Fields, Factories and Workshops

or Industry Combined with Agriculture and Brain Work with Manual Work

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Contents

Preface to the Second Edition

Fourteen years have passed since the first edition of this book was published, and in revising it for this new edition I found at my disposal an immense mass of new materials, statistical and descriptive, and a great number of new works dealing with the different subjects that are treated in this book. I have thus had an excellent opportunity to verify how far the previsions that I had formulated when I first wrote this book have been confirmed by the subsequent economical evolution of the different nations.

This verification permits me to affirm that the economical tendencies that I had ventured to foreshadow then have only become more and more definite since. Everywhere we see the same decentralisation of industries going on, new nations continually entering the ranks of those which manufacture for the world market. Each of these new-comers endeavours to develop, and succeeds in developing, on its own territory the principal industries, and thus frees itself from being exploited by other nations, more advanced in their technical evolution. All nations have made a remarkable progress in this direction, as will be seen from the new data that are given in this book.

On the other hand, one sees, with all the great industrial nations, the growing tendency and need of developing at home a more intensive agricultural productivity, either by improving the now existing methods of extensive agriculture, by means of small holdings, "inner colonisation," agricultural education, and co-operative work, or by introducing different new branches of intensive agriculture. This country is especially offering us at this moment a most instructive example of a movement in the said direction. And this movement will certainly result, not only in a much-needed increase of the productive forces of the nation a fuller appreciation of the immense value of its soil, and the desire of repairing the error that has been committed in leaving it in the hands of great land-owners and of those who find it now more advantageous to rent the land to be turned into shooting preserves. The different steps that are being taken now for raising English agriculture and for obtaining from the land a much greater amount of produce are briefly indicated in Chapter II.

It is especially in revising the chapters dealing with the small industries that I had to incorporate the results of a great number of new researches. In so doing I was enabled to show that the growth of an infinite variety of small enterprises by the side of the very great centralised concerns is not showing any signs of abatement. On the contrary, the distribution of electrical motive power has given them a new impulse. In those places where water power was utilized for distributing electric power in the villages, and in those cities where the machinery used for producing electric light during the night hours was utilised for supplying motive power during the day, the small industries are taking a new development.

In this domain I am enabled to add to the present edition the interesting results of a work about the small industries in the United Kingdom that I made in 1900. Such a work was only possible when the British Factory Inspectors had published (in 1898, in virtue of the Factories

Act of 1895) their first reports, from which I could determine the hitherto unknown numerical relations between the great and the small industries in the United Kingdom.

Until then no figures whatever as regards the distribution of operatives in the large and small factories and workshops of Great Britain were available; so that when economists spoke of the "unavoidable" death of the small industries they merely expressed hypotheses based upon a limited number of observations, which were chiefly made upon part of the textile industry and metallurgy. Only after Mr. Whitelegge had published the first figures from which reliable conclusions could be drawn was it possible to see how little such wide-reaching conclusions were confirmed by realities. In this country, as everywhere, the small industries continue to exist, and new ones continue to appear as a necessary growth, in many important branches of national production, by the side of the very great factories and huge centralised works. So I add to the chapter on small industries a summary of the work that I had published in the *Nineteenth Century* upon this subject.

As regards France, the most interesting observations made by M. Araouin Dumazet during his many years' travels all over the country give me the possibility of showing the remarkable development of rural industries, and the advantages which were taken from them for recent developments in agriculture and horticulture. Besides, the publication of the statistical results of the French industrial census of 1896 permits me to give now, for France, most remarkable numerical data, showing the real relative importance of the great and the small industries.

And finally, the recent publication of the result of the third industrial census made in Germany in 1907 gives me the data for showing how the German small industries have been keeping their ground for the last twenty-five years a subject which I could touch only in a general way in the first editions. The results of this census, compared with the two preceding ones, as also some of the conclusions arrived at by competent German writers, are indicated in the Appendix. So also the results recently arrived at in Switzerland concerning its home industries.

As to the need, generally felt at this moment, of an education which would combine a wide scientific instruction with a sound knowledge of manual work — a question which I treat in the last chapter — it can be said that this cause has already been won in this country during the last twenty years. The *principle* is generally recognised by this time, although most nations, impoverished as they are by their armaments, are much too slow in applying the principle in life.

P. Kropotkin
Brighton, October, 1912

Preface to First Edition

Under the name of profits, rent, interest upon capital, surplus value, and the like, economists have eagerly discussed the benefits which the owners of land or capital, or some privileged nations, can derive, either from the under-paid work of the wage-labourer, or from the inferior position of one class of the community toward another class, or from the inferior economical development of one nation towards another nation. These profits being shared in a very unequal proportion between the different individuals, classes and nations engaged in production, considerable pains were taken to study the present apportionment of the benefits, and its economical and moral consequences, as well as the changes in the present economical organisation of society which might bring about a more equitable distribution of a rapidly accumulating wealth. It is upon questions relating to the right to that increment of wealth that the hottest battles are now fought between economists of different schools.

In the meantime the great question "What have we to produce, and how?" necessarily remained in the background. Political economy, as it gradually emerges from its semi-scientific stage, tends more and more to become a science devoted to the study of the needs of men and of the means of satisfying them with the least possible waste of energy, — that is, a sort of physiology of society. But few economists, as yet, have recognised that this is the proper domain of economics, and have attempted to treat their science from this point of view. The main subject of social economy — that is, the *economy of energy required for the satisfaction of human needs* — is consequently the last subject which one expects to find treated in a concrete form in economical treatises.

The following pages are a contribution to a portion of this vast subject. They contain a discussion of the advantages which civilised societies could derive from a combination of industrial pursuits with intensive agriculture, and of brain work with manual work.

The importance of such a combination has not escaped the attention of a number of students of social science. It was eagerly discussed some fifty years ago under the names of "harmonised labour," "integral education," and so on. It was pointed out at that time that the greatest sum total of well-being can be obtained when a variety of agricultural, industrial and intellectual pursuits are combined in each community; and that man shows his best when he is in a position to apply his usually-varied capacities to several pursuits in the farm, the workshop, the factory, the study or the studio, instead of being riveted for life to one of these pursuits only.

At a much more recent date, in the 'seventies, Herbert Spencer's theory of evolution gave origin in Russia to a remarkable work, *The Theory of Progress,* by M. M. Mikhailovsky. The part which belongs in progressive evolution to *differentiation*, and the part which belongs in it to an *integration* of aptitudes and activities, were discussed by the Russian author with depth of thought, and Spencer's differentiation-formula was accordingly completed.

And, finally, out of a number of smaller monographs, I must mention a suggestive little book by J. R. Dodge, the United States statistician (*Farm and Factory: Aids derived by Agriculture from*

Industries, New York, 1886). The same question was discussed in it from a practical American point of view.

Half a century ago a harmonious union between agricultural and industrial pursuits, as also between brain work and manual work, could only be a remote desideratum. The conditions under which the factory system asserted itself, as well as the obsolete forms of agriculture which prevailed at that time, prevented such a union from being feasible. Synthetic production was impossible. However, the wonderful simplification of the technical processes in both industry and agriculture, partly due to an ever-increasing division of labour — in analogy with what we see in biology — has rendered the synthesis possible; and a distinct tendency towards a synthesis of human activities becomes now apparent in modern economical evolution. This tendency is analysed in the subsequent chapters — a special weight being laid upon the present possibilities of agriculture, which are illustrated by a number of examples borrowed from different countries, and upon the small industries to which a new impetus is being given by the new methods of transmission of motive power.

The substance of these essays was published in 1888–1890 in the *Nineteenth Century*, and of one of them in the *Forum*. However, the tendencies indicated there have been confirmed during the last ten years by such a mass of evidence that a very considerable amount of new matter had to be introduced, while the chapters on agriculture and the small trades had to be written anew.

I take advantage of this opportunity to address my best thanks to the editors of the *Nineteenth Century* and the *Forum* for their kind permission of reproducing these essays in a new form, as also to those friends and correspondents who have aided me in collecting information about agriculture and the petty trades.

P. Kropotkin
Bromley, Kent, 1898

Chapter I: The Decentralisation of Industries

Who does not remember the remarkable chapter by which Adam Smith opens his inquiry into the nature and causes of the wealth of nations? Even those of our contemporary economists who seldom revert to the works of the father of political economy, and often forget the ideas which inspired them, know that chapter almost by heart, so often has it been copied and recopied since. It has become an article of faith; and the economical history of the century which has elapsed since Adam Smith wrote has been, so to speak, an actual commentary upon it.

"Division of labour" was its watchword. And the division and subdivision — the permanent subdivision — of functions has been pushed so far as to divide humanity into castes which are almost as firmly established as those of old India. We have, first, the broad division into producers and consumers: little-consuming producers on the one hand, little-producing consumers on the other hand. Then, amidst the former, a series of further subdivisions: the manual worker and the intellectual worker, sharply separated from one another to the detriment of both; the agricultural labourers and the workers in the manufacture; and, amidst the mass of the latter, numberless subdivisions again — so minute, indeed, that the modern ideal of a workman seems to be a man or a woman, or even a girl or a boy, without the knowledge of any handicraft, without any conception whatever of the industry he or she is employed in, who is only capable of making all day long and for a whole life the same infinitesimal part of something: who from the age of thirteen to that of sixty pushes the coal cart at a given spot of the mine or makes the spring of a penknife, or "the eighteenth part of a pin." Mere servants to some machine of a given description; mere flesh-and-bone parts of some immense machinery; having no idea how and why the machinery performs its rhythmical movements.

Skilled artisanship is being swept away as a survival of a past condemned to disappear. The artist who formerly found aesthetic enjoyment in the work of his hands is substituted by the human slave of an iron slave. Nay, even the agricultural labourer, who formerly used to find a relief from the hardships of his life in the home of his ancestors — the future home of his children — in his love of the field and in a keen intercourse with nature, even he has been doomed to disappear for the sake of division of labour. He is an anachronism, we are told; he must be substituted, in a Bonanza farm, by an occasional servant hired for the summer, and discharged as the autumn comes: a tramp who will never again see the field he has harvested once in his life. "An affair of a few years," the economists say, "to reform agriculture in accordance with the true principles of division of labour and modern industrial organisation."

Dazzled with the results obtained by a century of marvellous inventions, especially in England, our economists and political men went still farther in their dreams of division of labour. They proclaimed the necessity of dividing the whole of humanity into national workshops having each of them its own speciality. We were taught, for instance, that Hungary and Russia are predestined by nature to grow corn in order to feed the manufacturing countries; that Britain had to provide the worldmarket with cottons, iron goods, and coal; Belgium with woollen cloth; and so on. Nay, within each nation, each region had to have its own speciality. So it has been for

some time since; so it ought to remain. Fortunes have been made in this way, and will continue to be made in the same way. It being proclaimed that the wealth of nations is measured by the amount of profits made by the few, and that the largest profits are made by means of a specialisation of labour, the question was not conceived to exist as to whether human beings *would* always submit to such a specialisation; whether nations could be specialised like isolated workmen. The theory was good for today — why should we care for tomorrow. Tomorrow might bring its own theory!

And so it did. The narrow conception of life which consisted in thinking that *profits* are the only leading motive of human society, and the stubborn view which supposes that what has existed yesterday would last for ever, proved in disaccordance with the tendencies of human life; and life took another direction. Nobody will deny the high pitch of production which may be attained by specialisation. But, precisely in proportion as the work required from the individual in modern production becomes simpler and easier to be learned, and, therefore, also more monotonous and wearisome — the requirements of the individual for varying his work, for exercising all his capacities, become more and more prominent. Humanity perceives that there is no advantage for the community in riveting a human being for all his life to a given spot, in a workshop or a mine; no gain in depriving him of such work as would bring him into free intercourse with nature, make of him a conscious part of the grand whole, a partner in the highest enjoyments of science and art, of free work and creation.

Nations, too, refuse to be specialised. Each nation is a compound aggregate of tastes and inclinations, of wants and resources, of capacities and inventive powers. The territory occupied by each nation is in its turn a most varied texture of soils and climates, of hills and valleys, of slopes leading to a still greater variety of territories and races. Variety is the distinctive feature, both of the territory and its inhabitants; and that variety implies a variety of occupations. Agriculture calls manufactures into existence, and manufactures support agriculture. Both are inseparable: and the combination, the integration of both brings about the grandest results. In proportion as technical knowledge becomes everybody's virtual domain, in proportion as it becomes international, and can be concealed no longer, each nation acquires the possibility of applying the whole variety of her energies to the whole variety of industrial and agricultural pursuits. Knowledge ignores artificial political boundaries. So also do the industries; and the present tendency of humanity is to have the greatest possible variety of industries gathered in each country, in each separate region, side by side with agriculture. The needs of human agglomerations correspond thus to the needs of the individual; and while a *temporary* division of functions remains the surest guarantee of success in each separate undertaking, the *permanent* division is doomed to disappear, and to be substituted by a variety of pursuits — intellectual, industrial, and agricultural — corresponding to the different capacities of the individual, as well as to the variety of capacities within every human aggregate.

When we thus revert from the scholastics of our textbooks, and examine human life as a whole, we soon discover that, while all the benefits of a temporary division of labour must be maintained, it is high time to claim those of the *integration of labour.* Political economy has hitherto insisted chiefly upon *division.* We proclaim *integration*; and we maintain that the ideal of society — that is, the state towards which society is already marching — is a society of integrated, combined labour. A society where each individual is a producer of both manual and intellectual work; where each able-bodied human being is a worker, and where each worker works both in the field and the industrial workshop; where every aggregation of individuals, large enough to dispose of a

certain variety of natural resources — it may be a nation, or rather a region — produces and itself consumes most of its own agricultural and manufactured produce.

Of course, as long as society remains organised so as to permit the owners of the land and capital to appropriate for themselves, under the protection of the State and historical rights, the yearly surplus of human production, no such change can be thoroughly accomplished. But the present industrial system, based upon a permanent specialisation of functions, already bears in itself the germs of its proper ruin. The industrial crises, which grow more acute and protracted, and are rendered still worse and still more acute by the armaments and wars implied by the present system, are rendering its maintenance more and more difficult. Moreover, the workers plainly manifest their intention to support no longer patiently the misery occasioned by each crisis. And each crisis accelerates the day when the present institutions of individual property and production will be shaken to their foundations with such internal struggles as will depend upon the more or less good sense of the now privileged classes.

But we maintain also that any socialist attempt at remodeling the present relations between Capital and Labour will be a failure, if it does not take into account the above tendencies towards integration. These tendencies have not yet received, in our opinion, due attention from the different socialist schools — but they must. A reorganised society will have to abandon the fallacy of nations specialized for the production of either agricultural or manufactured produce. It will have to rely on itself for the production of food and many, if not most, of the raw materials; it must find the best means of combining agriculture with manufacture — the work in the field with a decentralised industry; and it will have to provide for "integrated education," which education alone, by teaching both science and handicraft from earliest childhood, can give to society the men and women it really needs.

Each nation — her own agriculturist and manufacturer; each individual working in the field and in some industrial art; each individual combining scientific knowledge with the knowledge of a handicraft — such is, we affirm, the present tendency of civilised nations.

The prodigious growth of industries in Great Britain, and the simultaneous development of the international traffic which now permits the transport of raw materials and articles of food on a gigantic scale, have created the impression that a few nations of West Europe were destined to become *the* manufacturers of the world. They need only — it was argued — to supply the market with manufactured goods, and they will draw from all over the surface of the earth the food they cannot grow themselves, as well as the raw materials they need for their manufactures. The steadily increasing speed of trans-oceanic communications and the steadily increasing facilities of shipping have contributed to enforce the above impression. If we take the enthusiastic pictures of international traffic, drawn in such a masterly way by Neumann Spallart — the statistician and almost the poet of the world-trade — we are inclined indeed to fall into ecstasy before the results achieved. "Why shall we grow corn, rear oxen and sheep, and cultivate orchards, go through the painful work of the labourer and the farmer, and anxiously watch the sky in fear of a bad crop, when we can get, with much less pain, mountains of corn from India, America, Hungary, or Russia, meat from New Zealand, vegetables from the Azores, apples from Canada, grapes from Malaga, and so on?" exclaim the West Europeans. "Already now," they say, "our food consists, even in modest households, of produce gathered from all over the globe. Our cloth is made out of fibres grown and wool sheared in all parts of the world. The prairies of America and Australia; the mountains and steppes of Asia; the frozen wildernesses of the Arctic regions; the deserts of Africa and the depths of the oceans; the tropics and the lands of the midnight sun are our

tributaries. All races of men contribute their share in supplying us with our staple food and luxuries, with plain clothing and fancy dress, while we are sending them in exchange the produce of our higher intelligence, our technical knowledge, our powerful industrial and commercial organising capacities! Is it not a grand sight, this busy and intricate exchange of produce all over the earth which has suddenly grown up within a few years?"

Grand it may be, but is it not a mere nightmare? Is it necessary? At what cost has it been obtained, and how long will it last?

Let us turn a hundred years back. France lay bleeding at the end of the Napoleonic wars. Her young industry, which had begun to grow by the end of the 18th century, was crushed down. Germany, Italy were powerless in the industrial field. The armies of the great Republic had struck a mortal blow to serfdom on the Continent; but with the return of reaction efforts were made to revive the decaying institution, and serfdom meant no industry worth speaking of. The terrible wars between France and England, which wars are often explained by merely political causes, had a much deeper meaning — an economical meaning. They were wars for the supremacy on the world market, wars against French industry and commerce, supported by a strong navy which France had begun to build — and Britain won the battle. She became supreme on the seas. Bordeaux was no more a rival to London; as to the French industries, they seemed to be killed in the bud. And, aided by the powerful impulse given to natural sciences and technology by a great era of inventions, finding no serious competitors in Europe, Britain began to develop her manufactures. To produce on a large scale in immense quantities became the watchword. The necessary human forces were at hand in the peasantry, partly driven by force from the land, partly attracted to the cities by high wages. The necessary machinery was created, and the British production of manufactured goods went on at a gigantic pace. In the course of less than seventy years — from 1810 to 1878 — the output of coal grew from 10 to 133,000,000 tons; the imports of raw materials rose from 30 to 380,000,000 tons; and the exports of manufactured goods from 46 to 200,000,000 pounds. The tonnage of the commercial fleet was nearly trebled. Fifteen thousand miles of railways were built.

It is useless to repeat now at what a cost the above results were achieved. The terrible revelations of the parliamentary commissions of 1840–1842 as to the atrocious condition of the manufacturing classes, the tales of "cleared estates," and kidnapped children are still fresh in the memory. They will remain standing monuments for showing by what means the great industry was implanted in this country. But the accumulation of wealth in the hands of the privileged classes was going on at a speed never dreamed of before. The incredible riches which now astonish the foreigner in the private houses of England were accumulated during that period; the exceedingly expensive standard of life which makes a person considered rich on the Continent appear as only of modest means in Britain was introduced during that time. The taxed property alone doubled during the last thirty years of the above period, while, during the same years (1810 to 1878) no less than £1,112,000,000 — nearly £2,000,000,000 by this time — was invested by English capitalists either in foreign industries or in foreign loans.[1]

But the monopoly of industrial production could not remain with England for ever. Neither industrial knowledge nor enterprise could be kept for ever as a privilege of these islands. Necessarily, fatally, they began to cross the Channel and spread over the Continent. The Great Revolution had created in France a numerous class of peasant proprietors, who enjoyed nearly half

[1] See Appendix A.

a century of a comparative well-being, or, at least, of a guaranteed labour. The ranks of homeless town workers increased slowly. But the middle-class revolution of 1789–1793 had already made a distinction between the peasant householders and the village *prolétaires* , and, by favouring the former to the detriment of the latter, it compelled the labourers who had no household nor land to abandon their villages, and thus to form the first nucleus of working classes given up to the mercy of manufacturers. Moreover, the peasant-proprietors themselves, after having enjoyed a period of undeniable prosperity, began in their turn to feel the pressure of bad times, and their children were compelled to look for employment in manufactures. Wars and revolution had checked the growth of industry; but it began to grow again during the second half of our century; it developed, it improved; and now, notwithstanding the loss of Alsace, France is no longer the tributary to England for manufactured produce which she was sixty years ago. Today her exports of manufactured goods are valued at nearly one-half of those of Great Britain, and two-thirds of them are textiles; while her imports of the same consist chiefly of the finer sorts of cotton and woollen yarn — partly reexported as stuffs — and a small quantity of woollen goods. For her own consumption France shows a decided tendency towards becoming entirely a self-supporting country, and for the sale of her manufactured goods she is tending to rely, not on her colonies, but especially on her own wealthy home market.[2]

Germany follows the same lines. During the last fifty years, and especially since the last war, her industry has undergone a thorough reorganisation. Her population having rapidly increased from forty to sixty million, this increment went entirely to increase the urban population — without taking hands from agriculture — and in the cities it went to increase the population engaged in industry. Her industrial machinery has been thoroughly improved, and her new-born manufactures are supplied now with a machinery which mostly represents the last word of technical progress. She has plenty of workmen and technologists endowed with a superior technical and scientific education; and in an army of learned chemists, physicists and engineers her industry has a most powerful and intelligent aid, both for directly improving it and for spreading in the country serious scientific and technical knowledge. As a whole, Germany offers now the spectacle of a nation in a period of *Aufschwung*, of a sudden development, with all the forces of a new start in every domain of life. Fifty years ago she was a customer to England. Now she is already a competitor in the European and Asiatic markets, and at the present speedy rate of growth of her industries, her competition will soon be felt even more acutely than it is already felt.

At the same time the wave of industrial production, after having had its origin in the north-west of Europe, spreads towards the east and, south-east, always covering a wider circle. And, in proportion as it advances east, and penetrates into younger countries, it implants there all the improvements due to a century of mechanical and chemical inventions; it borrows from science all the help that science can give to industry; and it finds populations eager to grasp the last results of modern knowledge. The new manufactures of Germany begin where Manchester arrived after a century of experiments and gropings; and Russia begins where Manchester and Saxony have now reached. Russia, in her turn, tries to emancipate herself from her dependency upon Western Europe, and rapidly begins to manufacture all those goods she formerly used to import, either from Britain or from Germany.

Protective duties may, perhaps, sometimes help the birth of new industries: always at the expense of some other growing industries, and always checking the improvement of those which

[2] See Appendix B.

already exist; but the decentralisation of manufactures goes on with or without protective duties — I should even say, notwithstanding the protective duties. Austria, Hungary and Italy follow the same lines — they develop their home industries — and even Spain and Servia are going to join the family of manufacturing nations. Nay, even India, even Brazil and Mexico, supported by English, French, and German capital and knowledge, begin to start home industries on their respective soils. Finally, a terrible competitor to all European manufacturing countries has grown up of late in the United States. In proportion as technical education spreads more and more widely, manufactures grow in the States; and they do grow at such a speed — an American speed — that in a very few years the now neutral markets will be invaded by American goods.

The monopoly of the first comers on the industrial field has ceased to exist. And it will exist no more, whatever may be the spasmodic efforts made to return to a state of things already belonging to the domain of history. New ways, new issues must be looked for: the past has lived, and it will live no more.

Before going farther, let me illustrate the march of industries towards the east by a few figures. And, to begin with, let me take the example of Russia. Not because I know it better, but because Russia is one of the latest comers on the industrial field. Fifty years ago she was considered as the ideal of an agricultural nation, doomed by nature itself to supply other nations with food, and to draw her manufactured goods from the west. So it was, indeed — but it is so no more.

In 1861 — the year of the emancipation of the serfs — Russia and Poland had only 14,060 manufactories, which produced every year the value of 296,000,000 roubles (about £36,000,000). Twenty years later the number of establishments rose to 35,160, and their yearly production became nearly four times the above, *i.e.,* 1,305,000,000 roubles (about £131,000,000); and in 1894, although the census left the smaller manufactures and all the industries which pay excise duties (sugar, spirits, matches) out of account, the aggregate production in the Empire reached already 1,759,000,000 roubles, *i.e.,* £180,000,000. The most noteworthy feature of this increase is, that while the number of workmen employed in the manufactures has not even doubled since 1861 (it attained 1,555,000 in 1894, and 1,902,750 in 1910), the production per workman has more than trebled in the leading industries. The average was less than £70 per annum in 1861; it reaches now £219. The increase of production is thus chiefly due to the improvement of machinery.[3]

If we take, however, separate branches, and especially the textile industries and the machinery works, the progress appears still more striking. Thus, if we consider the eighteen years which preceded 1879 (when the import duties were increased by nearly 30 per cent. and a protective policy was definitely adopted), we find that even without protective duties the bulk of production in cottons increased three times, while the number of workers employed in that industry rose by only 26 per cent. The yearly production of each worker had thus grown from £45 to £117. During the next nine years (1880–1889) the yearly returns were more than doubled, attaining the respectable figure of £49,000,000 in money and 3,200,000 cwts. in bulk. Since that time, from 1890 to 1900, it has doubled once more, the quantity of raw cotton worked in the Russian factories having increased from 255,000 to 520,700 cwts., and the number of spindles having grown from

[3] For the last few years, since the Japanese war, the figures were uncertain. It appeared, however, in 1910, that there were in the empire, including the industries paying an excise duty, 19,983 establishments, employing 2,253,790 persons and showing a yearly production of 4,565,400,000 roubles (£494,600,000). Out of them, the industrial establishments under the factory inspectors in European Russia proper, Poland, and the four northern provinces of Caucasia numbered 15,720, employing 1,951,955 workpeople, out of whom 1,227,360 were men, 521,236 women, and 203,359 children.

3,457,000 to 6,646,000 in 1900, and to 8,306,000 in 1910. It must also be remarked that, with a population of 165,000,000 inhabitants, the home market for Russian cottons is almost unlimited; while some cottons are also exported to Persia and Central Asia.[4]

True, that the finest sorts of yarn, as well as sewing cotton, have still to be imported. But Lancashire manufacturers will soon see to that; they now plant their mills in Russia. Two large mills for spinning the finest sorts of cotton yarn were opened in Russia in 1897, with the aid of English capital and English engineers, and a factory for making thin wire for cotton-carding has lately been opened at Moscow by a well-known Manchester manufacturer. Several more have followed since. Capital is international and, protection or no protection, it crosses the frontiers.

The same is true of woollens. In this branch Russia was for a certain time relatively backward. However, wool-combing, spinning and weaving mills, provided with the best modern plant, were built every year in Russia and Poland by English, German and Belgian millowners; so that now four-fifths of the ordinary wool, and as much of the finer sorts obtainable in Russia, are combed and spun at home — one fifth part only of each being sent abroad. The times when Russia was known as an exporter of raw wool are thus irretrievably gone.[5]

In machinery works no comparison can even be made between nowadays and 1861, or even 1870. Thanks to English and French engineers to begin with, and afterwards to technical progress within the country itself, Russia needs no longer to import any part of her railway plant. And as to agricultural machinery, we know, from several British Consular reports, that Russian reapers and ploughs successfully compete with the same implements of both American and English make. During the years 1880 to 1890, this branch of manufactures has largely developed in the Southern Urals (as a village industry, brought into existence by the Krasnoufimsk Technical School of the local District Council, or *zemstvo),* and especially on the plains sloping towards the Sea of Azov. About this last region Vice-Consul Green reported, in 1894, as follows: "Besides some eight or ten factories of importance," he wrote, "the whole of the consular district is now studded with small engineering works, engaged chiefly in the manufacture of agricultural machines and implements, most of them having their own foundries… The town of Berdyansk," he added, "can now boast of the largest reaper manufactory in Europe, capable of turning out three thousand machines annually."[6]

Let me add that the above-mentioned figures, including only those manufactures which show a yearly return of more than £200, do not include the immense variety of domestic trades which

[4] The yearly imports of raw cotton from Central Asia and Transcaucasia represent, as a rule, about one tenth part of the total imports of raw cotton (£l,086,000, as against £11,923,000 In 1910). They are quite a recent growth, the first plantations of the American cotton tree having been introduced in Turkestan by the Russians, as well as the first sorting and pressing establishments. The relative cheapness of the plain cottons in Russia, and the good qualities of the printed cottons, attracted the attention of the British Commissioner at the Nijni Novgorod Exhibition in 1897, and are spoken of at some length in his report.

[5] The yearly production of the 1,037 woollen mills of Russia and Poland (149,850 workpeople) was valued at about £25,000,000 in 1910, as against £12,000,000 in 1894.

[6] Report of Vice-Consul Green, *The Economist,* 9th June, 1894: "Reapers of a special type, sold at £15 to £17, are durable and go through more work than either the English or the American reapers." In the year 1893, 20,000 reaping machines, 50,000 ploughs, and so on, were sold in that district only, representing a value of £822,000. Were it not for the simply prohibitive duties imposed upon foreign pig-iron (two and a half times its price in the London market), this industry would have taken a still greater development. But in order to protect the home iron industry — which consequently continued to cling to obsolete forms in the Urals — a duty of 61s. a ton of imported pig-iron was levied. The consequences of this policy for Russian agriculture, railways and State's budget have been discussed in full in a work by A. A. Radzig, The *Iron Industry of the World.* St. Petersburg, 1896 (Russian).

also have considerably grown of late, side by side with the manufactures. The domestic industries — so characteristic of Russia, and so necessary under her climate — occupy now more than 7,500,000 peasants, and their aggregate production was estimated a few years ago at more than the aggregate production of all the manufactures. It exceeded £180,000,000 per annum. I shall have an occasion to return later on to this subject, so that I shall be sober of figures, and merely say that even in the chief manufacturing provinces of Russia round about Moscow domestic weaving — for the trade — shows a yearly return of £4,500,000; and that even in Northern Caucasia, where the petty trades are of a recent origin, there are, in the peasants' houses, 45,000 looms showing a yearly production of £200,000.

As to the mining industries, notwithstanding over-protection, and notwithstanding the competition of fuelwood and naphtha,[7] the output of the coal mines of Russia has doubled during the years 1896–1904, and in Poland it has increased fourfold.[8] Nearly all steel, three-quarters of the iron, and two-thirds of the pig-iron used in Russia are home produce, and the eight Russian works for the manufacture of steel rails are strong enough to throw on the market over 10,000,000 cwts. of rails every year (10,068,000 cwts. in 1910).[9]

It is no wonder, therefore, that the imports of manufactured goods into Russia are so insignificant, and that since 1870 — that is, nine years before the general increase of duties — the proportion of manufactured goods to the aggregate imports has been on a steady decrease. Manufactured goods make now only one-fifth of the imports, and only occasionally rise to one-third, as was the case in 1910, year of maximal imports. Besides, while the imports of Britain into Russia were valued at £16,300,000 in 1872, they were only £6,884,500 to £11,320,000 in the years 1894 to 1909. Out of them, manufactured goods were valued at a little more than £2,000,000 — the remainder being either articles of food or raw and half-manufactured goods (metals, yarn, and so on). They reached £15,300,000 in 1910 — a year of maximum, and consisted chiefly of machinery and coal. In fact, the imports of British home produce have declined in the course of ten years from £8,800,000 to £5,000,000, so as to reduce in 1910 the value of British manufactured goods imported into Russia to the following trifling items: machinery, £1,320,000; cottons and cotton yarn, £360,000; woollens and woollen yarn, £480,000; chemical produce, £476,000; and so on. But the depreciation of British goods imported into Russia is still more striking. Thus, in 1876 Russia imported 8,000,000 cwts. of British metals, and they were paid £6,000,000; but in 1884, although the same quantity was imported, the amount paid was only £3,400,000.And the same depreciation is seen for all imported goods, although not always in the same proportion.

It would be a gross error to imagine that the decline of foreign imports is mainly due to high protective duties. The decline of imports is much better explained by the growth of home industries. The protective duties have no doubt contributed (together with other causes) towards attracting German and English manufacturers to Poland and Russia. Lodz — the Manchester of Poland — is quite a German city, and the Russian trade directories are full of English and German names. English and German capitalists, English engineers and foremen, have planted within Russia the improved cotton manufactures of their mother countries; they are busy now in improving the woollen industries and the production of machinery; while Belgians have rapidly created a great iron industry in South Russia. There is now not the slightest doubt — and this

[7] Out of the 1,500 steamers which ply on Russian rivers one quarter are heated with naphtha, and one-half with wood; wood is also tho chief fuel of the railways and ironworks in the Urals.

[8] The output was, in 1910, 24,146,000 tons in European Russia, and 1,065,000 tons in Siberia.

[9] See Appendix C.

opinion is shared, not only by economists, but also by several Russian manufacturers — that a free-trade policy would not check the further growth of industries in Russia. It would only reduce the high profits of those manufacturers who do not improve their factories and chiefly rely upon cheap labour and long hours.

Moreover, as soon as Russia succeeds in obtaining more freedom, a further growth of her industries will immediately follow. Technical education — which, strange to say, was for a long time systematically suppressed by the Government — would rapidly grow and spread; and in a few years, with her natural resource and her laborious youth, which even now tries to combine workmanship with science, Russia would see her industrial powers increase tenfold. She *fara da se* in the industrial field. She will manufacture all she needs; and yet she will remain an agricultural nation.

At the present time only a little more than 1,500,000 men and women, out of the 112,000,000 strong population of European Russia, work in manufactures, and 7,500,000 combine agriculture with manufacturing. This figure may treble without Russia ceasing to be an agricultural nation; but if it be trebled, there will be no room for imported manufactured goods, because an agricultural country can produce them cheaper than those countries which live on imported food. Let us not forget that in the United Kingdom 1,087,200 persons, all taken, are employed in *all* the textile industries of England, Scotland, Ireland and Wales, and that *only* 300,000 out of them are males above eighteen years of age (311,000 in 1907); that these workpeople keep going 53,000,000 spindles and more than 700,000 looms in the cotton factories only; and that the yearly production of textiles during the last few years was so formidable that it represented a value of £200,000,000, and that the average value of textiles exported every year attained £136,257,500 in 1905–1910 — to say nothing of the £163,400,000 reached in the extraordinary year of 1911.[10]

The same is still more true with regard to other European nations, much more advanced in their industrial development, and especially with regard to Germany. So much has been written about the competition which Germany offers to British trade, even in the British markets, and so much can be learned about it from a mere inspection of the London shops, that I need not enter into lengthy details. Several articles in reviews; the correspondence exchanged on the subject in *The Daily Telegraph* in August, 1886; numerous consular reports, regularly summed up in the leading newspapers, and still more impressive when consulted in originals; and, finally, political speeches, have familiarised the public opinion of this country with the importance and the

[10] Here are the figures obtained by the official census of 1908. In all the cotton industry, only 220,563 men (including boys), 262,245 women, and 90,061 girls less than eighteen years old were employed. They produced 6,417,798,000 yards of unbleached gray, and 611,824,000 yards of bleached white and coloured cottons that is, 160 yards per head of population — and 1,507,381,000 lb. of yarn, valued £96,000,000. We have thus 12,271 yards of cotton, and 2,631 lb. of yarn per person of workpeople employed. For woollens and worsted there were 112,438 men and boys, 111,492 women, and 34,087 girls under eighteen. The value (incomplete) of the woven goods was about £40,250,000, and that of the yarn about £21,000,000. These figures are most instructive, as they show how much man can produce with the present machinery. Unfortunately, the real productivity in a modern factory is not yet understood by the economists. Thus, we saw lately Russian economists very seriously maintaining that it was necessary to "proletarise" the peasants (about 100,000,000) in order to create a great industry. We see now that if one-fourth, or even one-fifth, part only of the yearly increase of the population took to industry (as it has done in Germany), Russian factories would soon produce such quantities of all sorts of manufactured goods that they would be able to supply with them 400 or 500 million people, in addition to the population of the Russian Empire.

powers of German competition.[11] Moreover, the forces which German industry borrows from the technical training of her workmen, engineers and numerous scientific men, have been so often discussed by the promoters of technical education in England that the sudden growth of Germany as an industrial power can be denied no more.

Where half a century was required in olden times to develop an industry, a few years are sufficient now. In the year 1864 only 160,000 cwts. of raw cotton were imported into Germany, and only 16,000 cwts. of cotton goods were exported; cotton spinning and weaving were mostly insignificant home industries. Twenty years later the imports of raw cotton were already 3,600,000 cwts., and in another twenty years they rose to 7,400,000 cwts.; while the exports of cottons and yarn, which were valued at £3,600,000 in 1883, and £7,662,000 in 1893, attained £19,000,000 in 1905. A great industry was thus created in less than thirty years, and has been growing since. The necessary technical skill was developed, and at the present time Germany remains tributary to Lancashire for the finest sorts of yarn only. However, it is very probable that even this disadvantage will soon be equalised.[12] Very fine spinning mills have lately been erected, and the emancipation from Liverpool, by means of a cotton exchange established at Bremen, is in fair progress.[13]

In the woollen trade we see the same rapid increase, and in 1910 the value of the exports of woollen goods attained £13,152,500 (against £8,220,300 in1894), out of which £1,799,000 worth were sent on the average to the United Kingdom during the years 1906–1910.[14] The flax industry has grown at a still speedier rate, and as regards silks Germany is second only to France.

The progress realised in the German chemical trade is well known, and it is only too badly felt in Scotland and Northumberland; while the reports on the German iron and steel industries which one finds in the publications of the Iron and Steel Institute and in the inquiry which was made by the British Iron Trade Association show how formidably the production of pig-iron and of finished iron has grown in Germany since 1871. (See Appendix D.) No wonder that the imports of iron and steel into Germany were reduced by one-half during the twenty years, 1874–1894, while the exports grew nearly four times. As to the machinery works, if the Germans have committed the error of too slavishly copying English patterns, instead of taking a new departure, and of creating new patterns, as the Americans did, we must still recognise that their copies are good and that they very successfully compete in cheapness with the tools and machinery produced in this country. (See Appendix E.) I hardly need mention the superior make of German scientific apparatus. It is well known to scientific men, even in France.

In consequence of the above, the imports of manufactured goods into Germany are, as a rule, in decline. The aggregate imports of textiles (inclusive of yarn) stand so low as to be compensated by nearly equal values of exports. And there is no doubt that not only the German markets for textiles will be soon lost for other manufacturing countries, but that German competition will be felt stronger and stronger both in the neutral markets and those of Western Europe. One can

[11] Many facts in point have also been collected In a little book, *Made in Germany,* by E. E. Williams. Unhappily, the facts relative to the recent industrial development of Germany are so often used in a partisan spirit in order to promote protection that their real importance is often misunderstood.

[12] Francke, *Die neuest Entwickelung der Textil-Industrie in Deutschland.*

[13] Cf. Schulze Gawernitz, *Der Grossbetrieb, etc.* — See Appendixes D, E, F.

[14] The imports of German woollen stuffs into this country have steadily grown from £607,444 in 1890 to £907,569 in 1894 and £1,822,514 In 1910. The British exports to Germany (of woollen stuffs and yarns have also grown, but not in the same proportion. They were valued at £2,769,392 in l890, £3,017,163 in 1894, and £4,638,000 in 1906–1910 (a five years' average).

easily win applause from uninformed auditories by exclaiming with more or less pathos that German produce can *never* equal the English! The fact is, that it competes in cheapness, and sometimes also — where it is needed — in an equally good workmanship; and this circumstance is due to many causes.

The "cheap labour" cause, so often alluded to in discussions about "German competition," which take place in this country and in France, must be dismissed by this time, since it has been well proved by so many recent investigations that low wages and long hours do not necessarily mean cheap produce. Cheap labour and protection simply mean the possibility for a number of employers to continue working with obsolete and bad machinery; but in highly developed staple industries, such as the cotton and the iron industries, the cheapest produce is obtained with high wages, short hours and the best machinery. When the number of operatives which is required for each 1000 spindles can vary from seventeen (in many Russian factories) to three (in England), and when one weaver can look either after twenty Northrop machine-looms, as we see it in the United States, or after two machine-looms only, as it is the case in backward mills, then it is evident that no reduction of wages can compensate for that immense difference. Consequently, in the best German cotton mills and ironworks the wages of the worker (we know it directly for the ironworks from the above-mentioned inquiry of the British Iron Trade Association) are not lower than they are in Great Britain. All that can be said is, that the worker in Germany gets more for his wages than he gets in this country — the paradise of the middleman — a paradise which it will remain so long as it lives chiefly on imported food produce.

The chief reason for the successes of Germany in the industrial field is the same as it is for the United States. Both countries have only lately entered the industrial phase of their development, and they have entered it with all the energy of youth. Both countries enjoy a widely spread scientifically-technical — or, at least, concrete scientific — education. In both countries manufactories are built according to the newest and best models which have been worked out elsewhere; and both countries are in a period of awakening in all branches of activity — literature and science, industry and commerce. They enter now on the same phase in which Great Britain was in the first half of the nineteenth century, when British workers took such a large part in the invention of the wonderful modern machinery.

We have simply before us a fact of *the consecutive development of nations.* And instead of decrying or opposing it, it would be much better to see whether the two pioneers of the great industry — Britain and France — cannot take a new initiative and do something new again; whether an issue for the creative genius of these two nations must not be sought for in a new direction — namely, the utilisation of both the land and the industrial powers of man for securing well-being to the whole nation instead of to the few.

The flow of industrial growths spreads, however, not only east; it moves also southeast and south. Austria and Hungary are rapidly gaining ground in the race for industrial importance. The Triple Alliance has already been menaced by the growing tendency of Austrian manufacturers to protect themselves against German competition; and even the dual monarchy has seen its two sister nations quarreling about customs duties. Austrian industries are a modern growth, and still they already give occupation to more than 4,000,000 workpeople.[15] Bohemia, in a few decades, has grown to be an industrial country of considerable importance; and the excellence

[15] During the census of 1902, there were in Austria 1,408,000 industrial establishments, with 1,787,000 horse-power, giving occupation to 4,049,300 workpeople; 1,128,000 workpeople were engaged in manufacturer in Hungary.

and originality of the machinery used in the newly reformed flour-mills of Hungary show that the young industry of Hungary is on the right road, not only to become a competitor to her elder sisters, but also to add her share to our knowledge as to the use of the forces of nature. Let me add, by the way, that the same is true to some extent with regard to Finland. Figures are wanting as to the present state of the aggregate industries of Austria-Hungary; but the relatively low imports of manufactured goods, are worthy of note. For British manufacturers, Austria-Hungary is, in fact, no customer worth speaking of; but even with regard to Germany she is rapidly emancipating herself from her former dependence. (See Appendix G.)

The same industrial progress extends over the southern peninsulas. Who would have spoken in 1859 about Italian manufactures? And yet — the Turin Exhibition of 1884 has shown it — Italy ranks already among the manufacturing countries. "You see everywhere a considerable industrial and commercial effort made," wrote a French economist to the *Temps*. "Italy aspires to go on without foreign produce. The patriotic watchword is, Italy all by herself. It inspires the whole mass of producers. There is not a single manufacturer or tradesman who, even in the most trifling circumstances, does not do his best to emancipate himself from foreign guardianship." The best French and English patterns are imitated and improved by a touch of national genius and artistic traditions. Complete statistics are wanting, so that the statistical *Annuario* resorts to indirect indications. But the rapid increase of imports of coal (9,339,000 tons in 1910, as against 779,000 tons in 1871); the growth of the mining industries, which have trebled their production during the fifteen years, 1870 to 1885; the increasing production of steel and machinery (£4,800,000 in 1900), which — to use Bovio's words — shows how a country having no fuel nor minerals of her own can have nevertheless a notable metallurgical industry; and, finally, the growth of textile industries disclosed by the net imports of raw cottons and the number of spindles[16] — all these show that the tendency towards becoming a manufacturing country capable of satisfying her needs by her own manufactures is not a mere dream. As to the efforts made for taking a more lively part in the trade of the world, who does not know the traditional capacities of the Italians in that direction?

I ought also to mention Spain, whose textile mining and metallurgical industries are rapidly growing; but I hasten to go over to countries which a few years ago were considered as eternal and obligatory customers to the manufacturing nations of Western Europe. Let us take, for instance, Brazil. Was it not doomed by economists to grow cotton, to export it in a raw state, and to receive cotton goods in exchange? In 1870 its nine miserable cotton mills could boast only of an aggregate of 385 spindles. But already in 1887 there were in Brazil 46 cotton mills, and five of them had already 40,000 spindles; while altogether their nearly 10,000 looms threw every year on the Brazilian markets more than 33,000,000 yards of cotton stuffs.

Twenty five years later, in 1912, there were already 161 cotton mills, with 1,500,000 spindles and 50,000 looms, employing over 100,000 operatives.[17] Even Vera Cruz, in Mexico, under the protection of customs officers, has begun to manufacture cottons, and boasted in 1887 its 40,200 spindles, 287,700 pieces of cotton cloth, and 212,000 lb. of yarn. Since that year progress has been

[16] The net imports of raw cotton reached 1,180,000 cwts. in 1885, and 4,120,000 cwts, in 1908; the number of spindles grew from 880,000 in 1877 to 3,800,000 in 1907. The whole industry has grown up since 1859. In 1910 no less than 358,200 tons of pig-iron and 671,000 tons of steel were produced in Italy. The exports of textiles reached the following values in 1905–1910: Silks, from £17,800,000 to £24,794,000-cottons £4,430,000 to £5,040,000; woollens, from £440,000 to £1.429.000.

[17] *Times* August 27, 1912.

steady, and in 1894 Vice-Consul Chapman reported that some of the finest machines are to be found at the Orizaba spinning mills, while "cotton prints," he wrote, "are now turned out as good if not superior to the imported article."[18] In 1910, 32,000 workpeople were already employed in 145 cotton mills, which had 703,000 spindles, and 25,000 powerlooms.[19]

The flattest contradiction to the export theory has, however, been given by India. She was always considered as the surest customer for British cottons, and so she has been until quite lately. Out of the total of cotton goods exported from Britain she used to buy more than one-quarter, very nearly one-third (from £17,000,000 to £22,000,000, out of an aggregate of about £76,000,000 in the years 1880–1890). But things have begun to change, and in 1904–1907 the exports were only from £21,680,000 to £25,680,000 out of an aggregate of £110,440,000. The Indian cotton manufactures, which — for some causes not fully explained were so unsuccessful at their beginnings, suddenly took firm root.

In 1860 they consumed only 23,000,000 lb. of raw cotton, but the quantity was nearly four times as much in 1877, and it trebled again within the next ten years: 283,000,000 Ib. of raw cotton were used in 1887–1888. The number of cotton mills grew up from 40 in 1887 to 147 in 1895; the number of spindles rose from 886,100 to 3,844,300 in the same years; and where 57,188 workers were employed in 1887, we found, seven years later, 146,240 operatives. And now, in 1909–1910, we find 237 cotton mills at work, with 6,136,000 spindles, 80,000 looms, and 231,850 workpeople. As for the quality of the mills, the blue-books praise them; the German chambers of commerce state that the best spinning mills in Bombay "do not now stand far behind the best German ones"; and two great authorities in the cotton industry, Mr. James Platt and Mr. Henry Lee, agree in saying "that in no other country of the earth except in Lancashire do the operatives possess such a natural leaning to the textile industry as in India."[20]

The exports of cotton twist from India more than doubled in five years (1882–1887), and already in 1887 we could read in the *Statement* (p. 62) that "what cotton twist was imported was less and less of the coarser and even medium kind, which indicates that the Indian (spinning) mills are gradually gaining hold of the home markets." Consequently, while India continued to import nearly the same amount of British cotton goods and yarn (from £16,000,000 to £26,700,000 in 1900–1908), she threw already in 1887 on the foreign markets no less than £3,635,510 worth of her own cottons of Lancashire patterns; she exported 33,000,000 yards of *gray cotton piece goods* manufactured in India by Indian workmen. And the export has continued to grow since, so that in the year 1910–1911 the value of the piece-goods and yarn exported from India reached the value of £7,943,700.

The jute factories in India have grown at a still speedier rate, and the once flourishing jute trade of Dundee was brought to decay, not only by the high tariffs of continental powers, but also by Indian competition.[21] Even woollen mills have lately been started; while the iron industry

[18] *The Economist*, 12th May, 1894, p. 9: "A few years ago the Orizaba mills used entirely imported raw cotton; but now they use home-grown and home-spun cotton as much as possible."

[19] *Annuario Estadistico*, 1911. They consumed 34,700 tons of raw cotton, and, produced 13,936,300 pieces of cotton goods, and 554,000 cwts. of yarn.

[20] Schulze Gawernitz, *The Cotton Trade,* etc., p. 123.

[21] In 1882 they had 5,633 looms and 95,937 spindles. Thirteen years later these figures were already doubled — there being 10,600 looms and 216,000 spindles. Now, or rather in 1909–1910, we find 60 jute mills, with 31,420 looms, 645,700 spindles, and 204,000 workpeople. The progress realised in the machinery is best seen from these figures. The exports of jute stuffs from India, which were only £1,543,870 in 1884–1885, reached £11,333,000 in 1910–1911. (See Appendix H.)

took a sudden development in India, since the means were found, after many experiments and failures, to work furnaces with local coal. In a few years, we are told by specialists, India will be self-supporting for iron. Nay, it is not without apprehension that the English manufacturers see that the imports of Indian manufactured textiles to this country are steadily growing, while in the markets of the Far East and Africa India becomes a serious competitor to the mother country.

Why should it not be so? What *might* prevent the growth of Indian manufactures? Is it the want of capital? But capital knows no fatherland; and if high profits can be derived from the work of Indian coolies whose wages are only one-half of those of English workmen, or even less, capital will migrate to India, as it has gone to Russia, although its migration may mean starvation for Lancashire and Dundee. Is it the want of knowledge? But longitudes and latitudes are no obstacle to its spreading; it is only the first steps that are difficult. As to the superiority of workmanship, nobody who knows the Hindoo worker will doubt about his capacities. Surely they are not below those of the 36,000 children less than fourteen years of age, or the 238,000 boys and girls less than eighteen years old, who are employed in the British textile manufactories.

Twenty years surely are not much in the life of nations. And yet within the last twenty years another powerful competitor has grown in the East. I mean Japan. In October, 1888, the *Textile Recorder* mentioned in a few lines that the annual production of yarns in the cotton mills of Japan had attained 9,498,500 Ib., and that fifteen more mills, which would hold 156,100 spindles, were in course of erection.[22] Two years later, 27,000,000 lb. of yarn were spun in Japan; and while in 1887–1888 Japan imported five or six times as much yarn from abroad as was spun at home, next year two-thirds only of the total consumption of the country were imported from abroad[23]

From that date the production grew up regularly. From 6,435,000 lb. in 1886 it reached 91,950,000 lb. in 1893, and 153,444,000 lb. in 1895. In nine years it had thus increased twenty-four times. Since then it rose to 413,800,000 lb. in 1909; and we learn from the *Financial Economical Annual* for the years 1910 and 1911, published at Tokio, that there were in Japan, in 1909, no less than 3,756 textile factories, with 1,785,700 spindles and 51,185 power-looms, to which 783,155 hand-looms must be added. Japan is thus already a serious competitor of the great industrial nations for tissues altogether, and especially for cottons, in the markets of Eastern Asia; and it took it only five-and-twenty years to attain this position. The total production of tissues, valued at £1,200,000 in the year 1887, rapidly rose to £14,270,000 in 1895 and to £22,500,000 in 1909 — cottons entering into this amount to the extent of nearly two-fifths. Consequently, the imports of foreign cotton goods from Europe fell from £1,640,000 in 1884 to £849,600 in 1895, and to £411,600 in 1910, while the exports of silk goods rose to nearly £3,000,000.[24]

As to the coal and iron industries, I ventured in the first edition of this book to predict that the Japanese would not long remain a tributary to Europe for iron goods — that their ambition was also to have their own shipbuilding yards, and that the previous year 300 engineers left the Elswick works of Mr. Armstrong in order to start shipbuilding in Japan. They were engaged for five years only — the Japanese expecting to have learned enough in five years to be their own shipbuilders. This prediction has been entirely fulfilled. Japan has now 1,030 iron and machine

[22] *Textile Recorder*, 15th Ootober, 1888.

[23] 39,200,000 Ib. of yarn were imported in 1886 as against 6,435,000 Ib. of home-spun yarn. In 1889 the figures were 66,633,000 Ib. imported and 26,809,000 Ib. home-spun.

[24] In 1910 the imports of cotton and woollens were only £2,650,500, while the exports of cotton yarn, cotton shirtings, and silk manufactures reached a value of £8,164,800.

works, and she now builds her own warships. During the last war, the progress realised in all industries connected with war was rendered fully evident.[25]

All this shows that the much-dreaded invasion of the East upon European markets is in rapid progress. The Chinese slumber still; but I am firmly persuaded from what I saw of China that the moment they will begin to manufacture with the aid of European machinery — and the first steps have already been made — they will do it with more success, and necessarily on a far greater scale, than even the Japanese.

But what about the United States, which cannot be accused of employing cheap labour or of sending to Europe "cheap and nasty" produce? Their great industry is of yesterday's date; and yet the States already send to old Europe constantly increasing quantities of machinery. In 1890 they began even to export iron, which they obtain at a very low cost, owing to admirable new methods which they have introduced in metallurgy.

In the course of twenty years (1870–1890) the number of persons employed in the American manufactures was more than doubled, and the value of their produce was nearly trebled; and in the course of the next fifteen years, the number of persons employed increased again by nearly fifty per cent., while the value of the produce was nearly doubled.[26] The cotton industry, supplied with excellent home-made machinery, has been rapidly developing, so that the yearly production of textiles attained in 1905 a value of 2,147,441,400 dollars, thus being twice as large as the yearly production of the United Kingdom in the same branch (which was valued at about £200,000,000); and the exports of cottons of domestic manufacture attained in 1910 the respectable figure of £8,600,000.[27] As to the yearly output of pig-iron and steel, it is already in excess of the yearly output in Britain;[28] and the organisation of that industry is also superior, as Mr. Berkley pointed out, already in 1891, in his address to the Institute of Civil Engineers.[29]

But all this has grown almost entirely within the last thirty or forty years — whole industries having been created entirely since 1860.[30] What will, then, American industry be twenty years henoe, aided as it is by a wonderful development of technical skill, by excellent schools, a scientific education which goes hand in hand with technical education, and a spirit of enterprise which is unrivalled in Europe?

Volumes have been written about the crisis of 1886–1887, a crisis which, to use the words of the Parliamentary Commission, lasted since 1875, with but "a short period of prosperity enjoyed

[25] The mining industry has grown as follows: — Copper extracted: 2,407 tons in 1875, 49,000 in 1909. Coal: 567,200 tons in 1875; 15,635,000 in 1909. Iron: 3,447 tons in 1875 15,268 in 1887; 65,000 in 1909. (K. Rathgen, *Japan's Volkwirthschaft und Staatshaushaltung*, Leipzig, 1891; Consular Reports.)

[26] Workers employed in manufacturing industries: 2,054,000 in 1870, 4,712,600 in 1890, and 6,723,900 in 1905 (including salaried officials and clerks). Value of produce: 3,385,861,000 dollars in 1870, 9,372,437,280 dollars in 1890, and 16,866,707,000 in 1905. Yearly production per head of workers: 1,648 dollars in 1870, 1,989 dollars in 1890, and 2,614 dollars in 1905.

[27] About the cotton industry in the United States, see Appendix I.

[28] It was from 7,255,076 to 9,811,620 tons of pig-ironduring the years 1890–94, and 27,303,600 long tons in 1910 (£85,000,000 worth). The total value of products of the steel works and rolling mills reached in 1909 the immense value of £197,144,500. In the *Statesman's Year-book* for the years 1910–1912, the reader may find most striking figures concerning the rapid growth of the iron and steel industry in the States. We have nothing parallel to it in Europe.

[29] The largest output of one blast-furnace in Great Britain does not exceed 750 tons in the week, while in America it had reached 2000 tons" (*Nature,* 19th Nov., 1891, p. 65). In 1909 the Bessemer steel plants had 99 oonverters; total daily capacity of ingots or direct castings, double turn, in 1909, 45,983 tons.

[30] J.R. Dodge, *Farm and Factory: Aids to Agriculture from other Industries,* New York and London, 1884, p. 111. I can but highly recommend this little work to those interested in the question.

by certain branches of trade in the years 1880 to 1883," and a crisis, I shall add, which extended over all the chief manufacturing countries of the world. All possible causes of the crisis have been examined; but, whatever the cacophony of conclusions arrived at, all unanimously agreed upon one, namely, that of the Parliamentary Commission, which could be summed up as follows: "The manufacturing countries do not find such customers as would enable them to realise high profits." Profits being the basis of capitalist industry, low profits explain all ulterior consequences.

Low profits induce the employers to reduce the wages, or the number of workers, or the number of days of employment during the week, or eventually compel them to resort to the manufacture of lower kinds of goods, which, as a rule, are paid worse than the higher sorts. As Adam Smith said, low profits ultimately mean a reduction of wages, and low wages mean a reduced consumption by the worker. Low profits mean also a somewhat reduced consumption by the employer; and both together mean lower profits and reduced consumption with that immense class of middlemen which has grown up in manufacturing countries, and that, again, means a further reduction of profits for the employers.

A country which manufactures to a great extent for export, and therefore lives to a considerable amount on the profits derived from her foreign trade, stands very much in the same position as Switzerland, which lives to a great extent on the profits derived from the foreigners who visit her lakes and glaciers. A good "season" means an influx of from £1,000,000 to £2,000,000 of money imported by the tourists, and a bad "season" has the effects of a bad crop in an agricultural country: a general impoverishment follows. So it is also with a country which manufactures for export. If the "season" is bad, and the exported goods cannot be sold abroad for twice their value at home, the country which lives chiefly on these bargains suffers. Low profits for the innkeepers of the Alps mean narrowed circumstances in large parts of Switzerland; and low profits for the Lancashire and Scotch manufacturers, and the wholesale exporters, mean narrowed circumstances in Great Britain. The cause is the same in both cases.

For many decades past we had not seen such a cheapness of wheat and manufactured goods as we saw in 1883–1884, and yet in 1886 the country was suffering from a terrible crisis. People said, of course, that the cause of the crisis was over-production. But over-production is a word utterly devoid of sense if it does not mean that those who are in need of all kinds of produce have not the means for buying them with their low wages. Nobody would dare to affirm that there is too much furniture in the crippled cottages, too many bedsteads and bedclothes in the workmen's dwellings, too many lamps burning in the huts, and too much cloth on the shoulders, not only of those who used to sleep (in 1886) in Trafalgar Square between two newspapers, but even in those households where a silk hat makes a part of the Sunday dress. And nobody will dare to affirm that there is too much food in the homes of those agricultural labourers who earn twelve shillings a week, or of those women who earn from fivepence to sixpence a day in the clothing trade and other small industries which swarm in the outskirts of all great cities. Over-production means merely and simply a want of purchasing powers amidst the workers. And the same want of purchasing powers of the workers was felt everywhere on the Continent during the years 1885–1887.

After the bad years were over, a sudden revival of international trade took place; and, as the British exports rose in four years (1886 to 1890) by nearly 24 percent, it began to be said that there was no reason for being alarmed by foreign competition; that the decline of exports in 1885–1887 was only temporary, and general in Europe; and that England, now as of old, fully maintained her dominant position in the international trade. It is certainly true that if we consider

exclusively the money value of the exports for the years 1876 to 1895, we see no permanent decline, we notice only fluctuations. British exports, like commerce altogether, seem to show a certain periodicity. They fell from £201,000,000 sterling in 1876 to £192,000,000 in 1879, then they rose again to £241,000,000 in 1882, and fell down to £213,000,000 in 1886; again they rose to £264,000,00n in 1890, but fell again, reaching a minimum of £216,000,000 in 1894, to be followed next year by a slight movement upwards.

This periodicity being a fact, Mr. Giffen could make light in 1886 of "German competition" by showing that exports from the United Kingdom had not decreased. It can even be said that, per head of population, they had remained unchanged until 1904, undergoing only the usual ups and downs.[31] However, when we come to consider the *quantities* exported, and compare them with the *money value* of the exports, even Mr. Giffen had to acknowledge that the prices of 1883 were so low in comparison with those of 1873 that in order to reach the same money value the United Kingdom would have had to export four pieces of cotton instead of three, and eight or ten tons of metallic goods instead of six. "The aggregate of British foreign trade, if valued at the prices of ten years previously, would have amounted to £861,000,000 instead of £667,000,000," we were told by no less an authority than the Commission on Trade Depression.

It might, however, be said that 1873 was an exceptional year, owing to the inflated demand which took place after the Franco-German war. But the same downward movement continued for a number of years. Thus, if we take the figures given in the *Statesman's Year-book,* we see that while the United Kingdom exported, in 1883, 4,957,000,000 yards of piece goods (cotton, woollen and linen) and 316,000,000 lb. of yarn in order to reach an export value of £104,000,000, the same country had to export, in 1896, no less than 5,478,000,000 yards of the same stuffs and 330,000,000 lb. of yarn in order to realise £99,700,000 only. And the figures would have appeared still more unfavourable if we took the cottons alone. True, the conditions improved during the last ten years, so that in 1906 the exports were similar to those of 1873; and they were better still in 1911, which was a year of an extraordinary foreign trade, when 7,041,000,000 yards of stuffs and 307,000,000 lb. of yarn were exported — the two being valued at £163,400,000. However, it was especially the yarn which kept the high prices, because it is the finest sorts of yarn which are now exported. But the great profits of the years 1873–1880 are irretrievably gone.

We thus see that while the total value of the exports from the United Kingdom, in proportion to its growing population, remains, broadly speaking, unaltered for the last thirty years, the high prices which could be got for the exports thirty years ago, and with them the high profits, are gone. And no amount of arithmetical calculations will persuade the British manufacturers that such is not the case. They know perfectly well that the home markets grow continually overstocked; that the best foreign markets are escaping; and that in the neutral markets Britain is being undersold. This is the unavoidable consequence of the development of manufactures all over the world. (See Appendix J.)

Great hopes were laid, some time ago, in Australia as a market for British goods; but Australia will soon do what Canada already does. She will manufacture. And the colonial exhibitions, by showing to the "colonists" what they are able to do, and how they must do, are only accelerating the day when each colony *farà da sé* in her turn. Canada and India aleady impose protective duties on British goods. As to the much-spoken-of markets en the Congo, and Mr. Stanley's calculations and promises of a trade amounting to £26,000,000 a year if the Lancashire people

[31] *[See Table 1]*

supply the Africans with loincloths, such promises belong to the same category of fancies as the famous nightcaps of the Chinese which were to enrich England after the first Chinese war. The Chinese prefer their own home-made nightcaps; and as to the Congo people, four countries at least are already competing for supplying them with their poor dress: Britain, Germany, the United States, and, last but not least, India.

There was a time when this country had almost the monopoly in the cotton industries; but already in 1880 she possessed only 55 per cent. of all the spindles at work in Europe, the United States and India (40,000,000 out of 72,000,000), and a little more than one-half of the looms (550,000 out of 972,000). In 1893 the proportion was further reduced to 49 per cent. of the spindles (45,300,000 out of 91,340,000), and now the United Kingdom has only 41 per cent. of all the spindles.[32] It was thus losing ground while the others were winning. And the fact is quite natural: it might have been foreseen. There is no reason why Britain should always be the great cotton manufactory of the world, when raw cotton has to be imported into this country as elsewhere. It was quite natural that France, Germany, Italy, Russia, India, Japan, the United States, and even Mexico and Brazil, should begin to spin their own yarns and to weave their own cotton stuffs. But the appearance of the cotton industry in a country, or, in fact, of any textile industry, unavoidably becomes the starting-point for the growth of a series of other industries; chemical and mechanical works, metallurgy and mining feel at once the impetus given by a new want. The whole of the home industries, as also technical education altogether, *must* improve in order to satisfy that want as soon as it has been felt.

What has happened with regard to cottons is going on also with regard to other industries. Great Britain, which stood in 1880 at the head of the list of countries producing pig-iron, came in 1904 the third in the same list, which was headed by the United States and Germany; while Russia, which occupied the seventh place in 1880, comes now fourth, after Great Britain.[33] Britain and Belgium have no longer the monopoly of the woollen trade. Immense factories at Verviers are silent; the Belgian weavers are misery-stricken, while Germany yearly increases her production of woollens, and exports nine times more woollens than Belgium. Austria has her own woollens and exports them, Riga, Lodz, and Moscow supply Russia with fine woollen cloths; and the growth of the woollen industry in each of the last-named countries calls into existence hundreds of connected trades.

For many years France has had the monopoly of the silk trade. Silkworms being reared in Southern France, it was quite natural that Lyons should grow into a centre for the manufacture of silks. Spinning, domestic weaving, and dyeing works developed to a great extent. But eventually the industry took such an extension that home supplies of raw silk became insufficient, and raw silk was imported from Italy, Spain and Southern Austria, Asia Minor, the Caucasus and Japan, to the amount of from £9,000,000 to £11,000,000 in 1875 and 1876, while France had only £800,000 worth of her own silk. Thousands of peasant boys and girls were attracted by high wages to Lyons and the neighboring district; the industry was prosperous.

However, by-and-by new centres of silk trade grew up at Basel and in the peasant houses round Zürich. French emigrants imported the trade into Switzerland, and it developed there, especially after the civil war of 1871. Then the Caucasus Administration invited French workmen

[32] *[See Table 2]*

[33] J. Stephen Jeans, *The Iron Trade of Great Britain* (London, Methuen), 1905, p. 46. The reader will find in this interesting little work valuable data concerning the growth and improvement of the iron industry in different countries.

and women from Lyons and Marseilles to teach the Georgians and the Russians the best means of rearing the silkworm, as well as the whole of the silk trade; and Stavropol became a new centre for silk weaving. Austria and the United States did the same; and what are now the results?

During the years 1872 to 1881 Switzerland more than doubled the produce of her silk industry; Italy and Germany increased it by one-third; and the Lyons region, which formerly manufactured to the value of 454 million francs a year, showed in 1887 a return of only 378 millions. The exports of Lyons silks, which reached an average of 425,000,000 francs in 1855–1859, and 460,000,000 in 1870–1874, fell down to 233,000,000 in 1887. And it is reckoned by French specialists that at present no less than one-third of the silk stuffs used in France are imported from Zürich, Crefeld, and Barmen. Nay, even Italy, which has now 191,000 persons engaged in the industry, sends her silks to France and competes with Lyons.

The French manufacturers may cry as loudly as they like for protection, or resort to the production of cheaper goods of lower quality; they may sell 3,250,000 kilogrammes of silk stuffs at the same price as they sold 2,500,000 in 1855–1859 — they will never again regain the position they occupied before. Italy, Switzerland, Germany, the United States and Russia have their own silk factories, and will import from Lyons only the highest qualities of stuffs. As to the lower sorts, a foulard has become a common attire with the St. Petersburg housemaids, because the North Caucasian domestic trades supply them at a price which would starve the Lyons weavers. The trade has been decentralised, and while Lyons is still a centre for the higher artistic silks, it will never be again the chief centre for the silk trade which it was thirty years ago.

Like examples could be produced by the score. Greenock no longer supplies Russia with sugar, because Russia has plenty of her own at the same price as it sells at in England. The watch trade is no more a speciality of Switzerland: watches are now made everywhere. India extracts from her ninety collieries two-thirds of her annual consumption of coal. The chemical trade which grew up on the banks of the Clyde and Tyne, owing to the special advantages offered for the import of Spanish pyrites and the agglomeration of such a variety of industries along the two estuaries, is now in decay. Spain, with the help of English capital, is beginning to utilise her own pyrites for herself; and Germany has become a great centre for the manufacture of sulphuric acid and soda — nay, she already complains about over-production.

But enough! I have before me so many figures, all telling the same tale, that examples could be multiplied at will. It is time to conclude, and, for every unprejudiced mind, the conclusion is self-evident. Industries of all kinds decentralise and are scattered all over the globe; and everywhere a variety, an integrated variety, of trades grows, instead of specialisation. Such are the prominent features of the times we live in. Each nation becomes in its turn a manufacturing nation; and the time is not far off when each nation of Europe, as well as the United States, and even the most backward nations of Asia and America, will themselves manufacture nearly everything they are in need of. Wars and several accidental causes may check for some time the scattering of industries: they will not stop it; it is unavoidable. For each new-comer the first steps only are difficult. But, as soon as any industry has taken firm root, it calls into existence hundreds of other trades; and as soon as the first steps have been made, and the first obstacles have been overcome, the industrial growth goes on at an accelerated rate.

The fact is so well felt, if not understood, that the race for colonies has become the distinctive feature of the last twenty years. Each nation will have her own colonies. But colonies will not help. There is not a second India in the world, and the old conditions will be repeated no more. Nay, some of the British colonies already threaten to become serious competitors with their mother

country; others, like Australia, will not fail to follow the same lines. As to the yet neutral markets, China will never be a serious customer to Europe: she can produce much cheaper at home; and when she begins to feel a need for goods of European patterns, she will produce them herself. Woe to Europe, if on the day that the steam engine invades China she is still relying on foreign customers! As to the African half-savages, their misery is no foundation for the well-being of a civilised nation.

Progress must be looked for in another direction. *It is in producing for home use.* The customers for the Lancashire cottons and the Sheffield cutlery, the Lyons silks and the Hungarian flour-mills, are not in India, nor in Africa. The true consumers of the produce of our factories must be our own populations. And they *can* be that, once we organise our economical life so that they might issue from their present destitution. No use to send floating shops to New Guinea with British or German millinery, when there are plenty of would-be customers for British millinery in these very islands, and for German goods in Germany. Instead of worrying our brains by schemes for getting customers abroad, it would be better to try to answer the following questions: Why the British worker, whose industrial capacities are so highly praised in political speeches; why the Scotch crofter and the Irish peasant, whose obstinate labours in creating new productive soil out of peat bogs are occasionally so much spoken of, are no customers to the Lancashire weavers, the Sheffield cutlers and the Northumbrian and Welsh pitmen? Why the Lyons weavers not only do not wear silks, but sometimes have no food in their attics? Why the Russian peasants sell their corn, and for four, six, and sometimes eight months every year are compelled to mix bark and auroch grass to a handful of flour for baking their bread? Why famines are so common amidst the growers of wheat and rice in India?

Under the present conditions of division into capitalists and labourers, into property-holders and masses living on uncertain wages, the spreading of industries over new fields is accompanied by the very same horrible facts of pitiless oppression, massacre of children, pauperism, and insecurity of life. The Russian Fabrics Inspectors' Reports, the Reports of the Plauen Handelskammer, the Italian inquests, and the reports about the growing industries of India and Japan are full of the same revelations as the Reports of the Parliamentary Commissions of 1840 to 1842, or the modern revelations with regard to the "sweating system" at Whitechapel and Glasgow, London pauperism, and York unemployment. The Capital and Labour problem is thus universalised; but, at the same time, it is also simplified. To return to a state of affairs where corn is grown, and manufactured goods are fabricated, *for the use of those very people who grow and produce them* — such will be, no doubt, the problem to be solved during the next coming years of European history. Each region will become its own producer and its own consumer of manufactured goods. But that unavoidably implies that, at the same time, it will be its own producer and consumer of agricultural produce; and that is precisely what I am going to discuss next.

Chapter II: The Possibilities of Agriculture

The industrial and commercial history of the world during the last fifty years has been a history of decentralisation of industry. It was not a mere shifting of the centre of gravity of commerce, such as Europe witnessed in the past, when the commercial hegemony migrated from Italy to Spain, to Holland, and finally to Britain: it had a much deeper meaning, as it excluded the very possibility of commercial or industrial hegemony. It has shown the growth of quite new conditions, and new conditions require new adaptations. To endeavour to revive the past would be useless: a new departure must be taken by civilised nations.

Of course, there will be plenty of voices to argue that the former supremacy of the pioneers must be maintained at any price: all pioneers are in the habit of saying so. It will be suggested that the pioneers must attain such a superiority of technical knowledge and organisation as to enable them to beat all their younger competitors; that force must be resorted to if necessary. But force is reciprocal; and if the god of war always sides with the strongest battalions, those battalions are strongest which fight for new rights against outgrown privileges. As to the honest longing for more technical education — surely let us all have as much of it as possible: it will be a boon for humanity; for humanity, of course — not for a single nation, because knowledge cannot be cultivated for home use only. Knowledge and invention, boldness of thought and enterprise, conquests of genius and improvements of social organisation have become international growths; and no kind of progress — intellectual, industrial or social — can be kept within political boundaries; it crosses the seas, it pierces the mountains; steppes are no obstacle to it. Knowledge and inventive powers are now so thoroughly international that if a simple newspaper paragraph announces to-morrow that the problem of storing force, of printing without inking, or of aerial navigation, has received a practical solution in one country of the world, we may feel sure that within a few weeks the same problem will be solved, almost in the same way, by several inventors of different nationalities.[1] Continually we learn that the same scientific discovery, or technical invention, has been made within a few days' distance, in countries a thousand miles apart; as if there were a kind of atmosphere which favours the germination of a given idea at a given moment. And such an atmosphere exists: steam, print and the common stock of knowledge have created it.

Those who dream of monopolising technical genius are therefore fifty years behind the times. The world — the wide, wide world — is now the true domain of knowledge; and if each nation displays some special capacities in some special branch, the various capacities of different nations compensate one another, and the advantages which could be derived from them would be only temporary. The fine British workmanship in mechanical arts, the American boldness for gigantic enterprise, the French systematic mind, and the German pedagogy, are becoming international capacities. Sir William Armstrong, in his works established in Italy and Japan, has already communicated to Italians and Japanese those capacities for managing huge iron masses which have

[1] I leave these lines on purpose as they were written for the first edition of this book.

been nurtured on the Tyne; the uproarious American spirit of enterprise pervades the Old World; the French taste for harmony becomes European taste; and German pedagogy — improved, I dare say — is at home in Russia. So, instead of trying to keep life in the old channels, it would be better to see what the new conditions are, what duties they impose on our generation.

The characters of the new conditions are plain, and their consequences are easy to understand. As the manufacturing nations of West Europe are meeting with steadily growing difficulties in selling their manufactured goods abroad, and getting food in exchange, they will be compelled to grow their food at home; they will be bound to rely on home customers for their manufactures, and on home producers for their food. And the sooner they do so the better.

Two great objections stand, however, in the way against the general acceptance of such conclusions. We have been taught, both by economists and politicians, that the territories of the West European States are so overcrowded with inhabitants that they cannot grow all the food and raw produce which are necessary for the maintenance of their steadily increasing populations. Therefore the necessity of exporting manufactured goods and of importing food. And we are told, moreover, that even if it were possible to grow in Western Europe all the food necessary for its inhabitants, there would be no advantage in doing so as long as the same food can be got cheaper from abroad. Such are the present teachings and the ideas which are current in society at large. And yet it is easy to prove that both are totally erroneous: plenty of food could be grown on the territories of Western Europe for much more than their present populations, and an immense benefit would be derived from doing so. These are the two points which I have now to discuss.

To begin by taking the most disadvantageous case: is it possible that the soil of Great Britain, which at present yields food for one-third only of its inhabitants, could provide all the necessary amount and variety of food for 41,000,000 human beings when it covers only 56,000,000 acres all told — forests and rocks, marshes and peat-bogs, cities, railways and fields — out of which only 33,000,000 acres are considered as cultivable?[2] The current opinion is, that it by no means can; and that opinion is so inveterate that we even see men of science, who are generally cautious when dealing with current opinions, endorse that opinion without even taking the trouble of verifying it. It is accepted as an axiom. And yet, as soon as we try to find out any argument in its favour, we discover that it has not the slightest foundation, either in facts or in judgment based upon well-known facts.

Let us take, for instance, J. B. Lawes' estimates of crops which were published every year in *The Times*. In his estimate of the year 1887 he made the remark that during the eight harvest years 1853–1860 "nearly three-fourths of the aggregate amount of wheat consumed in the United Kingdom was of home growth, and little more than one-fourth was derived from foreign sources"; but five-and-twenty years later the figures were almost reversed — that is, "during the eight years 1879–1886, little more than one-third has been provided by home crops and nearly two-thirds by imports." But neither the increase of population by 8,000,000 nor the increase of consumption of wheat by six-tenths of a bushel per head could account for the change. In the years 1853–1860 the soil of Britain nourished one inhabitant on every two acres cultivated: why did it require three acres in order to nourish the same inhabitant in 1887? The answer is plain: merely and simply because agriculture had fallen into neglect.

[2] Twenty.three per cent. of the total area of England, 40 per cent. in Wales, and 75 per cent. in Scotland are now under wood, coppice, mountain heath, water, etc. The remainder — that is, 32,777,513 acres — which were under culture and permanent pasture in the year 1890 (only 32,094,658 in 1911), may be taken as the "cultivable" area of Great Britain.

In fact, the area under wheat had been reduced since 1853–1860 by full 1,590,000 acres, and therefore the average crop of the years 1883–1886 was below the average crop of 1853–1860 by more than 40,000,000 bushels; and this deficit alone represented the food of more than 7,000,000 inhabitants. At the same time the area under barley, oats, beans, and other spring crops had also been reduced by a further 560,000 acres, which, alone, at the low average of thirty bushels per acre, would have represented the cereals necessary to complete the above, for the same 7,000,000 inhabitants. It can thus be said that if the United Kingdom imported cereals for 17,000,000 inhabitants in 1887, instead of for 10,000,000 in 1860, it was simply because more than 2,000,000 acres had gone out of cultivation.[3]

These facts are well known; but usually they are met with the remark that the character of agriculture had been altered: that instead of growing wheat, meat and milk were produced in this country. However, the figures for 1887, compared with the figures for 1860, show that the same downward movement took place under the heads of green crops and the like. The area under potatoes was reduced by 280,000 acres; under turnips by 180,000 acres; and although there was an increase under the heads of mangold, carrots, etc., still the aggregate area under all these crops was reduced by a further 330,000 acres. An increase of area was found only for permanent pasture (2,800,000 acres) and grass under rotation (1,600,000 acres); but we should look in vain for a corresponding increase of live stock. The increase of live stock which took place during those twenty-seven years was not sufficient to cover even the area reclaimed from waste land.[4]

Since the year 1887 affairs went, however, from worse to worse. If we take Great Britain alone, we see that in 1885 the area under all corn crops was 8,392,006 acres; that is very small, indeed, in comparison to the area which could have been cultivated; but even that little was further reduced to 7,400,227 acres in 1895. The area under wheat was 2,478,318 acres in 1885 (as against 3,630,300 in 1874); but it dwindled away to 1,417,641 acres in 1895, while the area under the other cereals increased by a trifle only — from 5,198,026 acres to 5,462,184 — the total loss on all cereals being nearly 1,000,000 *acres in ten years!* Another 5,000,000 people were thus compelled to get their food from abroad.

Did the area under green crops increase correspondingly, as it would have done if it were only the character of agriculture that had changed? Not in the least! This area was further reduced by nearly 500,000 acres (3,521,602 in 1885, 3,225,762 in 1895, and 3,006,000 in 1909–1911). Or was the area under clover and grasses in rotation increased in proportion to all these reductions? Alas no! It also was reduced (4,654,173 acres in 1885, 4,729,801 in 1895, and 4,164,000 acres in 1909–1911). In short, taking all the land that is under crops in rotation (17,201,490 acres in 1885, 16,166,950 acres in 1895, 14,795,570 only in 1905, and 14,682,550 in 1909–1911), we see that within the last twenty-six years another 2,500,000 acres went out of cultivation, without any compensation whatever. It went to increase that already enormous area of more than 17,000,000 acres

[3] Average area under wheat in 1853–1860, 4,092,160 acres; average crop, 14,310,779 quarters. Average area under wheat in 1884–1887, 2,509,055 acres; average crop (good years), 9,198 956 quarters. See Professor W. Fream's *Rothamstead Experiments* , (London, 1888), page 83. I take in the above Sir John Lawes' figure of 5.65 bushels per head of population every year. It is very close to the yearly allowance of 5.67 bushels of the French statisticians. The Russian statisticians reckon 5.67 bushels of winter crops (chiefly rye) and 2.5 bushels of spring crops (sarrazin, barley, etc.).

[4] There was an increase of 1,800,000 head of horned cattle and a decrease of 4.25 million sheep (6.66 millions, if we compare the year 1886 with 1868), which would correspond to an increase of 1.25 million of units of cattle, because eight sheep are reckoned as equivalent to one head of horned cattle. But five million acres having been reclaimed upon waste land since 1860, the above increase should hardly do for covering that area, so that the 2.25 million acres which were cultivated no longer remained fully uncovered. They were a pure loss to the nation.

(17,460,000 in 1909–1911) *more than one-half of the cultivable area* — which goes under the head of "permanent pasture," and hardly suffices to feed one cow on each three acres!

Need I say, after that, that quite to the contrary of what we are told about the British agriculturists becoming "meat-makers" instead of "wheat-growers," no corresponding increase of live stock took place during the last twenty-five years. Far from devoting the land freed from cereals to "meat-making," the country further reduced its live stock in 1885–1895, and began to show a slight increase during the last few years only. It had 6,597,964 head of horned cattle in 1885, 6,354,336 in 1895, and 7,057,520 in 1909–1911; 26,534,600 sheep in 1885, 25,792,200 in 1895, and from 26,500,000 to 27,610,000 in 1909–1911. True, the number of horses increased; every butcher and greengrocer runs now a horse "to take orders at the gents' doors" (in Sweden and Switzerland, by the way, they do it by telephone). But if we take the numbers of horses used in agriculture, unbroken, and kept for breeding, we find only small oscillations between 1,408,790 in 1885 and 1,553,000 in 1909. But numbers of horses are imported, as also the oats and a considerable amount of the hay that is required for feeding them.[5] And if the consumption of meat has really increased in this country, it is due to cheap imported meat, not to the meat that would be produced in these islands.[6]

In short, agriculture has not changed its direction, as we are often told; it simply went down in all directions. Land is going out of culture at a perilous rate, while the latest improvements in market-gardening, fruit-growing and poultry-keeping are but a mere trifle if we compare them with what has been done in the same direction in France, Belgium and America.

It must be said that during the last few years there was a slight improvement. The area under all corn crops was slightly increasing, and it fluctuated about 7,000,000 acres, the increase being especially notable for wheat (1,906,000 acres in 1911 as against 1,625,450 in 1907), while the areas under barley and oats were slightly diminished. But with all that, the surface under corn crops is still nearly *one-and-a-half million acres* below what it was in 1885 and nearly *two-and-a-half million acres* below 1874. This represents, let us remember it, the bread-food of *ten million people.*

The cause of this general downward movement is self-evident. It is the desertion, the abandonment of the land. Each crop requiring human labour has had its area reduced; and almost one-half of the agricultural labourers have been sent away since 1861 to reinforce the ranks of the unemployed in the cities,[7] so that far from being over-populated, the fields of Britain are *starved of human labour,* as James Caird used to say. The British nation does not work on her soil; *she is prevented from doing so;* and the would-be economists complain that the soil will not nourish its inhabitants!

I once took a knapsack and went on foot out of London, through Sussex. I had read Leonce de Lavergne's work and expected to find a soil busily cultivated; but neither round London nor

[5] According to a report read by Mr. Crawford before the Statistical Society in October, 1899, Britain imports every year 4,500,000 tons of hay and other food for its cattle and horses. Under the present system of culture, 6,000,000 acres could produce these food-stuffs. If another 6,000,000 acres were sown with cereals, all the wheat required for the United Kingdom could have been produced at home with the methods of culture now in use.

[6] No less than 5,877,000 cwts. of beef and mutton, 1,065,470 sheep and lambs, and 415,565 pieces of cattle were imported in 1895. In 1910 the first of these figures rose to 13,690,000 cwts. Altogether, it is calculated (Statesman's *Year-book,* 1912) that, in 1910, 21 lb. of imported beef, 13.5 lb. of imported mutton, and 7 lb. of other sorts of meat, per head of population, were retained for home consumption; in addition to 11 lb. of butter, 262 lb. of wheat, 26 lb. of flour, and 20 lb. of rice and rice-flour, imported.

[7] Agricultural population (farmer and labourers) in England and Wales: 2,100,000 in 1861; 1,383,000 in 1884; 1,311,720 in 1891; 1,152,500 (including fishing population) in 1901.

still less further south did I see men in the fields. In the Weald I could walk for twenty miles without crossing anything but heath or woodlands, rented as pheasant-shooting grounds to "London gentlemen," as the labourers said. "Ungrateful soil" was my first thought; but then I would occasionally come to a farm at the crossing of two roads and see the same soil bearing a rich crop; and my next thought was *tel seigneur, telle terre,* as the French peasants say. Later on I saw the rich fields of the midland counties; but even there I was struck by not perceiving the same busy human labour which I was accustomed to admire on the Belgian and French fields. But I ceased to wonder when I learnt that only 1,383,000 men and women in England and Wales work in the fields, while more than 16,000,000 belong to the "professional, domestic, indefinite, and unproductive class," as these pitiless statisticians say. One million human beings cannot productively cultivate an area of 33,000,000 acres, unless they can resort to the Bonanza farm's methods of culture.

Again, taking Harrow as the centre of my excursions, I could walk five miles towards London, or turning my back upon it, and I could see nothing east or west but meadow land on which they hardly cropped two tons of hay per acre — scarcely enough to keep alive one milch cow on each two acres. Man is conspicuous by his abscence from those meadows; he rolls them with a heavy roller in the spring; he spreads some manure every two or three years; then he disappears until the time has come to make hay. And that — within ten miles from Charing Cross, close to a city with 5,000,000 inhabitants supplied with Flemish and Jersey potatoes, French salads and Canadian apples. In the hands of the Paris gardeners, each thousand acres situated within the same distance from the city would be cultivated by at least 2,000 human beings, who would get vegetables to the value of from £50 to £300 per acre. But here the acres which only need human hands to become an inexhaustible source of golden crops lie idle, and they say to us, "Heavy clay!" without even knowing that in the hands of man there are no unfertile soils; that the most fertile soils are not in the prairies of America, nor in the Russian steppes; that they are in the peat-bogs of Ireland, on the sand downs of the northern seacoast of France, on the craggy mountains of the Rhine, where they have been made by man's hands.

The most striking fact is, however, that in some undoubtedly fertile parts of the country things are even in a worse condition. My heart simply ached when I saw the state in which land is kept in South Devon, and when I learned to know what "permanent pasture" means. Field after field is covered with nothing but grass, three inches high, and thistles in profusion. Twenty, thirty such fields can be seen at one glance from the top of every hill; and thousands of acres are in that state, notwithstanding that the grandfathers of the present generation have devoted a formidable amount of labour to the clearing of that land from the stones, to fencing it, roughly draining it and the like. In every direction I could see abandoned cottages and orchards going to ruin. A whole population has disappeared, and even its last vestiges must disappear if things continue to go on as they have gone. And this takes place in a part of the country endowed with a most fertile soil and possessed of a climate which is certainly more congenial than the climate of Jersey in spring and early summer — a land upon which even the poorest cottagers occasionally raise potatoes as early as the first half of May. But how can that land be cultivated when there is nobody to cultivate it? "We have fields; men go by, but never go in, "an old labourer said to me; and so it is in reality.[8]

[8] Round the small hamlet where I stayed for two summers there were: One farm, 370 acres, four labourers and two boys another, about 300 acres, two men and two boys; another, about 300 acres, two men and two boys; a third 800

Such were my impressions of British agriculture twenty years ago. Unfortunately, both the official statistical data and the mass of private evidence published since tend to show that but little improvement took place in the general conditions of agriculture in this country within the last twenty years. Some successful attempts in various new directions have been made in different parts of the country, and I will have the pleasure to mention them further on, the more so as they show what a quite average soil in these islands can give when it is properly treated. But over large areas, especially in the southern counties, the general conditions are even worse than they were twenty years ago.

Altogether one cannot read the mass of review and newspaper articles, and books dealing with British agriculture that have been published lately, without realising that the agricultural depression which began in the "seventies" and the "eighties" of the nineteenth century had causes much more deeply seated than the fall in the prices of wheat in consequence of American competition. However, it would lie beyond the scope of this book to enter here into such a discussion. Moreover, anyone who will read a few review articles written from the points of view of different parties, or consult such books as that of Mr. Christopher Turnor,[9] or study the elaborate inquest made by Rider Haggard in twenty-six counties of England — paying more attention to the *data* accumulated in this book than to the sometimes biassed conclusions of the author — will soon see himself what are the causes which hamper the development of British agriculture.[10]

In Scotland the conditions are equally bad. The population described as "rural" is in a steady decrease: in 1911 it was already less than 800,000; and as regards the agricultural labourers, their number has decreased by 42,370 (from 135,970 to 93,600) in the twenty years, 1881 to 1901. *The land goes out, of culture,* while the area under "deer forests" — that is, under hunting grounds established upon what formerly was *arable* land for the amusement of the rich — increases at an appalling rate. No need to say that at the same time the Scotch population is emigrating, and Scotland is depopulated at an appalling speed.

My chief purpose being to show here what *can and ought to be* obtained from the land under a proper and intelligent treatment, I shall only indicate one of the disadvantages of the systems of husbandry in vogue in this country. Both landlords and farmers gradually came of late to pursue other aims than that of obtaining from the land the greatest amount of produce than can be obtained; and when this problem of a maximum productivity of the land arose before the European nations, and therefore a complete modification of the methods of husbandry was rendered imperative, such a modification was *not* accomplished in this country. While in France, Belgium, Germany and Denmark the agriculturists did their best to meet the effects of American competition by rendering their culture more intensive in all directions, in this country the already antiquated method of reducing the area under corn crops and laying land for grass continues to prevail, although it ought to be evident that mere *grazing* will pay no more, and that some effort in the right direction would increase the returns of the corn crops, as also those of the roots

acres, five men only and probably as many boys. In truth, the problem of cultivating the land with the least number of men has been solved in this spot by not cultivating at all as much as two-thirds of it. Since these lines were written, in 1890, a movement in favour of intensive market-gardening has begun in this country, and I read in November, 1909, that they were selling at the Covent Garden market asparagus that had been grown in South Devon in November. They begin also to grow early potatoes in Cornwall and Devon. Formerly, nobody thought of utilising this rich soil and warm climate for growing early vegetables.

[9] *Land Problems and National Welfare*, London, 1911.

[10] *Rural England*, two big volumes, London, *1902.*

and plants cultivated for industrial purposes. The land continues to go out of culture, while the problem of the day is to render culture more and more intensive.

Many causes have combined to produce that undesirable result. The concentration of landownership in the hands of big landowners; the high profits obtained previously; the development of a class of both landlords and farmers who rely chiefly upon other incomes than those they draw from the land, and for whom farming has thus become a sort of pleasant by-occupation or sport; the rapid development of game reserves for sportsmen, both British and foreign; the absence of men of initiative who would have shown to the nation the necessity of a new departure; the absence of a desire to win the necessary knowledge, and the absence of institutions which could widely spread practical agricultural knowledge and introduce improved seeds and seedlings, as the Experimental Farms of the United States and Canada are doing; the dislike of that spirit of agricultural cooperation to which the Danish farmers owe their successes, and so on — all these stand in the way of the unavoidable change in the methods of farming, and produce the results of which the British writers on agriculture are complaining.[11] But it is self-evident that in order to compete with countries where machinery is largely used and new methods of farming are resorted to (including the industrial treatment of farm produce in sugar works, starch works, and the drying of vegetables, etc., connected with farming), the old methods cannot do; especially when the farmer has to pay a rent of twenty, forty, and occasional]y fifty shillings per acre for wheat-lands.

It may be said, of course, that this opinion strangely contrasts with the well-known superiority of British agriculture. Do we not know, indeed, that British crops average twenty-eight to thirty bushels of wheat per acre, while in France they reach only from seventeen to twenty bushels? Does it not stand in all almanacs that Britain gets every year £200,000,000 sterling worth of animal produce — milk, cheese, meat and wool — from her fields? All that is true, and there is no doubt that in many respects British agriculture is superior to that of many other nations. As regards obtaining the greatest amount of produce with the least amount of labour, Britain undoubtedly took the lead until she was superseded by America in the Bonanza farms (now disappeared or rapidly disappearing). Again, as regards the fine breeds of cattle, the splendid state of the meadows and the results obtained in separate farms, there is much to be learned from Britain. But a closer acquaintance with British agriculture as a whole discloses many features of inferiority.

However splendid, a meadow remains a meadow, much inferior in productivity to a cornfield; and the fine breeds of cattle appear to be poor creatures as long as each ox requires three acres of land to be fed upon. As regards the crops, certainly one may indulge in some admiration at the average twenty-eight or thirty bushels grown in this country; but when we learn that only 1,600,000 to 1,900,000 acres out of the cultivable 33,000,000 bear such crops, we are quite disappointed. Anyone could obtain like results if he were to put all his manure into one-twentieth part of the area which he possesses. Again, the twenty-eight to thirty bushels no longer appear to us so satisfactory when we learn that without any manuring, merely by means of a good culture, they have obtained at Rothamstead an average of 14 bushels per acre from the same plot of land for forty consecutive years;[12] while Mr. Prout, in his farm near Sawbridgeworth (Herts), on a cold

[11] See H. Rider Haggard's *Rural Denmark and, its; Lessons* , London, 1911, pp. 188–212.

[12] The *Rothamstead Experiments*, 1888, by Professor W. Fream, p. 35 *seq.* It is well worth noting that Mr. Hall, who was the head of Rothamstead for many years, maintained from his own experience that growing wheat in England is more profitable than rearing live stock. The same opinion was often expressed by the experts whose testimonies are

heavy clay, has obtained since 1861 crops of from thirty to thirty-eight bushels of wheat, year after year, without any farm manure at all, by good steam ploughing and artificial manure only. (R. Haggard, I. 528.) Under the allotment system the crops reach forty bushels. In some farms they occasionally attain even fifty and fifty-seven bushels per acre.

If we intend to have a correct appreciation of British agriculture, we must not base it upon what is obtained on a few selected and wellmanured plots; we must inquire what is done with the territory, taken as a whole.[13] Now, out of each 1,000 acres of the aggregate territory of England, Wales and Scotland, 435 acres are left under wood, coppice, heath, buildings, and so on. We need not find fault with that division, because it depends very much upon natural causes. In France and Belgium one-third of the territory is in like manner also treated as uncultivable, although portions of it are continually reclaimed and brought under culture. But, leaving aside the "uncultivable" portion, let us see what is done with the 565 acres out of 1,000 of the "cultivable" part (32,145,930 acres in Great Britain in 1910). First of all, it is divided into two parts, and one of them, the largest — 308 acres out of 1,000 — is left under "permanent pasture," that is, in most cases it is entirely uncultivated. Very little hay is obtained from it,[14] and some cattle are grazed upon it. More than one-half of the cultivable area is thus left without cultivation, and only 257 acres out of each 1,000 acres are under culture. Out of these last, 124 acres are under corn crops, twenty-one acres under potatoes, fifty-three acres under green crops, and seventy-three acres under clover fields and grasses under rotation. And finally, out of the 124 acres given to corn crops, the best thirty-three, and some years only twenty-five acres (one-fortieth part of the territory, one twenty-third of the cultivable area), are picked out and sown with wheat. They are well cultivated, well manured, and upon them an average of from twenty-eight to thirty bushels to the acre is obtained; and upon these twenty-five or thirty acres out of 1,000 the world superiority of British agriculture is based.

The net result of all that is, that on nearly 33,000,000 acres of cultivable land the food is grown for one third part only of the population (more than two-thirds of the food it consumes is imported), and we may say accordingly that, although nearly two-thirds of the territory is cultivable, British agriculture provides homegrown food for each 125 or 135 inhabitants only per square mile (out of 466). In other words, nearly three acres of the *cultivable area* are required to grow the food for each person. Let us then see what is done with the land in France and Belgium.

Now, if we simply compare the average thirty bushels per acre of wheat in Great Britain with the average nineteen to twenty bushels grown in France within the last ten years, the comparison is all in favour of these islands; but such averages are of little value because the two systems of agriculture are totally different in the two countries. The Frenchman also has his picked and heavily manured "twenty-five to thirty acres" in the north of France and in Ile-de France, and from these picked acres he obtains average crops ranging from thirty to thirty-three bushels.[15]

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reproduced by Rider Haggard. In many places of his *Rural England* one finds also a mention of high wheat crops, up to fifty-six bushels per acre, obtained in many places in this country.

[13] *[see Table 3]*

[14] Only from each 52 acres, out of 308 acres, hay is obtained. The remainder are grazing grounds.

[15] That is, thirty to thirty-three bushels on the average; forty bushels in good farms, and fifty in the best. The area under wheat was 16,700,000 acres in 1910, all chief corn crops covering 33,947,000 acres; the cultivated area is 90,300,000 acres, and the aggregate superficies of France, 130,800,000 acres. About agriculture in France, see Lecouteux, *Le ble, sa culture extensive et intensive* ,1883; Risler, *Physiologie et culture du ble* , 1886; Boitet, *Herbages et prairies naturelles* , 1885; Baudrillart, *Les populations agricoles de la Normandie* , 1880; Grandeau, *La production agricole en France* , and *L'agriculture et les institutions agricoles du monde au commencement du vingtieme siecle* ; P. Compain,

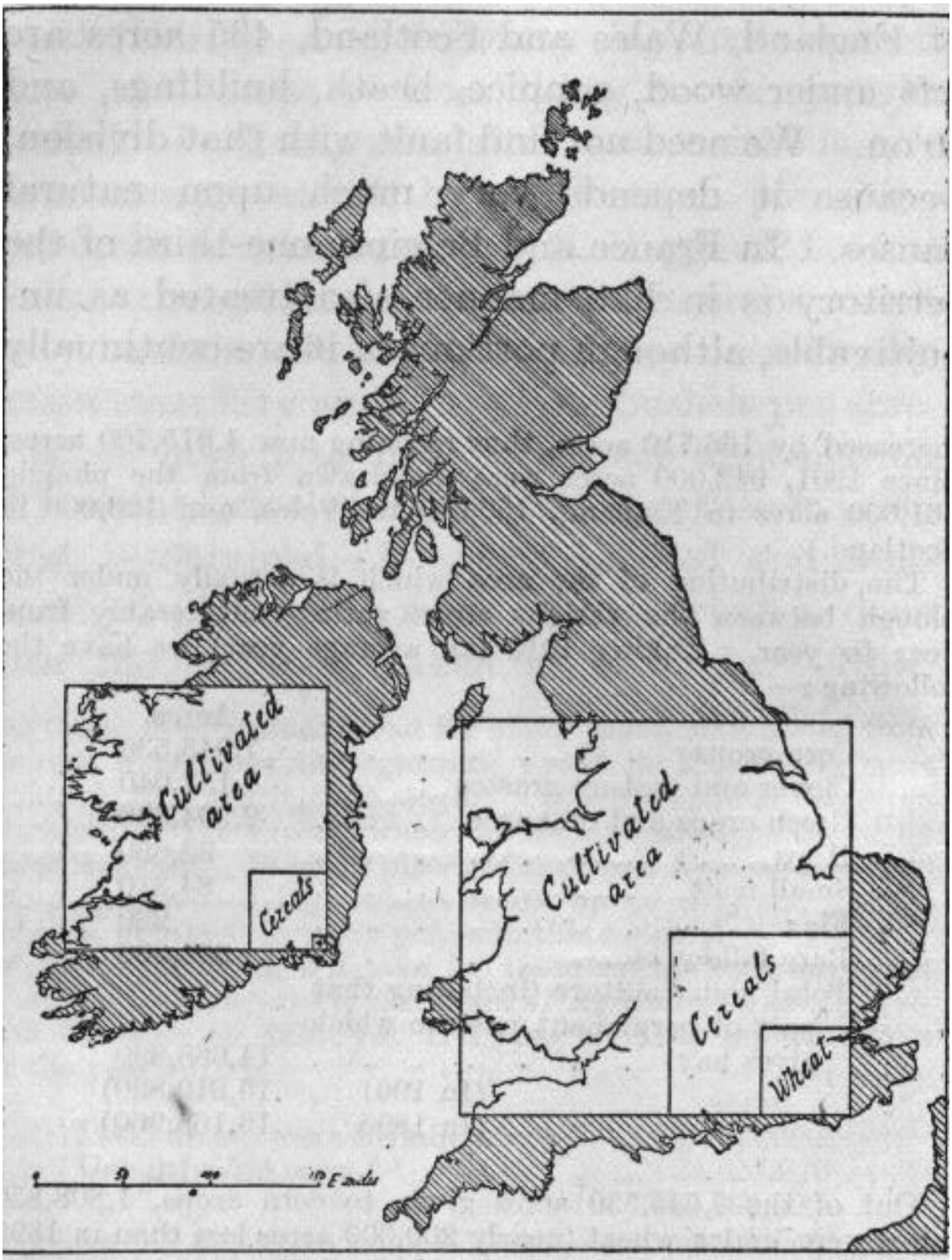

FIG. 1.—Proportion of the cultivated area which is given to cereals altogether, and to wheat, in Great Britain and Ireland.

However, he sows with wheat, not only the best picked out acres, but also such fields on the Central Plateau and in Southern France as hardly yield ten, eight and even six bushels to the acre, without irrigation; and these low crops reduce the average for the whole country.

The Frenchman cultivates much that is left here under permanent pasture — and this is what is described as his "inferiority" in agriculture. In fact, although the proportion between what we have named the "cultivable area" and the total territory is very much the same in France as it is in Great Britain (624 acres out of each 1,000 acres of the territory), the area under wheat crops is nearly *six times* as great, in proportion, as what it is in Great Britain (182 acres instead of twenty-five or thirty, out of each 1,000 acres): the corn crops altogether cover nearly two-fifths of the cultivable area (375 acres out of 1000), and large areas are given besides to green crops, industrial crops, vine, fruit and vegetables.

Taking everything into consideration, although the Frenchman keeps less cattle, and especially grazes less sheep than the Briton, he nevertheless obtains from his soil nearly all the food that he and his cattle consume. He imports, in an average year, but one-tenth only of what the nation consumes, and he exports to this country considerable quantities of food produce (£10,000,000 worth), not only from the south, but also, and especially, from the shores of the Channel (Brittany butter and vegetables; fruit and vegetables from the suburbs of Paris, and so on).[16]

The net result is that, although one-third part of the territory is also treated as "uncultivable," the soil of France yields the food for 170 inhabitants per square mile (out of 188), that is, for forty persons more, per square mile, than this country.[17]

It is thus apparent that the comparison with France is not so much in favour of this country as it is said to be; and it will be still less favourable when we come, in our next chapter, to horticulture.

The comparison with Belgium is even more striking — the more so as the two systems of culture are similar in both countries. To begin with, in Belgium we also find an average crop of over thirty bushels of wheat to the acre; but the area given to wheat is five times as big as in Great

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Prairies et paturages; A. Clement, *Agriculture moderne* , 1906; Auge Laribe, *L'evolution de la France agricole* , 1912; Leonco do Lavergne's last edition; and so on.

[16] The exports from France in 1910 (average year) attained: Wine, 222,804,000 fr.; spirits, 54,000,000 fr.; cheese, butter and sugar, 114,000,000 fr. To this country France sent, same year, £2,163,200 worth of wine, £1,013,200 worth of refined sugar, £2,11G,000 worth of butter, and £400,000 worth of eggs, all of French origin only, in addition to £12,206,700 worth of manufactured silks, woollens, and cottons. The exports from Algeria are not taken in the above figures.

[17] Each 1,000 acres of French territory are disposed of as follows: 379 acres are under woods and coppices (176), building, communal grazing grounds, mountains, etc., and 621 acres are considered as "cultivable." Out of the latter, 130 are under meadows, now Irrigated to a great extent, 257 acres under cereals (124 under wheat, and 26 under wheat mixed with rye), 33 under vineyards, 83 under orchards, green crops, and various industrial cultures, and the remainder is chiefly under permanent pasture or bare fallow. As to cattle, we find in Great Britain in 1910, which was an average year, 7,037,330 head of cattle (including in that number about 1,400,000 calves under one year), which makes *twenty-two head* per each 100 acres of the cultivable area, and 27,103,000 sheep — that is, *eighty-four sheep* per each 100 acres of the same area. In France we find, in the same year, 14,297,570 cattle *(nineteen* head per each 100 acres of cultivable area), and only 17,357,1340 sheep *(twenty-one* sheep per 100 acres of the same). In other words, the proportion of horned cattle is nearly the same in both countries (twenty-two head and nineteen head per 100 acres), a considerable difference appearing in favour of this country only as to the number of sheep (eighty-four as against twenty-one). The heavy imports of hay, oil cake, oats, etc., into this country must, however, not be forgotten, because, for each head of cattle which lives on imported food, eight sheep can be grazed, or be fed with home-grown fodder. As to horses, both countries stand on nearly the same footing.

Britain, in comparison to the cultivable area, and the cereals cover two-fifths of the land available for culture.[18] The land is so well cultivated that the average crops for the years 1890–1899 (the very bad year of 1891 being left out of account) were from twenty-six and a half to twenty-eight and a half bushels per acre for winter wheat, and reached an average of thirty-three and a half bushels in 1900–1904; over fifty-four bushels for oats (thirty-five to forty-one and a half in Great Britain), and from forty to forty-three and a half bushels for winter barley (twenty-nine to thirty-five in Great Britain); while on no less than 475,000 acres catch crops of swedes (3,345,000 tons), carrots (155,000 tons), and more than 500,000 of lucerne and other grasses were obtained.[19]

As to extraordinarily heavy crops, Mr. Seebohm Rowntree mentions, for instance, the wheat crop in the commune of Oirbeck, near Louvain, which was,in 1906, on the average,fifty-seven bushels per acre, while the average of the whole country was only thirty-four bushels, or a yield of 111.5 bushels of oats in the commune of Neuve-Eglise, while the average for Belgium was fifty-four bushels, and so on, the average crops of several communes for some cereals being seventy-three per cent. in excess of the average for Belgium, and from 106 to 153 per cent. for roots.[20]

All taken, they grow in Belgium more than 76,000,000 bushels of cereals — that is, fifteen and seven-tenths bushels per acre of the cultivable area — while the corresponding figure for Great Britain is only eight and a half bushels; and they keep almost twice as many cattle upon each cultivable acre as is kept in Great Britain.[21]

Moreover, they even export cattle and horses. Up to 1890 Belgium exported from 36,000 to 94,000 head of cattle, from 42,000 to 70,000 sheep, and from 60,000 to 108,600 swine. In 1890 these exports suddenly came to an end — probably in consequence of a prohibition of such imports into Germany. Only horses continue to be exported to the amount of about 25,000 horses and foals every year.

Large portions of the land are given besides to the culture of industrial plants, potatoes for spirit, beet for sugar, and so on.

However, it must not be believed that the soil of Belgium is more fertile than the soil of this country. On the contrary, to use the words of Laveleye, "only one half, or less, of the territory offers natural conditions which are favourable for agriculture"; the other half consists of a gravelly soil, or sands, "the natural sterility of which could be overpowered only by heavy manuring."

[18] Out of each 1000 acres of territory, 673 are cultivated, and 327 are left as uncultivable, and part of them are now used for afforestation. Out of the 673 cultivated acres, 273 are given to cereals, out of which 61 are under pure wheat, 114 under *meteil* (a mixture of two-thirds of wheat and one-third of rye) and pure rye, and 98 under other cereals; 18 to potatoes, 45 to roots and fodder and 281 to various industrial cultures (beet for sugar, oleaginous grains, etc.); 27 are under gardens, kitchen gardens and parks, 177 under woods, and 57 are cultivated periodically. On the other hand, each 65 acres out of 1000 give catch-crops of carrots, mangolds, etc.

[19] *Annuaire Statistique de la Belgique pour* 1910, Bruxelles, 1911. In Mr. Seebohm Rowntree's admirable work, *Land and Labour: Lessons from Belgium,* published 1910 (London, Macmillan), the reader will find all concerning Belgian agriculture dealt with in detail on the basis of the author's personal scrupulous inquiries on the spot, and all available statistical information

[20] *Land and Labour: Labour from Belgium*, pp. 178,179.

[21] Taking all horses, cattle and sheep in both countries, and reckoning eight sheep as equivalent to one head of horned cattle, we find that Belgium has *twenty-four* cattle units and horses upon each 100 acres of territory, as against *twenty* same units and horses in Great Britain. If we take cattle alone, the disproportion is much greater, as we find *thirty-six* cattle units on each 100 acres of cultivable area, as against *nineteen* in Great Britain. The annual value of animal produce in Belgium is estimated by the *Annuaire Statistique de la Belgique* (1910, p. 302) at £ 66,040,000, including milk (£4,000,000), poultry (£1,600,000), and eggs (£1,400,000).

Man, not nature, has given to the Belgium soil its present productivity. With this soil and labour, Belgium succeeds in supplying nearly all the food of a population which is denser than that of England and Wales, and numbers 589 inhabitants to the square mile.

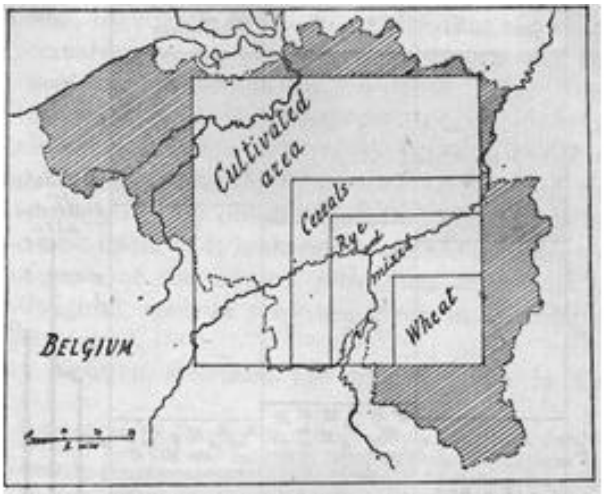

Fig. 2.—Proportion of the cultivated area which is given to cereals altogether, and to wheat, in Belgium. The square which encloses the wheat square represents the area given to both wheat and a mixture of wheat with rye.

If the exports and imports of agricultural produce from and into Belgium be taken into account, we can ask ourselves whether Laveleye's conclusions are not still good, and whether only one inhabitant out of each ten to twenty requires imported food. In the years 1880–1886 the soil of Belgium supplied with home-grown food no less than 490 *inhabitants per square mile,* and there remained something for export — no less than £1,000,000 worth of agricultural produce being exported every year to Great Britain. But it is not possible to say with certitude whether the conditions are the same at the present time.

Since 1880, when the duties on imported cereals were abolished (they were before that sixpence for each 220 lb.), and corn could be imported free, "the importers were no more obliged to make special declarations for merchandise which had to be re-exported; they declared their imports as if they were destined to be used within the country."[22] The result was, that while in the year 1870 the imports of cereals were 154 lb. per head of population, the same imports rose to 286 lb. in 1880. But no one can say how much of these 286 lb. is consumed in Belgium itself; and if we deduct from the total of the imports the quantities re-exported the same year, we obtain

[22] I take these lines from a letter which the Rural Office of the Belgian Ministry of agriculture had been kind enough to write to me on January 28, 1910, in reply to some questions which I had addressed to that Office in order to explain the striking occillations of the Belgian exports between the years 1870 and 1880. A Belgian friend, having kindly taken new information upon this point, had the same opinion confirmed from another official source.

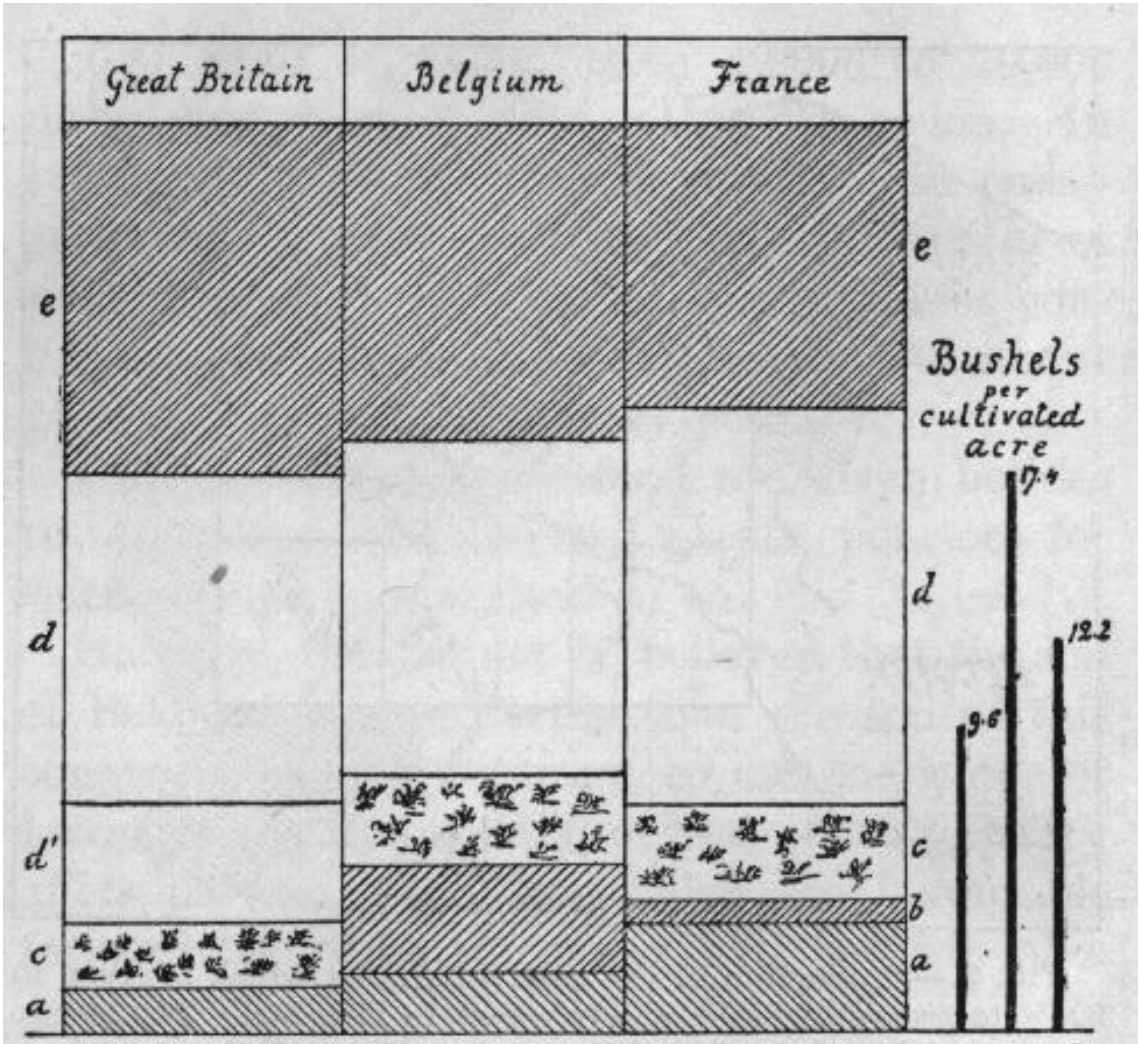

FIG. 3.—Proportion of cultivated and uncultivated areas in Great Britain, Belgium, and France. *a*, Wheat; *b*, wheat and rye mixed; *c*, other cereals; *d'*, green crops; *d*, permanent pasture; *e*, uncultivated.

figures which cannot be relied upon.[23] It is therefore safer to consider the figures of the *annual production* of cereals in Belgium, such as they are given in the official *Annuaire.*

Now, if we take the figures given in the *Annuaire Stastique de la Belgique* for the year 1911, we come to the following results. The annual agricultural census, which is being made since 1901, gives for the year 1909 that 2,290,300,000 lb. of wheat, rye, and wheat mixed with rye were obtained on all the farms of Belgium larger than two and a half acres (2,002,000,000 lb. in 1895). Besides, 219,200,000 lb. of barley, 1,393,000,000 lb. of oats, and a considerable quantity of oleaginous grains have been produced.

It is generally accepted that the average consumption of both winter and spring cereals attains 502 lb. per head of population; and as the population of Belgium was 7,000,000 on January 1, 1907, it appears that no less than 3,624,400,000 lb. of cereals would have been required to supply the annual food of the population. If we compare this figure with that of the annual production just mentioned, we see then that, notwithstanding the considerable decrease of the area given to wheat since the abolition of the entrance duties, Belgium still produces at least *two-thirds* of the cereal food required for its very dense population, which is nearly 600 persons per square mile (596 in 1907).

It must be noticed that we should have come to a still higher figure if we took into account the other cereals (to say nothing of the leguminous plants and vegetables grown and consumed in Belgium), and still more so if we took into account what is grown upon the small holdings less than two and a half acres each. The number of such small holdings was 554,041 in 1895, and the number of people living upon them reached nearly 2,000,000. *They are not included in the official statistics and yet upon most of them some cereals are grown,* in addition to vegetables and fodder for cattle.

If Belgium produces in cereals the food of more than two-thirds of its very dense population, this is already a quite respectable figure; but it must also be said that it exports every year considerable quantities of products of the soil. Thus, in the year 1910 she exported 254,730 tons of vegetables (as against 187,000 imported), 40,000 tons of fruit, 34,000 tons of plants and flowers (the whole nearly £3,000,000 worth), 256,000 of oleaginous grains, 18,500 tons of wool, nearly 60,000 tons of flax, and so on. I do not mention the exports of butter, rabbits, skins, an immense quantity of sugar (about 180,000 tons), the vegetable oils and the spirits, because considerable quantities of beet and potatoes are imported. In short, we have here *an export* of agricultural produce grown in the country itself attaining the figure of 48s. per head of population.

All taken, there is thus no possibility of contesting the fact, that if the soil of Great Britain were cultivated only as the unfertile soil of Belgium is cultivated — notwithstanding all the social obstacles which stand in the way of an intensive culture, in Belgium as elsewhere — a much

[23] If we take the figures of imports and exports, which I also owe to the Belgian Rural Office, we find that the net imports of wheat, rye, and wheat mixed with rye *(méteil)* reached 3.01 million lb. in 1907 (3,374 million in 1910), which would give 429 lb. *per capita* for a population of 7,000,000 inhabitant But if this amount be added to the local production of the same cereals, which reached the same year 2,426 million lb., we arrive at the figure of 776 lb. per head of population. But such a figure is much too high, because the annual *per capita* consumption *of both the winter and, the spring cereals* is generally estimated to be 502 lb. There must be, therefore, either an error in the weight of the imports, which is improbable, or the figures of re-exported cereals are not complete. Let me add that in France the average annual consumption *per capita* of *all* cereals, including oats, has been in the course of twenty-nine years (1880–1908) 525 lb., which confirms the above-mentioned figure. And in France people eat as much bread as in Belgium.

greater part of the population of these islands would obtain its food from the soil of its own land than is the case nowadays.[24]

On the other side it must not be forgotten that Belgium is a manufacturing country which exports, moreover, manufactured home-made goods to the value of 198s. per head of population, and 150s. worth of crude or half-manufactured produce, while the total exports from the United Kingdom have only lately attained during the extraordinary year of 1911 the value of 201s. per inhabitant. As to separate parts of the Belgian territory, the small and naturally unfertile province of West Flanders not only grew in 1890 the food of its 580 inhabitants on the square mile, but exported agricultural produce to the value of 25s. per head of its population. And yet no one can read Laveleye's masterly work without coming to the conclusion that Flemish agriculture would have realised still better results, were it not hampered in its growth by the steady and heavy increase of rent. In the face of the rent being increased each nine years, many farmers have lately abstained from further improvements.

Another example of what could be achieved by means of an effort of the nation seconded by its educated classes is given by Denmark. After the war of 1864, which ended in the loss of one of their provinces, the Danes made an effort widely to spread education amongst their peasants, and to develop at the same time an intensive culture of the soil. The result of these efforts is now quite evident. The rural population of Denmark, instead of flocking to the towns, has been increasing: in five years, 1906–1911, it rose from 1,565,585 to 1,647,350. Out of a total population of 2,775,100, no less than 990,900 find their living in agriculture, dairy work, and forestry. With a very poor soil, they have a cultivated area a trifle below 7,000,000 acres, out of which 2,773,320 acres are under cereals. Their wheat crops are on the average 40.6 bushels per acre, and the value of the home-grown food-stuffs is estimated at £40,000,000, which makes a little less than £6 per acre. As to their exports of home-grown produce, they exceed the imports by £14,483,000. The chief cause of these successes are: A highly developed agricultural education, town markets accessible to all the growers, and, above all, co-operation, which again is a result of the effort that was made by the educated classes after the unfortunate war of 1864.

Everyone knows that it is now Danish butter which rules the prices in the London market, and that this butter is of a high quality, which can only be attained in co-operative creameries with cold storage and certain uniform methods in producing butter. But it is not generally known that the Siberian butter, which is now imported in immense quantities into this country, is also a creation of the Danish co-operators. When they began to export their butter in large quantities, they used to import butter for their own use from the southern parts of the West Siberian provinces of Tobolsk and Tomsk, which are covered with prairies very similar to those of Winnipeg in Canada. At the outset this butter was of a most inferior quality, as it was made by every peasant household separately. The Danes began therefore to teach co-operation to the Russian peasants, and they were rapidly understood by the intelligent population of this fertile region. The co-operative creameries began to spread with an astounding rapidity, without us knowing for some time wherefrom came this interesting movement. At the present time a steamer loaded with Siberian butter leaves every week one of the Baltic ports and brings to London many thousands of casks of Siberian butter. If I am not wrong, Finland has also joined lately in the same export.

[24] See Appendix K.

Without going as far as China, I might quote similar examples from elsewhere, especially from Lombardy. But the above will be enough to caution the reader against hasty conclusions as to the impossibility of feeding 46,000,000 people from 78,000,000 acres. They also will enable me to draw the following conclusions: (1) If the soil of the United Kingdom were cultivated only as it *was* forty-five years ago, 24,000,000 people, instead of 17,000,000, could live on home-grown food; and this culture, while giving occupation to an additional 750,000 men, would give nearly 3,000,000 wealthy home customers to the British manufactures. (2) If the cultivable area of the United Kingdom were cultivated as the soil is cultivated *on the average* in Belgium, the United Kingdom would have food for at least 37,000,000 inhabitants; and it might export agricultural produce without ceasing to manufacture, so as freely to supply all the needs of a wealthy population. And finally (3), if the population of this country came to be doubled, all that would be required for producing the food for 90,000,000 inhabitants would be to cultivate the soil as it is cultivated in the best farms of this country, in Lombardy, and in Flanders, and to utilise some meadows, which at present lie almost unproductive, in the same way as the neighborhoods of the big cities in France are utilised for market-gardening. All these are not fancy dreams, but mere realities; nothing but the modest conclusions from what we see round about us, without any allusion to the agriculture of the future.

If we want, however, to know what agriculture *can be,* and what can be grown on a given amount of soil, we must apply for information to such regions as the district of Saffelare in East Flanders, the island of Jersey, or the irrigated meadows of Lombardy, which are mentioned in the next chapter. Or else we may apply to the market-gardeners in this country, or in the neighborhoods of Paris, or in Holland, or to the "truck farms" in America, and so on.

While science devotes its chief attention to industrial pursuits, a limited number of lovers of nature and a legion of workers whose very names will remain unknown to posterity have created of late a quite new agriculture, as superior to modern farming as modern farming is superior to the old three-fields system of our ancestors. Science seldom guided them, and sometimes misguided — as was the case with Liebig's theories, developed to the extreme by his followers, who induced us to treat plants as glass recipients of chemical drugs, and who forgot that the only science capable of dealing with life and growth is physiology, not chemistry. Science seldom has guided them: they proceeded in the empirical way; but, like the cattle-growers who opened new horizons to biology, they have opened a new field of experimental research for the physiology of plants. They have created a totally new agriculture. They smile when we boast about the rotation system, having permitted us to take from the field one crop every year, or four crops each three years, because their ambition is to have six and nine crops from the very same plot of land during the twelve months. They do not understand our talk about good and bad soils, because they make the soil themselves, and make it in such quantities as to be compelled yearly to sell some of it: otherwise it would raise up the level of their gardens by half an inch every year. They aim at cropping, not five or six tons of grass on the acre, as we do, but from 50 to 100 tons of various vegetables on the same space; not £5 worth of hay but £100 worth of vegetables, of the plainest description, cabbage and carrots, and more than £200 worth under intensive horticultural treatment. This is where agriculture is going now.

We know that the dearest of all varieties of our staple food is meat; and those who are not vegetarians, either by persuasion or by necessity, consume on the average 225 lb. of meat — that is, roughly speaking, a little less than the third part of an ox-every year. And we have seen that, even in this country, and Belgium, two to three acres are wanted for keeping one head of horned

cattle; so that a community of, say, 1,000,000 inhabitants would have to reserve somewhere about 1,000,000 acres of land for supplying it with meat. But if we go to the farm of M. Goppart — one of the promoters of *ensilage* in France — we shall see him growing, on a drained and well-manured field, no less than an average of 120,000 lb. of corn-grass to the acre, which gives 30,000 lb. of dry hay — that is, the food of one horned beast per acre. The produce is thus trebled.

As to beetroot, which is used also for feeding cattle, Mr. Champion, at Whitby, succeeded, with the help of sewage, in growing 100,000 lb. of beet on each acre, and occasionally 160,000 and 200,000 lb. He thus grew on each acre the food of, at least, two or three head of cattle. And such crops are not isolated facts; thus, M. Gros, at Autun, succeeds in cropping 600,000 lb. of beet and carrots, which crop would permit him to keep four horned cattle on each acre. In fact, crops of 100,000 lb. of beet occur in numbers in the French competitions, and the success depends entirely upon good culture and appropriate manuring. It thus appears that while under ordinary high farming we need 2,000,000 acres, or more, to keep 1,000,000 horned cattle, double that amount could be kept on one-half of that area; and if the density of population required it, the amount of cattle could be doubled again, and the area required to keep it might still be one-half, or even one-third of what it is now.[25]

French Gardening. — The above examples are striking enough, and yet those afforded by the market-gardening culture are still more striking. I mean the culture carried on in the neighbourhood of big cities, and more especially the *culture maraîchère* round Paris. In this culture each plant is treated according to its age. The seeds germinate and the seedlings develop their first four leaflets in especially favourable conditions of soil and temperature; then the best seedlings are picked out and transplanted into a bed of fine loam, under a frame or in the open air, where they freely develop their rootlets, and, gathered on a limited space, receive more than the usual care. Only after this preliminary training are they bedded in the open ground, where they grow till ripe. In such a culture the primitive condition of the soil is of little account, because loam is made out of the old forcing beds. The seeds are carefully tried, the seedlings receive proper attention, and there is no fear of drought, because of the variety of crops, the liberal watering with the help of a steam engine, and the stock of plants always kept ready to replace the weakest individuals. Almost each plant is treated individually.

There prevails, however, with regard to market-gardening a misunderstanding which it would be well to remove. It is generally supposed that what chiefly attracts market-gardening to the great centres of population is the market. It must have been so; and so it may be still, but to some extent only. A great number of the Paris *maraîchers*, even of those who have their gardens within the walls of the city and whose main crop consists of vegetables in season, export the whole of their produce to England. What chiefly attracts the gardener to the great cities is stable manure; and this is not wanted so much for increasing the richness of the soil — one-tenth part of the manure used by the French gardeners would do for that purpose — but for keeping the soil at a certain temperature. Early vegetables pay best, and in order to obtain early produce not only the air but the soil as well must be warmed; and this is done by putting great quantities of properly mixed manure into the soil; its fermentation heats it. But it is evident that with the present development of industrial skill, the heating of the soil could be obtained more economically and more easily by hotwater pipes. Consequently, the French gardeners begin more and more to make use of portable pipes, or *thermosiphons* , provisionally established in the cool frames. This

[25] *[See Table 4]*

new improvement becomes of general use, and we have the authority of Barral's *Dictionnaire d'Agriculture* to affirm that it gives excellent results. Under this system stable manure is used mainly for producing loam.[26]

As to the different degrees of fertility of the soil — always the stumbling-block of those who write about agriculture — the fact is that in market-gardening the soil is always *made*, whatever it originally may have been. Consequently — we are told by Prof. Dybowski, in the article "Maraîchers" in Barral's *Dictionnaire d'Agriculture* — it is now a usual stipulation of the renting contracts of the Paris *maraîchers* that the gardener may carry away his soil, down to a certain depth, when he quits his tenancy. He himself makes it, and when he moves to another plot he carts his soil away, together with his frames, his water-pipes, and his other belongings.[27]

I could not relate here all the marvels achieved in market-gardening; so that I must refer the reader to works — most interesting works — especially devoted to the subject, and give only a few illustrations.[28] Let us take, for instance, the orchard — the *marais* — of M. Ponce, the author of a well-known work on the *culture maraîchère*. His orchard covered only two and seven-tenths acres. The outlay for the establishment, including a steam engine for watering purposes, reached £1,136. Eight persons, M. Ponce included, cultivated the orchard and carried the vegetables to the market, for which purpose one horse was kept; when returning from Paris they brought in manure, for which £100 was spent every year. Another £100 was spent in rent and taxes. But how to enumerate all that was gathered every year on this plot of less than three acres, without filling two pages or more with the most wonderful figures? One must read them in M. Ponce's work, but here are the chief items: More than 20,000 lb. of carrots; more than 20,000 lb. of onions, radishes and other vegetables sold by weight; 6,000 heads of cabbage; 3,000 of cauliflower; 5,000 baskets of tomatoes; 5,000 dozen of choice fruit; and 154,000 heads of salad; in short, a total of 250,000 lb. of vegetables. The soil was made to such an amount out of forcing beds that every year

[26] I saw thermosiphons used by the market-gardeners at Worthing. They said that they found them quite satisfactory. As to the cost of heating the soil, let me mention the experiments of H. Mehner, described in *Gartenflora* , fascicules 16 and 17 of the year 1906. He considers the cost quite small, in comparison with the increased value of the crops. With £ 100 per *Morgen,* spent for the installation, and £ 10 every spring for heating, the author estimates the increase in the value of crops (earlier vegetables) at £ 100 every year. (Report to the German *Landwirthschafts Gesellschaft*, 1906.)

[27] "Portable soil" is not the latest departure in agriculture. The last one is the watering of the soil with special liquids containing special microbes. It is a fact that chemical manures, without organic manure, seldom prove to be sufficient. On the other hand, it was discovered lately that certain microbes in the soil are a necessary condition for the growth of plants. Hence the idea of *sowing* the beneficent microbes, which rapidly develop in the soil and fertilise it. We certainly shall soon hear more of this new method, which is experimented upon on a large scale in Germany, in order to transform peat-bogs and heavy soils into rich meadows and fields.

[28] Ponce, *La culture maraîchère*, 1869; Gressent, *Le potager moderne* , 7th edition in 1886; Courtois-Gérard, *Manuel pratique de culture maraîchère*, 1863, L. G. Gillekens, *Cours pratique de culture maraîchère*, Bruxelles, 1895; Vilmorin, *Le bon jardinier* (almanac). The general reader who cares to know about the productivity of the soil will find plenty of examples, well classified, in the most interesting work *La Répartition métrique des impôts,* by A. Toubeau, 2 vols., 1880. I do not quote many excellent English manuals, but I must remark that the market-gardening culture in this country has also obtained results very highly prized by the Continental gardeners, and that the chief reproach to be addressed to it is its relatively small extension. French market-gardening having been lately introduced into England, several manuals have been published for that purpose. The little work, *French Gardening*, by Thomas Smith London (Utopia Press), 1909, deserves special mention, as it contains the results of one year's observation of the work of a French gardener, specially invited to England by Mr. Joseph Fels, and gives (with illustrations a mass of practical indications and numerical data as to the cost and the value of the produce. A subsequent work of the same author *The Profitable Culture of Vegetables for Market Gardeners, Small Holders, und Others*, London (Longmans, Green), 1911, deals in detail with the ordinary culture of vegetables and the intensive culture of the French gardeners.

250 cubic yards of loam had to be sold. Similar examples could be given by the dozen, and the best evidence against any possible exaggeration of the results is the very high rent paid by the gardeners, which reaches in the suburbs of London from £10 to £15 per acre, and in the suburbs of Paris attains as much as £32 per acre. No less than 2,125 acres are cultivated round Paris in that way by 5,000 persons, and thus not only the 2,000,000 Parisians are supplied with vegetables, but the surplus is also sent to London

The above results are obtained with the help of warm frames, thousands of glass bells, and so on. But even without such costly things, with only thirty-six yards of frames for seedlings, vegetables are grown *in the open air* to the value of £200 per acre.[29] It is obvious, however, that in such cases the high selling prices of the crops are not due to the high prices fetched by early vegetables in winter; they are entirely due to the high crops of the plainest ones.

Let me add also that all this wonderful culture has entirely developed in the second half of the nineteenth century. Before that, it was quite primitive. But now the Paris gardener not only defies the soil — he would grow the same crops on an asphalt pavement — he defies climate. His walls, which are built to reflect light and to protect the wall-trees from the northern winds, his wall-tree shades and glass protectors, his frames and *pépinières* have made a real garden, a rich Southern garden, out of the suburbs of Paris. He has given to Paris the "two degrees less of latitude" after which a French scientific writer was longing; he supplies his city with mountains of grapes and fruit at any season; and in the early spring he inundates and perfumes it with flowers. But he does not only grow articles of luxury. The culture of plain vegetables on a large scale is spreading every year; and the results are so good that there are now practical *maraîchers* who venture to maintain that if all the food, animal and vegetable, necessary for 4,500,000 inhabitants of the departments of Seine and Seine-et-Oise had to be grown on their own territory (3,250 square miles), it could be grown without resorting to any other methods of culture than those already in use — methods already tested on a large scale and proved to be successful.

And yet the Paris gardener is not our ideal of an agriculturist. In the painful work of civilisation he has shown us the way to follow; but the ideal of modern civilisation is elsewhere. He toils, with but a short interruption, from three in the morning till late in the night. He knows no leisure; he has no time to live the life of a human being; the commonwealth does not exist for him; his world is his garden, more than his family. He cannot be our ideal; neither he nor his system of agriculture. Our ambition is, that he should produce even *more* than he does with *less* labour, and should enjoy all the joys of human life. And this is fully possible.

As a matter of fact, if we put aside those gardeners who chiefly cultivate the so-called *primeurs* — strawberries ripened in January, and the like — if we take only those who grow their crops in the open field, and resort to frames exclusively for the earlier days of the life of the plant, and if we analyse their system, we see that its very essence is, first, to create for the plant a nutritive and porous soil, which contains both the necessary decaying organic matter and the inorganic compounds; and then to keep that soil and the surrounding atmosphere at a temperature and moisture superior to those of the open air. The whole system is summed up in these few words. If the French *maraîcher* spends prodigies of labour, intelligence, and imagination in combining different kinds of manure, so as to make them ferment at a given speed, he does so for no purpose but the above: a nourishing soil, and a desired equal temperature and moisture of the air and the soil. All his empirical art is devoted to the achievement of these two aims. But both can also be

[29] *Manuel pratique de culture maraîchère*, by Courtois-Gérard, 4th edit., 1868.

achieved in another and much easier way. The soil can be *improved* by hand, but it need not be made by hand. Any soil, of any desired composition, can be made by machinery. We already have manufactures of manure, engines for pulverising the phosphorites, and even the granites of the Vosges; and we shall see manufactures of loam as soon as there is a demand for them.

It is obvious that at present, when fraud and adulteration are exercised on such an immense scale in the manufacture of artificial manure, and the manufacture of manure is considered as a chemical process, while it ought to be considered as a physiological one, the gardener prefers to spend an unimaginable amount of labour rather than risk his crop by the use of a pompously labelled and unworthy drug. But that is a social obstacle which depends upon a want of knowledge and a bad social organisation, not upon physical causes.[30]

Of course, the necessity of creating for the earlier life of the plant a warm soil and atmosphere will always remain, and sixty years ago Léonce de Lavergne foretold that the next step in culture would be to warm the soil. But heating pipes give the same results as the fermenting manures at a much smaller expense of human labour. And already the system works on a large scale, as will be seen from the next chapter. Through it the productive powers of a given area of land are increased more than a hundred times.

It is obvious that now, when the capitalist system makes us pay for everything three or four times its labour value, we often spend about £1 for each square yard of a heated conservatory. But how many middlemen are making fortunes on the wooden sashes imported from Drontheim? If we only could reckon our expenses in labour, we should discover to our amazement that, thanks to the use of machinery, the square yard of a conservatory does not cost more than half a day of human labour; and we will see presently that the Jersey and Guernsey average for cultivating one acre under glass is only three men working ten hours-a day. Therefore the conservatory, which formerly was a luxury, is rapidly entering into the domain of high culture. And we may foresee the day when the glass conservatory will be considered as a necessary appendix to the field, both for the growth of those fruits and vegetables which cannot succeed in the open air, and for the preliminary training of most cultural plants during the earlier stages of their life.

Home-grown fruit is always preferable to the half-ripe produce which is imported from abroad, and the additional work required for keeping a young plant under glass is largely repaid by the incomparable superiority of the crops. As to the question of labour, when we remember the incredible amount of labour which has been spent on the Rhine and in Switzerland for making the vineyards, their terraces, and stone walls, and for carrying the soil up the stony crags, as also the amount of labour which is spent every year for the culture of those vineyards and fruit gardens, we are inclined to ask, which of the two, all taken, requires less of human labour — a winery (I mean the cold vinery) in a London suburb, or a vineyard on the Rhine, or on Lake Leman? And when we compare the prices realised by the grower of grapes round London (not those which are paid in the West-end fruit shops, but those received by the grower for his grapes in September and October) with those current in Switzerland on the Rhine during

[30] Already it is partly removed in France and Belgium, owing to the public laboratories where analyses of seeds and manure are made free. The falsification discovered by these laboratories exceed all that could have been imagined. Manures, containing only one-fifth part of the nutritious elements they were supposed to contain, were found to be quite common; while manures containing injurious matters, and no nutritious parts whatever, were not infrequently supplied by firms of "respectable" repute. With seeds, things stand even worse. Samples of grass seeds which contained 20 per cent. of unjurious grasses, or 20 per cent. of grains of sand, so ooloured as to deceive the buyer, or even 10 per cent. of a deadly poisonous grass, passed through the Ghent laboratory.

the same months, we are inclined to maintain that nowhere in Europe, beyond the forty-fifth degree of latitude, are grapes grown at less expense of human labour, both for capital outlay and yearly work, than in the vineries of the London and Brussels suburbs.

At any rate, let us not overrate the productivity of the exporting countries, and let us remember that the vine-growers of Southern Europe drink themselves an abominable *piquette*; that Marseilles fabricates wine for home use out of dry raisins brought from Asia; and that the Normandy peasant who sends his apples to London, drinks real cider only on great festivities. Such a state of things will not last for ever; and the day is not far when we shall be compelled to look to our own resources to provide many of the things which we now import. And we shall not be the worse for that. The resources of science, both in enlarging the circle of our production and in new discoveries, are inexhaustible. And each new branch of activity calls into existence more and more new branches which steadily increase the power of man over the forces of nature.

If we take all into consideration; if we realise the progress made of late in the gardening culture, and the tendency towards spreading its methods to the open field; if we watch the cultural experiments which are being made now — experiments to-day and realities tomorrow — and ponder over the resources kept in store by science, we are bound to say that *it is utterly impossible to foresee at the present moment the limits as to the* maximum *number of human beings who would draw their means of subsistence from a given area of land*, or as to what a variety of produce they could advantageously grow in any latitude. Each day widens former limits, and opens new and wide horizons. All we can say now is, that, *even now*, 600 persons could easily live on a square mile; and that, with cultural methods already used on a large scale, 1,000 human beings — not idlers — living on 1,000 acres could easily, without any kind of overwork, obtain from that area a luxurious vegetable and animal food, as well as the flax, wool, silk, and hides necessary for their clothing. As to what may be obtained under still more perfect methods — also known but not yet tested on a large scale — it is better to abstain from any forecast: so unexpected are the recent achievements of intensive culture.

We thus see that the over-population fallacy does not stand the very first attempt at submitting it to a closer examination. Those only can be horror-stricken at seeing the population of this country increase by one individual every 1,000 seconds who think of a human being as a mere claimant upon the stock of material wealth of mankind, without being at the same time a contributor to that stock. But we, who see in each new-born babe a future *worker* capable of producing much more than his own share of the common stock — we greet his appearance.

We know that a crowded population is a necessary condition for permitting man to increase the productive powers of his labour. We know that highly productive labour is impossible so long as men are scattered, few in numbers, over wide territories, and are thus unable to combine together for the higher achievements of civilisation. We know what an amount of labour must be spent to scratch the soil with a primitive plough, to spin and weave by hand; and we know also how much less labour it costs to grow the same amount of food and weave the same cloth with the help of modern machinery.

We also see that it is infinitely easier to grow 200,000 lb. of food on one acre than to grow them on ten acres. It is all very well to imagine that wheat grows by itself on the Russian steppes; but those who have seen how the peasant toils in the "fertile" black earth region will have one desire: that the increase of population may permit the use of the steam-digger and gardening culture in the steppes; that it may permit those who are now the beasts of burden of humanity to raise their backs and to become at last men.

We must, however, recognise that there are a few economists fully aware of the above truths. They gladly admit that Western Europe could grow much more food than it does; but they see no necessity nor advantage in doing so, as long as there are nations which can supply food in exchange for manufactured goods. Let us then examine how far this view is correct.

It is obvious that if we are satisfied with merely stating that it is cheaper to bring wheat from Riga than to grow it in Lincolnshire, the whole question is settled in a moment. But is it so in reality? Is it really cheaper to have food from abroad? And, supposing it is, are we not yet bound to analyse that compound result which we call price, rather than to accept it as a supreme and blind ruler of our actions?

We know, for instance, how French agriculture is burdened by taxation. And yet, if we compare the prices of articles of food in France, which herself grows most of them, with the prices in this country, which imports them, we find no difference in favour of the importing country. On the contrary, the balance is rather in favour of France, and it decidedly was so for wheat until the new protective tariff was introduced. As soon as one goes out of Paris, one finds that every *home produce* is cheaper in France than it is in England, and that the prices decrease further when we go farther East on the Continent.

There is another feature still more unfavourable for this country: namely, the enormous development of the class of middlemen who stand between the importer and the home producer on the one side and the consumer on the other. We have lately heard a good deal about the quite disproportionate part of the prices we pay which goes into the middleman's pockets. We have all heard of the East-end clergyman who was compelled to become butcher in order to save his parishioners from the greedy middleman. We read in the papers that many farmers of the midland counties do not realise more than 9d. for a pound of butter, while the customer pays from 1s. 6d. to 1s. 8d.; and that from 1.5d. to 2d. for the quart of milk is all that the Cheshire farmers can get, while we pay 4d. for the adulterated, and 5d. for the unadulterated milk. An analysis of the Covent Garden prices and a comparison of the same with retail prices, which is being made from time to time in the daily papers, proves that the customer pays for vegetables at the rate of 6d. to 1s., and sometimes more, for each penny realised by the grower. But in a country of imported food it must be so: the grower who himself sells his own produce disappears from its markets, and in his place appears the middleman.[31] If we move, however, towards the East, and go to Belgium, Germany, and Russia, we find that the cost of living is more and more reduced, so that finally we find that in Russia, which remains still agricultural, wheat costs one-half or two-thirds of its London prices, and meat is sold throughout the provinces at about ten farthings (kopecks) the pound. And we may therefore hold that it is not yet proved at all that it is cheaper to live on imported food than to grow it ourselves.

But if we analyse *price*, and make a distinction between its different elements, the disadvantage becomes still more apparent. If we compare, for instance, the costs of growing wheat in this country and in Russia, we are told that in the United Kingdom the hundredweight of wheat cannot be grown at less than 8s. 7d.; while in Russia the costs of production of the same hun-

[31] During the winter of 1890 a friend of mine, who lived in a London suburb, used to get his butter from Bavaria *per parcel post*. It cost him 10s. the eleven pounds in Bavaria, parcel post inclusive (2s. 2d.), 6d. for the money order, and 2.5d. the letter; total, less than 11s. Butter of an inferior quality (out of comparison), with 10 to 15 per cent. of water inclusive, was sold in London at 1s. 6d. the lb. at the same time.

dredweight are estimated at from 3s. 6d. to 4s. 9d.[32] The difference is enormous, and it would still remain very great even if we admit that there is some exaggeration in the former figure. But why this difference? Are the Russian labourers paid so much less for their work? Their money wages surely are much lower, but the difference is equalised as soon as we reckon their wages in produce. The twelve shillings a week of the British agricultural labourer represents the same amount of wheat in Britain as the six shillings a week of the Russian labourer represents in Russia. As to the supposed prodigious fertility of the soil in the Russian prairies, it is a fallacy. Crops of from sixteen to twenty-three bushels per acre are considered good crops in Russia, while the average hardly reaches thirteen bushels, even in the corn-exporting parts of the empire. Besides, the amount of labour which is necessary to grow wheat in Russia with no thrashing-machines, with a plough dragged by a horse hardly worth the name, with no roads for transport, and so on, is certainly much greater than the amount of labour which is necessary to grow the same amount of wheat in Western Europe.

When brought to the London market, Russian wheat was sold in 1887 at 31s. the quarter, while it appeared from the same *Mark Lane Express* figures that the quarter of wheat could not be grown in this country at less than 36s. 8d., even if the straw be sold, which is not always the case. But the difference of the land rent in both countries would alone account for the difference of prices. In the wheat belt of Russia, where the average rent stood at about 12s. per acre, and the crop was from fifteen to twenty bushels, the rent amounted to from 3s. 6d. to 5s. 8d. in the costs of production of each quarter of Russian wheat; while in this country, where the rent and taxes are valued (in the *Mark Lane Express* figures) at no less than 40s. per each wheat-growing acre, and the crop is taken at thirty bushels, the rent amounts to 10s. in the costs of production of each quarter.[33] But even if we take only 30s. per acre of rent and taxes, and an average crop of twenty-eight bushels, we still have 8s. 8d. out of the sale price of each quarter of wheat, which goes to the landlord and the State. If it costs so much more in money to grow wheat in this country, while the amount of labour is so much less in this country than in Russia, it is due to the very great height of the land rents attained during the years 1860–1880. But this growth itself was due to the facilities for realising large profits on the sale of manufactured goods abroad. The false condition of British rural economy, not the infertility of the soil, is thus the chief cause of the Russian competition.

Twenty-five years have passed since I wrote these lines — the agricultural crisis provoked by the competition of cheap American wheat being at that time at its climax, and, I am sorry to say, I must leave these lines such as they were written. I do not mean, of course, that no adaptation to the new conditions created by the fall in the prices of wheat should have taken place during the last quarter of a century, in the sense of a more intensive culture and a better utilisation of the land. On the contrary, I mention in different parts of this book the progress accomplished of

[32] The data for the calculation of the cost of production of wheat in this country are those given by the *Mark Lane Express*; they will be found in a digestible form in an article on wheat-growing in the *Quarterly Review* for April, 1887, and in W. E Bear's book, *The British Farmer and his Competitors*, London (Cassell), 1888. Although they are a little above the average, the crop taken for the calculations is also above the average. A similar inquiry has been made on a large scale by the Russian Provincial Assemblies, and the whole was summed up in an elaborate paper, in the *Vyestnik Promyshlennosti*, No. 49, 1887. To compare the paper kopecks with pence I took the rouble at .63 of its nominal value: such was its average quotation during the year 1886. I took 475 English lb. in the quarter of wheat.

[33] The rents have declined since 1887, but the prices of wheat also went down. It must not be forgotten that as the best acres only are selected for wheat-growing, the rent for each acre upon which wheat is grown must be taken higher than the average rent per acre in a farm of from 200 to 300 acres.

late in the development of separate branches of intensive culture, such as fruit-culture, market-gardening, culture under glass, French gardening, and poultry farming, and I also indicate the different steps taken to promote further improvements, such as better conditions of transport, co-operation among the farmers, and especially the development of small holdings.

However, after having taken into account all these improvements, one cannot but see with regret that the same regressive movement in British agriculture, which began in the 'seventies, continues still; and while more and more of the land that was once under the plough goes out of culture, no corresponding increase in the quantities of live stock is to be seen. And if we consult the mass of books and review articles which have been dealing lately with this subject, we see that all the writers recognise that British agriculture must adapt itself to the new conditions by a thorough reform of its general character; and yet the same writers recognise that only a few steps were taken till now in the proper direction. and none of them was taken with a sufficient energy. Society at large remains indifferent to the needs of British agriculture.

It must not be forgotten that the competition of American wheat has made the same havoc in the agriculture of most European countries — especially in France and Belgium; but in the last two countries the adaptations which were necessary to resist the effects of the competition have already taken place to a great extent. Both in Belgium and in France the American imports gave a new impetus toward a more intensive utilisation of the soil, and this impetus was strongest in Belgium, where no attempt was made to protect agriculture by an increase of the import duties, as was the case in France. On the contrary, the duties upon imported wheat were abolished in Belgium precisely at the time when the American competition began to be felt — that is, between 1870 and 1880.

It was not only in England that the fall in the prices of wheat was felt acutely by the farmers. In France, the hectolitre of wheat (very nearly three bushels), which was sold at 18s. 10d. in 1871–1875, fell to 15s. 5d. in 1881–1885, and to 12s. 6d. in 1893; and the same must have been in Belgium, the more so as the protective duties were abolished. But here is what Mr. Seebohm Rowntree says about the effect of the prices in his admirable book on land and labour in Belgium: —

"For a time the Belgian agriculturist was hardly hit, but gradually he adjusted himself to the new conditions. His cultivation became more intensive, he made more and more use of co-operation in various directions, and he devoted himself to new branches of agriculture, especially the raising of live stock and garden produce. He began to realise the value of artificial manure, and to acknowledge that science could help him." — *Land and Labour*, p. 147.

These words by Mr. Rowntree are fully confirmed by the change in the general aspects of the Belgian agriculture, as they appear from the official statistical data. The same must be said of France. The above-mentioned fall in prices induced agriculturists to intensify their methods of culture. I have mentioned already the rapid spreading of agricultural machinery among the French peasants during the last twenty years; and I must mention also the equally remarkable increase in the amounts of chemical manure used by the peasants; the sudden development of agricultural syndicates since 1884; the extension taken by co-operation; the new organisation of transport with cool storage, or in heated cars, for the export of fruit and flowers; the development taken by special industrial cultures; and still more so the immense development of gardening in the South of France and market-gardening in the North. All these adaptations were introduced on such a scale that one is bound to recognise that the crisis has had the effect of giving quite a new aspect to French agriculture, taken as a whole.

Much more ought to be said with regard to the American competition, and therefore I must refer the reader to the remarkable series of articles dealing with the whole of the subject which Schaeffle published in 1886 in the *Zeitschrift für die gesammte Staatswissenschaft*, and to the most elaborate article on the costs of growing wheat all over the world which appeared in April, 1887, in the *Quarterly Review*. These articles were written at the time when American competition was something new and made much havoc in English agriculture, causing a fall of from 30 to 50 per cent. in the rents of land for agricultural purposes. But the conclusions of these two writers were fully corroborated by the yearly reports of the American Board of Agriculture, and Schaeffle's previsions were fully confirmed by the subsequent reports of Mr. J. R. Dodge. It appeared from these works that the fertility of the American soil had been grossly exaggerated, as the masses of wheat which America sent to Europe from its north-western farms were grown on a soil the natural fertility of which is not higher, and often lower, than the average fertility of the unmanured European soil. The Casselton farm in Dakota, with its twenty bushels per acre, was an exception; while the average crop of the chief wheat-growing States in the West was only eleven to twelve bushels. In order to find a fertile soil in America, and crops of from thirty to forty bushels, one must go to the old Eastern States, where the soil is made by man's hands.[34]

The same applies to the American supplies of meat. Schaeffle pointed out that the great mass of live stock which appeared in the census of cattle in the States was not reared in the prairies, but in the stables of the farms, in the same way as in Europe; as to the prairies, he found on them only one-eleventh part of the American horned cattle, one-fifth of the sheep and one-twenty-first of the pigs.[35] "Natural fertility" being thus out of question, we must look for social causes; and we have them, for the Western States, in the cheapness of land and a proper organisation of production; and for the Eastern States in the rapid progress of *intensive* high farming.

It is evident that the methods of culture must vary according to different conditions. In the vast prairies of North America, where land could be *bought* from 8s. to 40s. the acre, and where spaces of from 100 to 160 square miles in one block could be given to wheat culture, special methods of culture were applied and the results were excellent. Land was bought — not rented. In the autumn, whole studs of horses were brought, and the tilling and sowing were done with the aid of formidable ploughs and sowing machines. Then the horses were sent to graze in the mountains; the men were dismissed, and one man, occasionally two or three, remained to winter on the farm. In the spring the owners' agents began to beat the inns for hundreds of miles round, and engaged labourers and tramps, both freely supplied by Europe, for the crop. Battalions of men were marched to the wheat fields, and were camped there; the horses were brought from the mountains, and in a week or two the crop was cut, thrashed, winnowed, put in sacks, by specially invented machines, and sent to the next elevator, or directly to the ships which carried it to Europe. Whereupon the men were disbanded again, the horses were sent back to the grazing grounds, or sold, and again only a couple of men remained on the farm.

The crop from each acre was small, but the machinery was so perfected that in this way 300 days of one man's labour produced from 200 to 300 quarters of wheat; in other words — the area

[34] L. de Lavergne pointed out as far back as fifty years ago that the States were at that time the chief importers of guano. Already in 1854 they imported it almost to the same amount as this country, and they had, moreover, sixty-two manufactories of guano which supplied it to the amount of sixteen times the imports. Compare also Ronna's *L'agriculture aux Etats Unis*, 1881; Lecouteux, *Le blé*; and J. R. Dodge's *Annual Report of the American Department of Agriculture* for 1885 and 1886. Sohaeffle's work was also summed up in Schmoller's *Jahrbuch.*

[35] See also J. R. Dodge's *Farm and Factory*, New York, 1884.

of land being of no account — every man produced in one day his yearly bread food (eight and a half bushels of wheat); and taking into account all subsequent labour, it was calculated that the work of 300 men in one single day delivered to the consumer at Chicago the flour that is required for the yearly food of 250 persons. Twelve hours and a half of work are thus required in Chicago to supply one man with his yearly provision of wheat-flour.

Under the special conditions offered in the Far West this certainly was an appropriate method for increasing all of a sudden the wheat supplies of mankind. It answered its purpose when large territories of unoccupied land were opened to enterprise. But it could not answer for ever. Under such a system of culture the soil was soon exhausted, the crop declined, and *intensive* agriculture (which aims at high crops on a limited area) had soon to be resorted to. Such was the case in Iowa in the year 1878. Up till then, Iowa was an emporium for wheat-growing on the lines just indicated. But the soil was already exhausted, and when a disease came the wheat plants had no force to resist it. In a few weeks nearly all the wheat crop, which was expected to beat all previous records, was lost; eight to ten bushels per acre of bad wheat were all that could be cropped. The result was that "mammoth farms" had to be broken up into small farms, and that the Iowa farmers (after a terrible crisis of short duration — everything is rapid in America) took to a more intensive culture. Now, they are not behind France in wheat culture, as they already grow an average of sixteen and a half bushels per acre on an area of more than 2,000,000 acres, and they will soon win ground. Somehow, with the aid of manure and improved methods of farming, they compete admirably with the mammoth farms of the Far West.

In fact, over and over again it was pointed out, by Schaeffle, Semler, Oetken, and many other writers, that the force of "American competition" is not in its mammoth farms, but in the countless small farms upon which wheat is grown in the same way as it is grown in Europe — that is, with manuring — but with a better organised production and facilities for sale, and without being compelled to pay to the landlord a toll of one-third part, or more, of the selling price of each quarter of wheat. However, it was only after I had myself made a tour in the prairies of Manitoba in 1897, and those of Ohio in 1901, that I could realise the full truth of the just-mentioned views. The 15,000,000 to 20,000,000 bushels of wheat, which are exported every year from Manitoba, are grown almost entirely in farms of one or two "quarter-sections" — that is, of 160 and 320 acres. The ploughing is made in the usual way, and in an immense majority of cases the farmers buy the reaping and binding machines (the "binders") by associating in groups of four. The thrashing machine is rented by the farmer for one or two days, and the farmer carts his wheat to the elevator with his own horses, either to sell it immediately, or to keep it at the elevator if he is in no immediate need of money and hopes to get a higher price in one month or two. In short, in Manitoba one is especially struck with the fact that, even under a system of keen competition, the middle-size farm has completely beaten the old mammoth farm, and that it is not manufacturing wheat on a grand scale which pays best. It is also most interesting to note that thousands and thousands of farmers produce mountains of wheat in the Canadian province of Toronto and in the Eastern States, although the land is not prairie-land at all, and the farms are, as a rule, small.

The force of "American competition" is thus not in the possibility of having hundreds of acres of wheat in one block. It lies in the ownership of the land, in a system of culture which is appropriate to the character of the country, in a widely developed spirit of association, and, finally, in a number of institutions and customs intended to lift the agriculturist and his profession to a high level which is unknown in Europe.

In Europe we do not realise at all what is done in the States and Canada in the interests of agriculture. In every American State, and in every distinct region of Canada, there is an experimental farm, and all the work of preliminary experiment upon new varieties of wheat, oats, barley, fodder and fruit, which the farmer has mostly to make himself in Europe, is made under the best scientific conditions at the experimental farms, on a small scale first and on a large scale next. The results of all these researches and experiments are not merely rendered accessible to the farmer who would like to know them, but they are brought to his knowledge, and, so to speak, are forced upon his attention by every possible means. The "Bulletins" of the experimental stations are distributed in hundreds of thousands of copies, visits to the farms are organised in such a way that thousands of farmers should inspect the stations every year, and be shown by specialists the results obtained, either with new varieties of plants or under various new methods of treatment. Correspondence is carried on with the farmers on such a scale that, for instance, at Ottawa, the experimental farm sends out every year a hundred thousand letters and packets. Every farmer can get, free of charge and postage, five pounds of seed of any variety of cereals, out of which he can get next year the necessary seed for sowing several acres. And, finally, in every small and remote township there are held farmers' meetings, at which special lecturers, who are sent out by the experimental farms or the local agricultural societies, discuss with the farmers in an informal way the results of last year's experiments and discoveries relative to every branch of agriculture, horticulture, cattle-breeding, dairying and agricultural co-operation.[36]

American agriculture really offers an imposing sight — not in the wheat fields of the Far West, which soon will become a thing of the past, but in the development of rational agriculture and the forces which promote it. Read the description of an agricultural exhibition, "the State's fair," in some small town of Iowa, with its 70,000 farmers camping with their families in tents during the fair's week, studying, learning, buying, and selling, and enjoying life. You see a *national fête*, and you feel that you deal with a nation in which agriculture is in respect. Or read the publications of the scores of experimental stations, whose reports are distributed broadcast over the country, and are read by the farmers and discussed at countless "farmers' meetings." Consult the "Transactions" and "Bulletins" of the countless agricultural societies, not royal but popular; study the grand enterprises for irrigation; and you will feel that American agriculture is a real force, imbued with life, which no longer fears mammoth farms, and needs not to cry like a child for protection.

"Intensive" agriculture and gardening are already by this time as much a feature of the treatment of the soil in America as they are in Belgium. As far back as the year 1880, nine States, among which were Georgia, Virginia and the two Carolinas, bought £5,750,000 worth of artificial manure; and we are told that by this time the use of artificial manure has immensely spread towards the West. In Iowa, where mammoth farms used to exist twenty years ago, sown grass is already in use, and it is highly recommended by both the Iowa Agricultural Institute and the numerous local agricultural papers; while at the agricultural competitions the highest rewards

[36] Some additional information on this subject will be found in the articles of mine: "Some Resources of Canada," and "Recent Science," in the *Nineteenth Century*, January, 1898, and October, 1897. I see from the *Experimental Farms' Reports* for 1909 that on the average 38,000 samples of seeds are sent in this way to the farmers every year; in 1909 more than 38,000 farmers united in experiments as to the relative merits of the different sorts of wheat, oats, and barley under trial. I think that my friend, Dr. William Saunders, is quite right in saying that this system of supplying a great number of farmers with small quantities of choice seeds has contributed notably to increase the yield of corn in Canada.

are given, not for extensive farming, but for high crops on small areas. Thus, at a recent competition in which hundreds of farmers took part, the first ten prizes were awarded to ten farmers who had grown, on three acres each, from 262 to 346.75 bushels of Indian corn, in other words *from, 87 to 115 bushels to the acre.* This shows where the ambition of the Iowa farmer goes. In Minnesota, prizes were given already for crops of 300 to 1,120 bushels of potatoes to the acre — that is, from eight and a quarter to thirty-one tons to the acre — while the average potato crop in Great Britain is only six tons.

At the same time market-gardening is immensely extending in America. In the market-gardens of Florida we see such crops as 445 to 600 bushels of onions per acre, 400 bushels of tomatoes, 700 bushels of sweet potatoes, which testify to a high development of culture. As to the "truck farms" (market-gardening for export by steamer and rail), they covered, in 1892, 400,000 acres, and the fruit farms in the suburbs of Norfolk, in Virginia, were described by Prof. Ch. Baltet[37] as real *models* of that sort of culture — a very high testimony in the mouth of a French gardener who himself comes from the model *marais* of Troyes. And while people in London continue to pay almost all the year round twopence for a lettuce (very often imported from Paris), they have at Chicago and Boston those unique establishments in the world where lettuces are grown in immense greenhouses with the aid of electric light; and we must not forget that although the discovery of "electric" growth is European (it is due to Siemens), it was at the Cornell University that it was proved by a series of experiments that electric light is an admirable aid for forwarding the growth of the *green parts* of the plant.

In short, America, which formerly took the lead in bringing "extensive" agriculture to perfection, now takes the lead in "intensive," or forced, agriculture as well. In this adaptability lies the real force of American competition.

Few books have exercised so pernicious an influence upon the general development of economic thought as Malthus's *Essay on the Principle of Population* exercised for three consecutive generations. It appeared at the right time, like all books which have had any influence at all, and it summed up ideas already current in the minds of the wealth-possessing minority. It was precisely when the ideas of equality and liberty, awakened by the French and American revolutions, were still permeating the minds of the poor, while the richer classes had become tired of their amateur excursions into the same domains, that Malthus came to assert, in reply to Godwin, that no equality is possible; that the poverty of the many is not due to institutions, but is a natural *law.* Population, he wrote, grows too rapidly and the new-comers find no room at the feast of nature; and that law cannot be altered by any change of institutions. He thus gave to the rich a kind of scientific argument against the ideas of equality; and we know that though all dominion is based upon force, force itself begins to totter as soon as it is no longer supported by a firm belief in its own rightfulness. As to the poorer classes — who always feel the influence of ideas circulating at a given time amid the wealthier classes — it deprived them of the very hope of improvement; it made them sceptical as to the promises of the social reformers; and to this day the most advanced reformers entertain doubts as to the possibility of satisfying the needs of all, in case there should be a claim for their satisfaction, and a temporary welfare of the labourers resulted in a sudden increase of population.

Science, down to the present day, remains permeated with Malthus's teachings. Political economy continues to base its reasoning upon a tacit admission of the impossibility of rapidly increas-

[37] *L'Horticulture dans les cinq Parties du Monde.* Paris ,1895.

ing the productive powers of a nation, and of thus giving satisfaction to all wants. This postulate stands, undiscussed, in the background of whatever political economy, classical or socialist, has to say about exchange-value, wages, sale of labour force, rent, exchange, and consumption. Political economy never rises above the hypothesis of a *limited and insufficient supply of the necessaries of life*; it takes it for granted. And all theories connected with political economy retain the same erroneous principle. Nearly all socialists, too, admit the postulate. Nay, even in biology (so deeply interwoven now with sociology) we have recently seen the theory of variability of species borrowing a quite unexpected support from its having been connected by Darwin and Wallace with Malthus's fundamental idea, that the natural resources must inevitably fail to supply the means of existence for the rapidly multiplying animals and plants. In short, we may say that the theory of Malthus, by shaping into a pseudo-scientific form the secret desires of the wealth-possessing classes, became the foundation of a whole system of practical philosophy, which permeates the minds of both the educated and uneducated, and reacts (as practical philosophy always does) upon the theoretical philosophy of our century.

True, the formidable growth of the productive powers of man in the industrial field, since he tamed steam and electricity, has somewhat shaken Malthus's doctrine. Industrial wealth has grown at a rate which no possible increase of population could attain, and it can grow with still greater speed. But agriculture is still considered a stronghold of the Malthusian pseudo-philosophy. The recent achievements of agriculture and horticulture are not sufficiently well known; and while our gardeners defy climate and latitude, acclimatise sub-tropical plants, raise several crops a year instead of one, and themselves make the soil they want for each special culture, the economists nevertheless continue saying that the surface of the soil is limited, and still more its productive powers; they still maintain that a population which should double each thirty years would soon be confronted by a lack of the necessaries of life!

A few data to illustrate what can be obtained from the soil were given in the preceding chapter. But the deeper one goes into the subject, the more new and striking data does he discover, and the more Malthus's fears appear groundless.

To begin with an instance taken from culture in the open field — namely, that of wheat — we come upon the following interesting fact. While we are so often told that wheat-growing does not pay, and England consequently reduces from year to year the area of its wheat fields, the French peasants steadily increase the area under wheat, and the greatest increase is due to those peasant families which themselves cultivate the land they own. In the course of the nineteenth century they have nearly doubled the area under wheat, as well as the returns from each acre, so as to increase almost fourfold the amount of wheat grown in France.[38]

At the same time the population has only increased by 41 per cent., so that the ratio of increase of the wheat crop has been six times greater than the ratio of increase of population, although agriculture has been hampered all the time by a series of serious obstacles — taxation, military service, poverty of the peasantry, and even, up to 1884, a severe prohibition of all sorts of association among the peasants.[39] It must also be remarked that during the same hundred years, and even within the last fifty years, market-gardening, fruit-culture and culture for industrial purposes have immensely developed in France; so that there would be no exaggeration in saying that the French obtain now from their soil at least six or seven times more than they obtained a

[38] *[see Table 5]*
[39] *[see Table 6]*

hundred years ago. The "means of existence" drawn from the soil have thus grown about fifteen times quicker than the population.

But the ratio of progress in agriculture is still better seen from the rise of the standard of requirement as regards cultivation of land. Some thirty years ago the French considered a crop very good when it yielded twenty-two bushels to the acre; but with the same soil the present requirement is at least thirty-three bushels, while in the best soils the crop is good only when it yields from forty-three to forty-eight bushels, and occasionally the produce is as much as fifty-five bushels to the acre.[40] There are whole countries — Hesse, for example — which are satisfied only when the *average* crop attains thirty-seven bushels, or Denmark, where the average crop (1908–1910) is forty-one bushels per acre (forty-four bushels in l910).[41] As to the experimental farms of Central France, they produce from year to year, over large areas, forty-one bushels to the acre; and a number of farms in Northern France regularly yield, year after year, from fifty-five to sixty-eight bushels to the acre. Occasionally even so much as eighty bushels have been obtained upon limited areas under special care.[42] In fact, Prof. Grandeau considers it proved that by combining a series of such operations as the selection of seeds, sowing in rows, and proper manuring, the crops can be largely increased over the best present average, while the cost of production can be reduced by 50 per cent. by the use of inexpensive machinery; to say nothing of costly machines, like the steam digger, or the pulverisers which make the soil required for each special culture. They are now occasionally resorted to here and there, and they surely will come into general use as soon as humanity feels the need of largely increasing its agricultural produce.

In fact, a considerable progress has already been realised in French agriculture by labour-saving machinery during the last twenty-five years; but there still remains an immense field for further improvement. Thus, in 1908, France had already in use 25,000 harvesting machines and 1,200 binders as against 180 only of the former and sixty of the second, which were used in 1882; but it is calculated that no less than 375,000 more harvesting machines and 300,000 mowing machines are required to satisfy the needs of French agriculture. The same must be said as regards the use of artificial manure, irrigation, pumping machinery, and so on.

When we bear in mind the very unfavourable conditions in which agriculture stands now all over the world, we must not expect to find considerable progress in its methods realised over wide regions; we must be satisfied with noting the advance accomplished in separate, especially favoured spots, where, for one cause or another, the tribute levied upon the agriculturist has not been so heavy as to stop all possibility of progress.

One such example may be seen in the district of Saffelare in East Flanders. Thirty years ago, on a territory of 37,000 acres, all taken, a population of 30,000 inhabitants, all peasants, not only used to find its food, but managed, moreover, to keep no less than 10,720 horned cattle, 3,800 sheep, 1,815 horses and 6,550 swine, to grow flax, and to export various agricultural produce.[43]

[40] Grandeau, *Etudes agronomiques*, 2e série. Paris, 1888.

[41] Although 36 per cent. of the cultivable area is under cereals, there were in Denmark, in 1910, 2,253,980 head of cattle, as against 1,238,900 in 1871, and 1,470,100 in 1882.

[42] Risler, *Physiologie et Culture du Blé*. Paris, 1886. Taking the whole of the wheat crop in France, we see that the following progress has been realised. In 1872–1881 the average crop was 16.5 bushels per acre. In 1882–1890 it attained 17.9 bushels per acre. Increase by 14 per cent. in ten years (Prof. C. V. Garola, *Les Céréales*, p. 70 *seq.*).

[43] O. de Kerchove de Denterghen, *La petite Culture des Flanders belges*, Gand, 1878.

And during the last thirty years it has continued steadily to increase its exports of agricultural produce.

Another illustration of this sort may be taken from the Channel Islands, whose inhabitants have happily not known the blessings of Roman law and landlordism, as they still live under the common law of Normandy. The small island of Jersey, eight miles long and less than six miles wide, still remains a land of open-field culture; but, although it comprises only 28,707 acres, rocks included, it nourishes a population of about two inhabitants to each acre, or 1,300 inhabitants to the square mile, and there is not one writer on agriculture who, after having paid a visit to this island, did not praise the well-being of the Jersey peasants and the admirable results which they obtain in their small farms of from five to twenty acres — very often less than five acres — by means of a rational and intensive culture.

Most of my readers will probably be astonished to learn that the soil of Jersey, which consists of decomposed granite, with no organic matter in it, is not at all of astonishing fertility, and that its climate, though more sunny than the climate of these isles, offers many drawbacks on account of the small amount of sun-heat during the summer and of the cold winds in spring. But so it is in reality, and at the beginning of the nineteenth century the inhabitants of Jersey lived chiefly on imported food. (See Appendix L.) The successes accomplished lately in Jersey are entirely due to the amount of labour which a dense population is putting in the land; to a system of land-tenure, land-transference and inheritance very different from those which prevail elsewhere; to freedom from State taxation; and to the fact that communal institutions have been maintained, down to quite a recent period, while a number of communal habits and customs of mutual support, derived therefrom, are alive to the present time. As to the fertility of the soil, it is made partly by the sea-weeds gathered free on the sea-coast, but chiefly by artificial manure fabricated at Blaydon-on-Tyne, out of all sorts of refuse — inclusive of bones shipped from Plevna and mummies of cats shipped from Egypt.

It is well known that for the last thirty years the Jersey peasants and farmers have been growing early potatoes on a great scale, and that in this line they have attained most satisfactory results. Their chief aim being to have the potatoes out as early as possible, when they fetch at the Jersey Weigh-Bridge as much as £17 and £20 the ton, the digging out of potatoes begins, in the best sheltered places, as early as the first days of May, or even at the end of April. Quite a system of potato-culture, beginning with the selection of tubers, the arrangements for making them germinate, the selection of properly sheltered and well situated plots of ground, the choice of proper manure, and ending with the box in which the potatoes germinate and which has so many other useful applications, — quite a system of culture has been worked out in the island for that purpose by the collective intelligence of the peasants.[44]

In the last weeks of May and in June, when the export is at its height, quite a fleet, of steamers runs between the small island of Jersey and various ports of England and Scotland. Every day

[44] One could not insist too much on the collcctive character of the development of that branch of husbandry. In many places of the South coast of England early potatoes can also be grown — to say nothing of Cornwall and South Devon, where potatoes are obtained by separate labourers in small quantities as early as they are obtained in Jersey. But so long as this culture remains the work of isolated growers, its results must necessarily be inferior to those which the Jersey peasants obtain through their collective experience. For the technical details concerning potato-culture in Jersey, see a paper by a Jersey grower in the *Journal of Horticulture*, 22nd and 29th May, 1890. Considerable progress has been made lately in Cornwall, especially in the neighbourhood of Penzance, in the development of potato-growing and intensive market-gardening, and one may hope that the successes of these growers will incite others to imitate their example.

eight to ten steamers enter the harbour of St. Hélier, and in twenty-four hours they are loaded with potatoes and steer for London, Southampton, Liverpool, Newcastle, and Scotland. From 50,000 to 60,000 tons of potatoes, valued at from £260,000 to £500,000, according to the year, are thus exported every summer; and, if the local consumption be taken into account, we have at least 60,000 to 70,000 tons that are obtained, although no more than from 6,500 to 7,500 acres are given to all potato crops, early and late — early potatoes, as is well known, never giving as heavy crops as the later ones. Ten to eleven tons per acre is thus the average, while in this country the average is only six tons per acre.

As soon as the potatoes are out, the second crop of mangold or of "three months' wheat" (a special variety of rapidly growing wheat) is sown. Not one day is lost in putting it in. The potato-field may consist of one or two acres only, but as soon as one-fourth part of it is cleared of the potatoes it is sown with the second crop. One may thus see a small field divided into four plots, three of which are sown with wheat at five or six days' distance from each other, while on the fourth plot the potatoes are being dug out.

The admirable condition of the meadows and the grazing land in the Channel Islands has often been described, and although the aggregate area which is given in Jersey to green crops, grasses under rotation, and permanent pasture — both for hay and grazing — is less than 11,000 acres, they keep in Jersey over 12,300 head of cattle and over 2,300 horses solely used for agriculture and breeding.

Moreover, about 100 bulls and 1,600 cows and heifers are exported every year,[45] so that by this time, as was remarked in an American paper, there are more Jersey cows in America than in Jersey Island. Jersey milk and butter have a wide renown, as also the pears which are grown in the open air, but each of which is protected on the tree by a separate cap, and still more the fruit and vegetables which are grown in the hothouses. In a word, it will suffice to say that on the whole they obtain agricultural produce to the value of £50 to each acre of the aggregate surface of the island.

Fifty pounds' worth of agricultural produce from each acre of the land is sufficiently good. But the more we study the modern achievements of agriculture, the more we see that the limits of productivity of the soil are not attained, even in Jersey. New horizons are continually unveiled. For the last fifty years science — especially chemistry — and mechanical skill have been widening and extending the industrial powers of man upon organic and inorganic dead matter. Prodigies have been achieved in that direction. Now comes the turn of similar achievements with living plants. Human skill in the treatment of living matter, and science — in its branch dealing with living organisms — step in with the intention of doing for the art of food-growing what mechanical and chemical skill have done in the art of fashioning and shaping metals, wood and the dead fibres of plants. Almost every year brings some new, often unexpected improvement in the art of agriculture, which for so many centuries had been dormant.

We just saw that while the average potato crop in the country is six tons per acre, in Jersey it is nearly twice as big. But Mr. Knight, whose name is well known to every horticulturist in this country, has once dug out of his fields no less than 1,284 bushels of potatoes, or thirty-four tons and nine cwts. in weight, on one single acre; and at a recent competition in Minnesota 1,120 bushels, or thirty tons, could be ascertained as having been grown on one acre.

[45] See Appendix L.

These are undoubtedly extraordinary crops, but quite recently the French Professor Aime Girard undertook a series of experiments in order to find out the best conditions for growing potatoes in his country.[46] He did not care for show-crops obtained by means of extravagant manuring, but carefully studied all conditions: the best variety, the depth of tilling and planting, the distance between the plants. Then he entered into correspondence with some 350 growers in different parts of France, advised them by letters, and finally induced them to experiment. Strictly following his instructions, several of his correspondents made experiments on a small scale, and they obtained, — instead of the three tons which they were accustomed to grow — such crops as would correspond to twenty and thirty-six tons to the acre. Moreover, ninety growers experimented on fields more than one-quarter of an acre in size, and more than twenty growers made their experiments on larger areas of from three to twenty-eight acres. The result was that *none of them obtained less than twelve tons* to the acre, while some obtained twenty tons, and the average was, for the 110 growers, fourteen and a half tons per acre.

However, industry requires still heavier crops. Potatoes are largely used in Germany and Belgium for distilleries; consequently, the distillery owners try to obtain the greatest possible amounts of starch from the acre. Extensive experiments have lately been made for that purpose in Germany, and the crops were: Nine tons per acre for the poor sorts, fourteen tons for the better ones, and thirty-two and four-tenths tons for the best varieties of potatoes.

Three tons to the acre and more than thirty tons to the acre are thus the ascertained limits; and one necessarily asks oneself: Which of the two requires *less labour* in tilling, planting, cultivating and digging, and less expenditure in manure — thirty tons grown on ten acres, or the same thirty tons grown on one acre or two? If labour is of no consideration, while every penny spent in seeds and manure is of great importance, as is unhappily very often the case with the peasant — he will perforce choose the first method. But is it the most economic?

Again, I just mentioned that in the Saffelare district and Jersey they succeed in keeping one head of horned cattle to each acre of green crops, meadows and pasture land, while elsewhere two or three acres are required for the same purpose. But better results still can be obtained by means of irrigation, either with sewage or even with pure water. In England, farmers are contented with one and a half and two tons of hay per acre, and in the part of Flanders just mentioned, two and a half tons of hay to the acre are considered a fair crop. But on the irrigated fields of the Vosges, the Vaucluse, etc., in France, six tons of dry hay become the rule, even upon ungrateful soil; and this means considerably more than the annual food of one milch cow (which can be taken at a little less than five tons) grown on each acre. All taken, the results of irrigation have proved so satisfactory in France that during the years 1862–1882 no less than 1,355,000 acres of meadows have been irrigated,[47] which means that the annual meat-food of at least 1,500,000 full-grown persons, or more, has been added to the yearly income of the country; home-grown, not imported. In fact, in the valley of the Seine, the value of the land was doubled by irrigation; in the Saône valley it was increased five times, and ten times in certain *landes* of Brittany.[48]

[46] See the *Annales agronomiques* for 1892 and 1893; also *Journal des Economistes*, février, 1893, p. 215.

[47] Barral in *Journal d'Agriculture pratique*, 2 février, 1889; Boitel, *Herbages et Prairies naturelles*, Paris, I887.

[48] The increase of the crops due to irrigation is most instructive. In the most unproductive Sologne, irrigation has increased the hay crop from two tons per hectare (two and a half acres) to eight tons; in the Vendée, from four tons of bad hay to ten tons of excellent hay. In the Ain, M. Puris, having spent 19,000 francs for irrigating ninety-two and a half hectares (about £ 2 10s. per acre), obtained an increase of 207 tons of excellent hay. In the south of France, a net increase of over four bushels of wheat per acre is easily obtained by irrigation; while for market gardening the

The example of the Campine district, in Belgium, is classical. It was a most unproductive territory — mere sand from the sea, blown into irregular mounds which were only kept together by the roots of the heath; the acre of it used to be sold, not rented, at from 5s. to 7s. (15 to 20 francs per hectare). But now it is capable, thanks to the work of the Flemish peasants and to irrigation, to produce the food of one milch cow per acre — the dung of the cattle being utilised for further improvements.

The irrigated meadows round Milan are another well-known example. Nearly 22,000 acres are irrigated there with water derived from the sewers of the city, and they yield crops of from eight to ten tons of hay as a rule; occasionally some separate meadows will yield the fabulous amount — fabulous to-day, but no longer fabulous tomorrow — of eighteen tons of hay per acre, that is, the food of nearly four cows to the acre, and nine times the yield of good meadows in this country.[49] However, English readers need not go so far as Milan for ascertaining the results of irrigation by sewer water. They have several such examples in this country, in the experiments of Sir John Lawes, and especially at Craigentinny, near Edinburgh, where, to use Ronna's words, "the growth of rye grass is so activated that it attains its full development in one year instead of in three to four years. Sown in August, it gives a first crop in autumn, and then, beginning with next spring, a crop of four tons to the acre is taken every month; which represents in the fourteen months more than fifty-six tons (of green fodder) to the acre."[50] At Lodge Farm they grow forty to fifty-two tons of green crops per acre, after the cereals, without new manuring. At Aldershot they obtain excellent potato crops; and at Romford (Breton's Farm) Colonel Hope obtained, in 1871–1872, quite extravagant crops of various roots and potatoes.[51]

It can thus be said that while at the present time we give two and three acres for keeping one head of horned cattle, and only in a few places one head of cattle is kept on each acre given to green crops, meadows and pasture, man has already in irrigation (which very soon repays when it is properly made) the possibility of keeping twice and even thrice as many head of cattle to the acre over parts of his territory. Moreover, the very heavy crops of roots which are now obtained (seventy-five to 110 tons of beetroot to the acre are not infrequent) give another powerful means for increasing the number of cattle without taking the land from what is now given to the culture of cereals.

Another new departure in agriculture, which is full of promises and probably will upset many a current notion, must be mentioned in this place. I mean the almost horticultural treatment of our corn crops, which is widely practised in the far East, and begins to claim our attention in Western Europe as well.

At the First International Exhibition, in 1851, Major Hallett, of Manor House, Brighton, had a series of very interesting exhibits which he described as "pedigree cereals." By picking out the best plants of his fields, and by submitting their descendants to a careful selection from year to year, he had succeeded in producing new prolific varieties of wheat and barley. Each grain of

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increase was found to attain £ 30 to £ 40 per acre. (See H. Sagnìer, "Irrigation," in Barral's *Dictionnaire d'Agriculture*, vol. iii., p. 339.) I hardly need mention the striking results obtained lately by irrigation in Egypt and on the dry plateaus of the United States.

[49] *Dictionnaire d'Agriculture*, same article. See also Appendix M.

[50] Ronna. *Les Irrigations.* vol. iii, p. 67. Paris, 1890.

[51] Prof. Ronna gives the following figures of crops per acre: Twenty-eight tons of potatoes, sixteen tons of mangolds, 105 tons of beet, 110 tons of carrots, nine to twenty tons of various cabbage, and so on. — Most remarkable results seem also to have been obtained by M. Goppart, by growing green fodder for ensilage. See his work, *Manuel de la Culture des Maïs et autres Fourrages verts*, Paris, 1877.

these cereals, instead of giving only two to four ears, as is the usual average in a cornfield, gave ten to twenty-five ears, and the best ears, instead of carrying from sixty to sixty-eight grains, had an average of nearly twice that number of grains.

In order to obtain such prolific varieties Major Hallett naturally could not sow his picked grains broadcast; he planted them, each separately, in rows, at distances of from ten to twelve inches from each other. In this way he found that each grain, having full room for what is called "tillering" (*tallage* in French[52]), would produce ten, fifteen, twenty-five, and even up to ninety and 100 ears, as the case may be; and as each ear would contain from 60 to 120 grains, crops of 500 to 2,500 grains, or more, could be obtained from each separately planted grain. He even exhibited at the Exeter meeting of the British Association three plants of wheat, barley, and oats, each from a single grain, which had the following number of stems: wheat, ninety-four stems; barley, 110 stems; oats, eighty-seven stems.[53] The barley plant which had 110 stems thus gave something like 5,000 to 6,000 grains from one single grain. A careful drawing of that wonderful stubble was made by Major Hallett's daughter and circulated with his pamphlets.[54] Again, in 1876, a wheat plant, with "105 heads growing on one root, on which more than 8,000 grains were growing at once," was exhibited at the Maidstone Farmers' Club.[55]

Two different processes were thus involved in Hallett's experiments: a process of selection, in order to create new varieties of cereals, similar to the breeding of new varieties of cattle; and a method of immensely increasing the crop from each grain and from a given area, by planting each seed separately and wide apart, so as to have room for the full development of the young plant, which is usually suffocated by its neighbours in our corn-fields.[56]

The double character of Major Hallett's method — the breeding of *new prolific varieties,* and the method of culture by *planting the seeds wide apart* — seems, however, so far as I am entitled to judge, to have been overlooked until quite lately. The method was mostly judged upon its results; and when a farmer had experimented upon "Hallett's Wheat," and found out that it was late in ripening in his own locality, or gave a less perfect grain than some other variety, he usually did not care more about the method.[57] However, Major Hallett's successes or non-successes in breeding such or such varieties are quite distinct from what is to be said about the method itself of selection, or the method of planting wheat seeds wide apart. Varieties which were bred, and

[52] "Shortly after the plant appears above ground it commences to throw out new and distinct stems, upon the first appearance of which a correspondent root-bud is developed for its support, and while the new stems grow out flat over the surface of the soil, their respective roots assume a corresponding development beneath it. This process, called 'tillering,' will continue until the season arrives for the stems to assume an upright growth." The less the roots have been interfered with by overcrowding the better will be the ears (Major Hallett, "Thin Seeding," etc.).

[53] Paper on " Thin Seeding and the Selection of Seed," read before the Midland Farmers' Club, 4th June, 1874.

[54] "Pedigree Cereals," 1889. Paper on "Thin Seeding," etc., just mentioned. Abstracts from *The Times*, etc., 1862. Major Hallett contributed, moreover, several papers to the *Journal of the Royal Agricultural Society*, and one to *The Nineteenth Century*.

[55] *Agricultural Gazette*, 3rd January, 1876. Ninety ears, some of which contained as many as 132 grains each, were also obtained in New Zealand.

[56] It appears from many different experiments (mentioned in Prof. Garola's excellent work, *Les Céréales*, Paris, 1892) that when tested seeds (of which no more than 6 per cent. are lost on sowing) are sown broadcast, to the amount of 500 seeds per square metre (a little more than one square yard), *only* 148 *of them give plants*. Each plant gives in such case from two to four stems and from two to four ears, but nearly 360 seeds are entirely lost. When sown in rows, the loss is not so great, but it is still considerable.

[57] See Prof. Garola's remarks on "Hallett's Wheat," which, by the way, seems to be well known to farmers in France and Germany (*Les Céréales*, p. 337).

which I saw grown still at Manor Farm, on the windy downs of Brighton may be, or may not be, suitable to this or that locality. Latest physiological researches give such an importance to evaporation in the bringing of cereals to maturity that where evaporation is not so rapid as it is on the Brighton Downs, other varieties must be resorted to and bred on purpose.[58] I should also suggest that quite different wheats than the English ought to be experimented upon for obtaining prolific varieties; namely, the quickly-growing Norwegian wheat, the Jersey "three months' wheat," or even Yakutsk barley, which matures with an astonishing rapidity. And now that horticulturists, so experienced in "breeding" and "crossing" as Vilmorin, Carter, Sherif, W. Saunders in Canada and many others are, have taken the matter in hand, we may feel sure that future progress will be made. But breeding is one thing; and the planting wide apart of seeds of an appropriate variety of wheat is quite another thing.

This last method was lately experimented upon by M. Grandeau, Director of the Station Agronomique de l'Est, and by M. Florimond Dessprèz at the experimental station of Capelle; and in both cases the results were most remarkable. At this last station a method which is in use in France for the choice of seeds was applied. Already now some French farmers go over their wheat fields before the crop begins, choose the soundest plants which bear two or three equally strong stems, adorned with long ears, well stocked with grains, and take these ears. Then they crop off with scissors the top and the bottom of each ear and keep its middle part only, which contains the biggest seeds. With a dozen quarts of such selected grains they obtain next year the required quantity of seeds of a superior quality.[59]

The same was done by M. Dessprèz. Then each seed was planted separately, eight inches apart in a row, by means of a specially devised tool, similar to the *rayonneur* which is used for planting potatoes; and the rows, also eight inches apart, were alternately given to the big and to the smaller seeds. One-fourth part of an acre having been planted in this way, with seeds obtained from both early and late ears, crops corresponding to 83.8 bushels per acre for the first series, and 90.4 bushels for the second series, were obtained; even the small grains gave in this experiment as much as 70.2 and 62 bushels respectively.[60]

The crop was thus more than doubled by the choice of seeds and by planting them separately eight inches apart. It corresponded in Dessprèz's experiments to *600 grains obtained on the average from each grain sown*; and one-tenth or one-eleventh part of an acre was sufficient in such case to grow the eight and a half bushels of wheat which are required on the average for the annual bread food per head of a population which would chiefly live on bread.

Prof. Grandeau, Director of the French Station Agronomique de l'Est, has also made, since 1886, experiments on Major Hallett's method, and he obtained similar results. "In a proper soil," he wrote, "one single grain of wheat can give as much as fifty stems (and ears), and even more, and thus cover a circle thirteen inches in diameter."[61] But as he seems to know how difficult it often is to convince people of the plainest facts, he published the photographs of separate wheat plants

[58] Besides, Hallett's wheat must not be sown later than the first week of September. Those who may try experiments with planted wheat must be especially careful to make the experiments in open fields, not in a back garden, and to sow early.

[59] Upon this method of selecting seeds opinions are, however, at variance amongst agriculturists.

[60] The straw was eighty-three and seventy-seven cwts. per acre in the first case; fifty-nine and forty-nine cwts. in the second case (Garola, *Les Céréales*). In his above-mentioned paper on "Thin Seeding," Major Hallett mentions a crop at the rate of 108 bushels to the acre, obtained by planting nine inches apart.

[61] L. Grandeau, *Etudes agronomiques*, 3e série, 1887–1888, p. 43. This series is still continued by one volume every year.

grown in different soils, differently manured, including pure river sand enriched by manure.[62] He concluded that under proper treatment 2,000 and even 4,000 grains could be easily obtained from each planted grain. The seedlings, growing from grains planted ten inches apart, cover the whole space, and the experimental plot takes the aspect of an excellent cornfield, as may be seen from a photograph given by Grandeau in his *Etudes agronomiques*.[63]

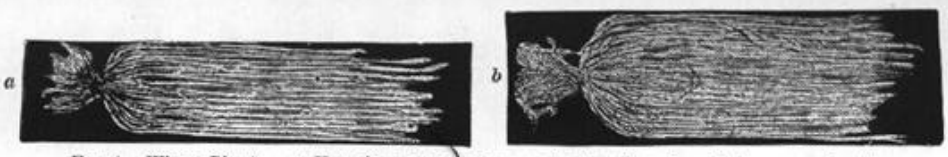

FIG. 4.—Wheat Plants. *a*, Has given 17 ears from each planted grain. Soil manured with chemical manure only. *b*, Has given 25 ears from each planted grain. Soil manured with both stable and chemical manure.

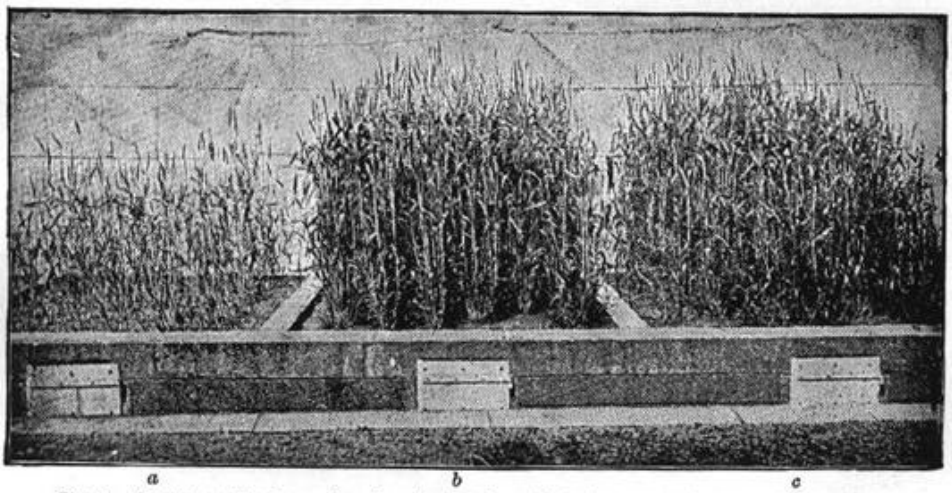

FIG. 5.—Squares at Professor Grandeau's experimental station, planted with grains of wheat, in three different soils: *a*, pure sand; *b* and *c*, manured arable soil; each grain 12 inches apart.

In fact, the eight and a half bushels required for one man's annual food were actually grown at the Tomblaine station on a surface of 2,250 square feet, or forty-seven feet square — that is, on very nearly one-twentieth part of an acre.

Again, we may thus say, that where we require now three acres, one acre would be sufficient for growing the same amount of food, if planting wide apart were resorted to. And there is, surely, no more objection to planting wheat than there is to sowing in rows, which is now in general use, although at the time when the system was first introduced, *in lieu* of the formerly usual mode of sowing broadcast, it certainly was met with great distrust. While the Chinese and the Japanese used for centuries to sow wheat in rows, by means of a bamboo tube adapted to the plough,

[62] On one of these photographs one sees that in a soil improved by chemical manure only, seventeen stems from each grain are obtained; with organic manure added to the former, twenty-five stems were obtained.

[63] Most interesting experiments for obtaining new sorts of wheat, combining the qualities of Canadian wheat with those of the best British sorts, are being carried on now at the Cambridge University. Similar experiments have been made in Germany by F. von Lochow, at Petkno, in order to produce new races of rye rich in gluten and prolific. These last experiments were made on Mr. Hallett's method, and the results were satisfaotory, as it appears from a report published in Fuehling's *Landwirthschaftliche Zeitung*, Leipzig, January and February, 1900, pp. 29 and 54.

European writers objected, of course, to this method under the pretext that it would require too much labour. It is the same now with planting each seed apart. Professional writers sneer at it, although all the rice that is grown in Japan is planted *and even replanted*. Everyone, however, who will think of the labour which must be spent for ploughing, harrowing, fencing, and keeping free of weeds three acres instead of one, and who will calculate the corresponding expenditure in manure, will surely admit that all advantages are in favour of the one acre as against the three acres, to say nothing of the possibilities of irrigation or of the planting machine-tool, which will be devised as soon as there is a demand for it.[64]

More than that, there is full reason to believe that even this method is liable to further improvement by means of *replanting*. Cereals in such cases would be treated as vegetables are treated in horticulture. Such is, at least, the idea which began to germinate since the methods of cereal culture that are resorted to in China and Japan became better known in Europe. (See Appendix O.)

The future — a near future, I hope — will show what practical importance such a method of treating cereals may have. But we need not speculate about that future. We have already, in the facts mentioned in this chapter, an experimental basis for quite a number of means of improving our present methods of culture and of largely increasing the crops. It is evident that in a book which is not intended to be a manual of agriculture, all I can do is to give only a few hints to set people thinking for themselves upon this subject. But the little that has been said is sufficient to show that we have no right to complain of over-population, and no need to fear it in the future. Our means of obtaining from the soil whatever we want, under *any* climate and upon *any* soil, have lately been improved at such a rate that we cannot foresee yet what is the limit of productivity of a few acres of land. The limit vanishes in proportion to our better study of the subject, and every year makes it vanish further and further from our sight.

One of the most interesting features of the present evolution of agriculture is the extension lately taken by intensive market-gardening of the same sort as has been described in the third chapter. What formerly was limited to a few hundreds of small gardens, is now spreading with an astonishing rapidity. In this country the area given to market-gardens, after having more than doubled within the years 1879 to 1894, when it attained 88,210 acres, has continued steadily to increase.[65] But it is especially in France, Belgium, and America that this branch of culture has lately taken a great development. (See Appendix P.)

At the present time no less than 1,075,000 acres are given in France to market-gardening and intensive fruit culture, and a few years ago it was estimated that the *average* yield of every acre given to these cultures attains £33, 10s.[66] Their character, as well as the amount of skill displayed in, and labour given to, these cultures, will best appear from the following illustrations.

About Roscoff, which is a great centre in Brittany for the export to England of such potatoes as will keep till late in summer, and of all sorts of vegetables, a territory, twenty-six miles in diameter, is entirely given to these cultures, and the rents attain and exceed £6 per acre. Nearly 300 steamers call at Roscoff to ship potatoes, onions and other vegetables to London and different English ports, as far north as Newcastle. Moreover, as much as 4,000 tons of vegetables are sent

[64] See Appendix N.

[65] Charles Whitehead, *Hints on Vegetable and Fruit Farming*, London (J. Murray), 1890. *The Gardener's Chronicle*, 20th April, 1895.

[66] Charles Baltet, *L'Horticulture dans les cinq Parties du Monde. Ouvrage couronné par la Société Nationale d'Horticulture*. Paris (Hachette), 1895.

every year to Paris.[67] And although the Roscoff peninsula enjoys a specially warm climate, small stone walls are erected everywhere, and rushes are grown on their tops in order to give still more protection and heat to the vegetables.[68] The climate is improved as well as the soil.

In the neighbourhoods of Cherbourg it is upon land conquered from the sea that the best vegetables are grown — more than 800 acres of that land being given to potatoes exported to London; another 500 acres are given to cauliflower; 125 acres to Brussels sprouts; and so on. Potatoes grown under glass are also sent to the London market from the middle of April, and the total export of vegetables from Cherbourg to England attains 300,000 cwts., while from the small port of Barfleur another 100,000 cwts. are sent to this country, and about 60,000 cwts. to Paris. Nay, in a quite small commune, Surtainville, near Cherbourg, £2,800 are made out of 180 acres of market-gardens, three crops being taken every year: cabbage in February, early potatoes next, and various crops in the autumn — to say nothing of the catch crops.

At Ploustagel one hardly believes that he is in Brittany. Melons used to be grown at that spot, long since, in the open fields, with glass frames to protect them from the spring frost, and green peas were grown under the protection of rows of furze which sheltered them from the northern winds. Now, whole fields are covered with strawberries, roses, violets, cherries and plums, down to the very sea beach.[69] Even the *landes* are reclaimed, and we are told that in five years or so there will be no more *landes* in that district (p. 265). Nay, the marshes of the Dol — "The Holland of Brittany" — protected from the sea by a wall (5,050 acres), have been turned into market-gardens, covered with cauliflowers, onions, radishes, haricot beans and so on, the acre of that land being rented at from £2 , 10s. to £4.

The neighbourhoods of Nantes could also be mentioned. Green peas are cultivated there on a very large scale. During the months of May and June quite an army of working people, especially women and children, are picking them. The roads leading to the great preserving factories are covered at certain hours with rows of carts, upon which the peas and onions are carted one way, while another row of carts are carrying the empty pods which are used for manure. For two months the children are missing in the schools; and in the peasant families of the neighbourhood, when the question comes about some expenditure to be made, the usual saying is, "Wait till the season of the green peas has come."

About Paris no less than 50,000 acres are given to the field culture of vegetables and 25,000 acres to the forced culture of the same. Sixty years ago the yearly rent paid by market-gardeners attained already as much as £18 and £24 per acre, and yet it has been increased since, as well as the gross receipts, which were valued by Courtois Gérard at £240 per acre for the larger market-gardeners, and twice as much for the smaller ones in which early vegetables are grown in frames.

The fruit culture in the neighbourhoods of Paris is equally wonderful. At Montreuil, for instance, 750 acres, belonging to 400 gardeners, are literally covered with stone walls, specially erected for growing fruit, and having an aggregate length of 400 miles. Upon these walls, peach trees, pear trees and vines are spread, and every year something like 12,000,000 peaches are gathered, as well as a considerable amount of the finest pears and grapes. The acre in such conditions brings in £56. This is how a "warmer climate" was made, at a time when the greenhouse was still a costly luxury. All taken, 1,250 acres are given to peaches (26,000,000 peaches every year) in the

[67] Charles Baltet, loc. cit.

[68] Ardouin Dumazet, *Voyage en France*, vol. v., p. 10.

[69] Ardouin Dumazet, *Voyage en France*, vol. v., p. 200.

close neighbourhood of Paris. Acres and acres are also covered with pear trees which yield three to five tons of fruit per acre, such crop being sold at from £50 to £60. Nay, at Angers, on the Loire, where pears are eight days in advance of the suburbs of Paris, Baltet knows an orchard of five acres, covered with pears (pyramid trees), which brings in £400 every year; and at a distance of thirty-three miles from Paris one pear plantation brings in £24 per acre — the cost of package, transport and selling being deducted. Likewise, the plantations of plums, of which 80,000 cwts. are consumed every year at Paris alone, give an annual money income of from £29 to £48 per acre every year; and yet, pears, plums and cherries are sold at Paris, fresh and juicy, at such a price that the poor, too, can eat fresh home-grown fruit.

In the province of Anjou one may see how a heavy clay, improved with sand taken from the Loire and with manure, has been turned, in the neighbourhoods of Angers, and especially at Saint Laud, into a soil which is rented at from £2, 10s. to £5 the acre, and upon that soil fruit is grown which a few years ago was exported to America.[70] At Bennecour, a quite small village of 850 inhabitants, near Paris, one sees what man can make out of the most unproductive soil. Quite recently the steep slopes of its hills were only *mergers* from which stone was extracted for the pavements of Paris. Now these slopes are entirely covered with apricot and cherry trees, black-currant shrubs, and plantations of asparagus, green peas and the like. In 1881, £5,600 worth of apricots alone was sold out of this village, and it must be borne in mind that competition is so acute in the neighbourhoods of Paris that a delay of twenty-four hours in the sending of apricots to the market will often mean a loss of 8s. — one-seventh of the sale price on each hundredweight.[71]

At Perpignan, green artichokes — a favourite vegetable in France — are grown, from October till June, on an area covering 2,500 acres, and the net revenue is estimated at £32 per acre. In Central France, artichokes are even cultivated in the open fields, and nevertheless the crops are valued (by Baltet) at from £48 to £100 per acre. In the Loiret, 1,500 gardeners, who occasionally employ 5,000 workmen, obtain from £400,000 to £480,000 worth of vegetables, and their yearly expenditure for manure is £60,000. This figure alone is the best answer to those who are fond of talking about the extraordinary fertility of the soil, each time they are told of some success in agriculture. At Lyons, a population of 430,000 inhabitants is entirely supplied with vegetables by the local gardeners. The same is in Amiens, which is another big industrial city. The districts surrounding Orléans form another great centre for market-gardening, and it is especially worthy of notice that the shrubberies of Orléans supply even America with large quantities of young trees.[72]

It would take, however, a volume to describe the chief centres of market-gardening and fruit-growing in France; and I will mention only one region more, where vegetables and fruit-growing go hand in hand. It lies on the banks of the Rhône, about Vienne, where we find a narrow strip of land, partly composed of granite rocks, which has now become a garden of an incredible richness. The origin of that wealth, we are told by Ardouin Dumazet, dates from some thirty years ago, when the vineyards, ravaged by phylloxera, had to be destroyed and some new culture had to be found. The village of Ampuis became then renowned for its apricots. At the present time, for

[70] Baudrillart, *Les Populations agricoles de la France: Anjou*, pp.70–71.

[71] The total production of dessert fruit as well as dried or preserved fruit in France was estimated, in 1876, at 84,000 tons, and its value was taken at about 3,000,000,000 fr. (£ 120,000,000) — more than one-half of the war contribution levied by Germany. It must have largely increased since 1876.

[72] Ardouin Dumazet, i., 204.

a full 100 miles along the Rhône, and in the lateral valleys of the Ardèche and the Drôme, the country is an admirable orchard, from which millions' worth of fruit is exported, and the land attains the selling price of from £325 to £400 the acre. Small plots of land are continually reclaimed for culture upon every crag. On both sides of the roads one sees the plantations of apricot and cherry trees, while between the rows of trees early beans and peas, strawberries, and all sorts of early vegetables are grown. In the spring the fine perfume of the apricot trees in bloom floats over the whole valley. Strawberries, cherries, apricots, peaches and grapes follow each other in rapid succession, and at the same time cartloads of French beans, salads, cabbages, leeks, and potatoes are sent towards the industrial cities of the region. It would be impossible to estimate the quantity and value of all that is grown in that region. Suffice it to say that a tiny commune, Saint Désirat, exported during Ardouin Dumazet's visit about 2,000 cwts. of cherries every day.[73]

The results of this development are simply striking. Thus it appears, from an inquest made in 1906 by the French professors of agriculture, that the yearly export of fresh flowers from the *département* of the Alpes Maritimes attains as much as £400,000, and that of the flowers used for perfumes gives from £280,000 to £320,000 in addition to the just mentioned sum.[74] From the *département* of the Var, 3,475 tons of flowers, valued from £160,000 to £200,000, were exported in 1902.

I must refer the reader to the work of Charles Baltet if he will know more about the extension taken by market-gardening in different countries, and will only mention Belgium and America.

The exports of vegetables from Belgium have increased twofold within the last twenty years of the nineteenth century, and whole regions, like Flanders, claim to be now the marketgarden of England, even seeds of the vegetables preferred in this country being distributed free by one horticultural society in order to increase the export. Not only the best lands are appropriated for that purpose, but even the sand deserts of the Ardennes and peat-bogs are turned into rich market-gardens, while large plains (namely at Haeren) are irrigated for the same purpose. Scores of schools, experimental farms, and small experimental stations, evening lectures, and so on, are opened by the communes, the private societies, and the State, in order to promote horticulture, and hundreds of acres of land are covered with thousands of greenhouses.

Here we see one small commune exporting 5,500 tons of potatoes and 163 4,000 worth of pears to Stratford and Scotland, and keeping for that purpose its own line of steamers. Another commune supplies the north of France and the Rhenish provinces with strawberries, and occasionally sends some of them to Covent Garden as well. Elsewhere early carrots, which are grown amidst flax, barley and white poppies, give a considerable addition to the farmer's income. In another place we learn that land is rented at £24 and £27 the acre, not for grapes or melon-growing but for the modest culture of onions; or that the gardeners have done away with such a nuisance as natural soil in their frames, and prefer to make their loam out of wood sawings, tannery refuse and hemp dust, "animalised" by various composts.[75]

In short, Belgium, which is one of the chief manufacturing countries of Europe, is now becoming one of the chief centres of horticulture. (See Appendix R.)

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[73] Ardouin Dumazet, vol. vii., pp. 124,125.

[74] Auge-Laribe, *L'evolution de la France agricole*, Paris (Armand Colin), 12, p. 74. Professor Fontgalland estimates that the total exports of flowers, living plants, fruit and vegetables, both in season and out of season (*primeurs*), from the Alpes Maritimes, reach the enormous sum of £ 1,188,000, the gross income from an acre reaching as much as £ 200.

[75] Charles Baltet, *L'Horticulture*, etc.

The other country which must especially be recommended to the attention of horticulturists is America. When we see the mountains of fruit imported from America we are inclined to think that fruit in that country grows by itself. "Beautiful climate," "virgin soil," "immeasurable spaces" — these words continually recur in the papers. The reality, however, is that horticulture — that is, both market-gardening and fruit culture — has been brought in America to a high degree of perfection. Prof. Baltet, a practical gardener himself, originally from the classical *marais* (market-gardens) of Troyes, describes the "truck farms" of Norfolk in Virginia as real "model farms." A highly complimentary appreciation from the lips of a practical *maraîcher* who has learned from his infancy that only in fairyland do the golden apples grow by fairies' magic wand. As to the perfection to which apple-growing has been brought in Canada, the aid which the apple-growers receive from the Canadian experimental farms, and the means which are resorted to, on a truly American scale, to spread information amongst the farmers and to supply them with new varieties of fruit trees — all this ought to be carefully studied in this country, instead of inducing Englishmen to believe that the American supremacy is due to the golden fairies' hands. If one tenth part of what is done in the States and in Canada for favouring agriculture and horticulture were done in this country, English fruit would not have been 80 shamefully driven out of the market as it was a few years ago.

The extension given to horticulture in America is immense. The "truck farms" alone — that is, the farms which work for export by rail or steam — covered in the States in 1892 no less than 400,000 acres. At the very doors of Chicago one single market-gardening farm covers 500 acres, and out of these, 150 acres are given to cucumbers, 50 acres to early peas, and so on. During the Chicago Exhibition a special "strawberry express," composed of thirty waggons, brought in every day 324,000 quarts of the freshly gathered fruit, and there are days that over 10,000 bushels of strawberries are imported in New York — three-fourths of that amount coming from the "truck farms" of Virginia by steamer.[76]

This is what can be achieved by an intelligent combination of agriculture with industry, and undoubtedly will be applied on a still larger scale in the future.

However, a further advance is being made in order to emancipate horticulture from climate. I mean the glasshouse culture of fruit and vegetables.

Formerly the greenhouse was the luxury of the rich mansion. It was kept at a high temperature, and was made use of for growing, under cold skies, the golden fruit and the bewitching flowers of the South. Now, and especially since the progress of technics allows of making cheap glass and of having all the woodwork, sashes and bars of a greenhouse made by machinery, the glasshouse becomes appropriated for growing fruit for the million, as well as for the culture of common vegetables The aristocratic hothouse, stocked with the rarest fruit trees and flowers, remains; nay, it spreads more and more for growing luxuries which become more and more accessible to the great number. But by its side we have the plebeian greenhouse, which is heated for only a couple of months in winter and the still more economically built "cool greenhouse," which is a simple glass shelter — a big "cool frame" — and is stuffed with the humble vegetables of the kitchen garden: the potatoes, the carrots, the French beans, the peas and the like. The heat of the sun, passing through the glass, but prevented by the same glass from escaping by radiation, is sufficient to keep it at a very high temperature during spring and early summer. A new system of horticulture — the market-garden under glass — is thus rapidly gaining ground.

[76] Charles Baltet, *L'Horticulture*, etc.

The greenhouse for commercial purposes essentially of British, or perhaps Scottish, origin. Already in 1851, Mr. Th. Rivers had published a book, *The Orchard Houses and the Cultivation of Fruit Trees in Pots under Glass;* and we were told by Mr. D. Thomson, in the *Journal of Horticulture* (31st January, 1889), that nearly fifty years ago grapes in February were sold at 25s. the pound by a grower in the north of England, and that part of them was sent by the buyer to Paris for Napoleon III.'s table, at 50s. the pound. "Now," Mr. Thomson added, "they are sold at the tenth or twentieth part of the above prices. Cheap coal-cheap grapes; that is the whole secret."

Large vineries and immense establishments for growing flowers under glass are of an old standing in this country, and new ones are continually built on a grand scale. Entire fields are covered with glass at Cheshunt, at Broxburn (fifty acres), at Finchley, at Bexley, at Swanley, at Whetstone, and so on, to say nothing of Scotland. Worthing is also a well known centre for growing grapes and tomatoes; while the greenhouses given to flowers and ferns at Upper Edmonton, at Chelsea, at Orpington, and so on, have a world-wide reputation. And the tendency is, on the one side, to bring grape culture to the highest, degree of perfection, and, on the other side, to cover acres and acres with glass for growing tomatoes, French beans and peas, which undoubtedly will soon be followed by the culture of still plainer vegetables. This movement, as will be seen further on, has been steadily continuing for the last twenty years.

However, the Channel Islands and Belgium still hold the lead in the development of glasshouse culture. The glory of Jersey is, of course, Mr. Bashford's establishment. When I visited it in 1890, it contained 490,000 square feet under glass — that is, nearly thirteen acres — but seven more acres under glass have been added to it since. A long row of glasshouses, interspersed with high chimneys, covers the ground — the largest of the houses being 900 feet long and forty-six feet wide; this means that about one acre of land, in one piece, is under glass. The whole is built most substantially: granite walls, great height, thick "twenty-seven oz. glass" (of the thickness of three pennies),[77] ventilators which open upon a length of 200 and 300 feet by working one single handle; and so on. And yet the most luxurious of these greenhouses was said by the owners to have cost less than 1s. the square foot of glass (13d. the square foot of ground), while the other houses have cost much less than that, From 5d. to 9d. the square foot of glass[78] is the habitual cost, without the heating apparatus -6d. being a current price for the ordinary glasshouses.

But it would be hardly possible to give an idea of all that is grown in such glasshouses, without producing photographs of their insides. In 1890, on the 3rd of May, exquisite grapes began to be out in Mr. Bashford's vineries, and the crop was continued till October. In other houses, cartloads of peas bad already been gathered, and tomatoes were going to take their place after a thorough cleaning of the house. The 20,000 tomato plants, which were going to be planted, had to yield no less than eighty tons of excellent fruit (eight to ten pounds per plant). In other houses melons were grown instead of the tomatoes. Thirty tons of early potatoes, six tons of early peas, and two tons of early French beans had already been sent away in April. As to the vineries, they yielded no less than twenty-five tons of grapes every year. Besides, very many other things were grown in the open air, or as catch crop, and all that amount of fruit and vegetables was the result of the labor of thirty-six men and boys only, under the supervision of one single gardener — the owner himself; true that in Jersey, and especially in Guernsey, everyone is a gardener. About 1,000 tons of coke were burnt to beat these houses. Mr. W. Bear, who had visited the same establishment in

[77] "Twenty-one oz." and even fifteen oz." glass is used in the cheaper greenhouses.

[78] It is reckoned by measuring the height of the front and back walls and the length of the two slopes of the roof.

1886, was quite right to say that from these thirteen acres they obtained money returns equivalent to what a farmer would obtain from 1,300 acres of land.

I hardly need say that Mr. Rider Haggard, who visited Jersey and Guernsey in 1901, gave of these two islands the same enthusiastic description as his predecessors. "I can only state in conclusion," he wrote, "that for my part, here (in Jersey) as in , I was amazed at the prosperity of the place. That so small an area of land can produce so much wealth is nothing short of astonishing. It is true, as I have shown, that the inquirer hears some grumblings and fears for the future; but when on the top of them he sees a little patch of twenty-three and one-third acres of land, such as I have instanced, and is informed that quite recently it sold at an auction for £5,760, to be used, not for building sites but for the cultivation of potatoes, he is perhaps justified in drawing his own conclusions." It need not be added that, like all his predecessors, Mr. Haggard disposes ofthe legend of extraordinary natural fertility of the soil, and shows at what a considerable expenditure the heavy crops of potatoes are obtained.[79]

However, it is in the small "vineries" that one sees, perhaps, the most admirable results. As I walked through such glass-roofed kitchen gardens, I could not but admire this recent conquest of man. I saw, for instance, three-fourths of an acre heated for the first three months of the year, from which about eight tons of tomatoes and about 200 lb. of French beans had been taken as a first crop in April, to be followed by two crops more. In these houses one gardener was employed with two assistants, a small amount of coke was consumed, and there was a gas engine for watering purposes, consuming only 13s. worth of gas during the quarter. I saw again, in cool greenhouses — simple plank and glass shelters — pea plants covering the walls, for the length of one quarter of a mile, which already had yielded by the end of April 3,200 lb. of exquisite peas and were yet as full of pods as if not one had been taken off.

I saw potatoes dug from the soil in a cool greenhouse, in April, to the amount of five bushels to the twenty-one feet square. And when chance brought me, in 1896, in company with a local gardener, to a tiny, retired "vinery" of a veteran grower, I could see there, and admire, what a lover of gardening can obtain from so small a space as the two-thirds of an acre, Two small "houses" about forty feet long and twelve feet wide, and a third-formerly a pigsty, twenty feet by twelve-contained vine trees which many a professional gardener would be happy to have a look at; especially the whilom pigsty, fitted with "Muscats"! Some grapes (in June) were already in full beauty, and one fully understands that the owner could get in 1895, from a local dealer, £4 for three bunches of grapes (one ofthem was a "Colmar," 13 3/4 lb. weight). The tomatoes and strawberries in the open air, as well as the fruit trees, all on tiny spaces, were equal to grapes; and when one is shown on what a space half a ton of strawberries can be gathered under proper culture, it is hardly believable.

It is especially in Guernsey that the simplification of the greenhouse must be studied. Every house in the suburbs of St. Peter has some sort of greenhouse, big or small. All over the island, especially in the north, wherever you look, you see greenhouses. They rise amid the fields and from behind the trees; they are piled upon one another on the steep crags facing the harbour of St. Peters and with them a whole generation of practical gardeners has grown up. Every farmer is more or less of a gardener, and he gives free scope to his inventive powers for devising some cheap type of greenhouses. Some of them have almost no front and back walls — the glass roofs coming low down and the two or three feet of glass in front simply reaching the ground; in

[79] Rural England, i., p. 103.

some houses the, lower sheet of glass was simply plunged into a wooden trough standing on the ground and filled with sand. Many houses have only two or three planks, laid horizontally, instead of the usual stone wall, in the front of the greenhouse.

The large houses of one big company are built close to each other, and have no partitions between. But this system cannot be recommended amended. Altogether, when I revisited Guernsey in 1903, I saw that the system of greenhouses which prevailed was that of long two-roofed glass "tents," placed by the side of each other, but separated from each other by partitions preventing the circulation of the air over the whole block. As to the extensive *cool* greenhouses on the Grande Maison estate, which are built by a company and are rented to gardeners for so much the 100 feet, they are simply made of thin deal board and glass. They are on the "lean" or "one roof" system, and the back wall, ten feet high, and the two side walls are in simple grooved boards, standing upright. The whole is supported by uprights inserted into cocrete pillars. They are said to cost not more than 5d. the square foot, of glass-covered ground. And yet, even such plain and cheap houses yield excellent results. The potato crop which had been grown in some of them was excellent, as also the green peas.[80]

In Jersey I even saw a row of five houses, the walls of which were made of corrugated iron, for the sake of cheapness. Of course, the owner himself was not over-sanguine about his houses. "They are too cold in winter and too hot in summer". But although the five houses cover only less than one-fifth of an acre, 2,000 lb. of green peas had already been sold as a first crop; and, in the first days of June, the second crop (about 1,500 of tomatoes) was already in good progress.

It is always difficult, of course, to know that are the money returns of the growers, first of all because Thorold Rogers' complaint about modern farmers keeping no accounts holds good, even for the best gardening establishments, and next because when the returns are known to me in all details, it would not be right for me to publish them. "Don't prove too much; beware of the landlord!" a practical gardener once wrote to me. Roughly speaking, I can only confirm Mr. Bear's estimate to the effect that under proper management even a cool greenhouse, which covers 4,050 square feet, can give a gross return of £180.

As a rule, the Guernsey and Jersey growers have only three crops every year from their greenhouses. They will start, for instance, potatoes in December. The houses will, of course, not be heated, fires being made only when a sharp frost is expected at night; and the potato crop (from eight to ten tons per acre) will be ready in April or May before the open-air potatoes begin to be dug out. Tomatoes will be planted next and be ready by the end of the summer. Various catch crops of peas, radishes, lettuce and other small things will be taken in the meantime. Or else the house will be "started" in November with melons, which will be ready in April. They will be followed by tomatoes, either in pots, or trained as vines, and the last crop of tomatoes will be in October. Beans may follow and be ready for Christmas. I need to say that every grower has his preference method for utilising his houses, and it entirely depends upon his will and watchfulness to have all sorts of small catch crops. These last begin to have a greater and greater importance, and one can already foresee that the growers under glass will be forced to accept

[80] Growing peas along the wall seems, however, to be a bad semester. It requires too rich work in attaching the plants to the wall. This system, however, excellent though it may be for a provisory start for gardeners who have not much capital to spend, is not profitable in the Iong run. The gardeners with whom I spoke in 1903, after having made some money with with these light greenhouses, preferred to build more substantial ones, which could be heated from January to March or April.

the methods of the French *maraichers*, so as to have five and six crops every year, so far as it can be done without spoiling the present high quality of the produce.

All this industry is of a relatively recent origin. One may see it still working out its methods. And yet the exports from Guernsey alone are already represented by quite extraordinary figures. It was estimated some years ago that they were as follows: Grapes, 502 tons, £37,500 worth at the average price of 9d. the pound; tomatoes, 1,000 tons, about £30,000; early potatoes (chiefly in the fields), £20,000; radishes and broccoli, £9,250; cut flowers, £3,000; mushrooms, £200; total, £99,950 — to which total the local consumption in the houses and hotels, which have to feed nearly 30,000 tourists, must be added. Since then these figures have grown considerably. In June, 1896, I saw the Southampton steamers taking every day from 9,000 to 12,000, and occasionally more, baslets of fruit (grapes, tomatoes, French beans and peas), each basket representing from twelve to fourteen pounds of fruit. Taking into account what was sent by other channels, one could say that from 400 to 500 tons of tomatoes, grapes, beans and peas, worth from £20,000 to £25,000, were exported there every week in June.

When I returned to Guernsey in 1903, I found that the industry of fruit-growing under glass had grown immensely since 1896, so that the whole system of export had to be reorganised. In 1896 it was the tourists' boats which tranported the fruit and vegetables to Southampton, and the. gardeners paid one shilling for each basket taken at Guernsey and delivered at the Covent Garden market. In 1903 there was already a Guernsey Crowers' Association, which had its own boats keeping, during the summer, a regular daily service direct from Guernsey to London. The Association had its own store-houses on quay and its own cranes, which lifted immense cubic boxes containing on their shelves twenty or even a hundred baskets, and carrying them to the boats. The cost of transport was thus reduced to 4d. per basket. All this crop is sold every morning Covent Garden to the London dealers and greengrocers. The importance of this export is seen from the fact that a special steamer has to leave Guernsey every morning with its cargo of fruit and vegetables. As to the total export of fresh flowers, plants and shurbs, various fruit and vegetables (including £555,275 worth of potatoes), they reached £1,115,650 in 1910.

All this is obtained form an island whose total area, rocks and barren hill-tops included, is only 16,000 acres, of which only 9,884 acres are under culture, and 5,189 acres are given to green crops and meadows. An island, moreover, on which 1,480 horses, 7,260 head of cattle and 900 sheep find their existence. How many men's food is, then, grown on these 10,000 acres?

Belgium has also made, within the last few years, an immense progress in the same direction. Wile no more than 250 acres, all taken, were covered with glass some thirty years ago, more than 800 acres are under glass by this time.[81] In the village of Hoeilaert, which is perched upon a stony hill, nearly 200 acres are under glass, given up to grape-growing. One single establishment, Baltet remarks, has 200 greenhouses and consumes 1,500 tons of coal for the vineries.[82] "Cheap coal-cheap grapes," as the editor of the *Journal of Horticulture* wrote. Grapes in Brussels are certainly not dearer in the, beginning of the summerer than they are in Switzerland in October, Even *in March*, Belgian grapes were sold in Covent Garden at from 4d. and 6d. the pound.[83] This price

[81] I take these from notes which a Belgian professor of agriculture was kind enough to send me. The greenhouses in Belgian are mostly with iron frames

[82] A friend, who has studied practicial horticulture in the Channel Islands, writes me of the vineries about Brussels: "You have no idea to what extent it is done there. Bashford is nothing against it."

[83] A quotation which I took at random, in 1895, from a London daily, was: "Covent Garden, 19th March, 1895. Quotations: Belgian grapes, 4d. to 6d.; Jersey ditto, 6d. to 10d.; Muscats, ls. 6d. to 2s.; and tomatoes, Bd. to 5d. per lb."

alone shows sufficiently how small are the amounts of labour which are required to grow grapes in our latitudes with the aid of glass. *It certainly cost less labour to grow grapes in Belgium than to grow them on the coasts of Lake Leman.*[84]

I will not conclude this chapter without casting a glance on the progress that has been made in this country since the first edition of this book was published, in 1898, by fruit and flower farming, as also by culture under glass, and on the attempts recently made to introduce in different parts of England "French Gardening," — that is, the *culture maraîchère* of the French gardeners.

There is not the slightest doubt that fruit-growing has notably increased — the area under fruit orchards having grown in Great Britain from 200,000 acres in 1888 to 250,000 acres in 1908; while the area under small fruit (gooseberries, currants, strawberries) has grown from acres in 1901 to 85,000 in 1908.[85] In some counties the acreage has trebled.[86] Large plantations of fruit have grown lately round London and all the large cities, and the counties of Kent, Devon, Hereford, Somerset, Worcester and Gloucester have now more than 20,000 acres each under fruit orchards, a great proportion of them being of a recent origin. Not only was the area of fruit-growing considerably increased, but, owing to the experiments carried on since 1894 at the Woburn Experimental Farm, where different sorts of fruit-trees and small fruit are tested, new varieties have been introduced; and the system is spreading of growing fruit trees of the pyramidal or "bush" form (instead of the old-fashioned standards) — a step the advantages of which I was enabled fully to appreciate in 1897 at the Agassiz Experimental Farm in British Columbia.

At the same time the culture of small fruit — gooseberries, raspberries, currants, and especially strawberries — took an immense development. Enormous quantities of strawberries are now grown in Mid and South Kent, where we find the culture of fruit combined with large jam factories. One of such factories is connected with great fruit farms covering 2,000 acres at Swanley, Ben its yearly output attains 3,500 tons of jam 850 tons of candied peel, and more than 100,000 bottles of bottled fruit. An extensive horticulture has also developed of late in Cambridgeshire, wherefrom fruit is sent partly fresh to London and Manchester, and partly is transformed on the spot in the jam factory at Histon. No less than 250 workpeople were employed at this factory at the time of Rider Haggard's visit in 1900, and no less than 7,600 tons were exported; the most interesting result of this industry combined with agriculture being that quite a number of small farmers, renting from three to twenty acres each, have grown round the am factory. "Altogether," Mr. Haggard wrote, "fruit and flower culture has increased enormously; so that, in 1901, from 4,000 to 5,000 acres in the neighbourhood of Wisbeeli were devoted to this trade. Plums, apples, pears, small fruit, as also cauliflowers, asparagus, rhubarb, narcissi, pansies and other flowers were grown here on a grand scale, and as much as from 130 to 140 tons of gooseberries and from 60 to 70 tons of strawberries were despatched from Wisbech in one single day." "The result of this industry," Mr, Haggard adds, "was that the population of Wisbech and the number of houses in this little town have rapidly increased; the land has increased in value considerably in the past twenty years, and as much as £200 an acre had been given for choice land-holdings suitable for fruit culture." (Rural England, Vol. ii., pp. 52, 54, 55.) In other words, the net result of the labour spent by the farmers and of the intelligent enterprise of the industrials was, as everywhere, immensely to increase the value of the land for the benefit of the landlords. Mr. Haggard's

[84] See Appendix S.

[85] Out of them, 27,000 acres are grown in the fruit orchards, between the apple and cherry tree, so that the total area under fruit orchards and small fruit was reckoned at 308,000 acres in 1908.

[86] "Fruit and Flower Farmin " in *Encyclopoeadia Britannica*, 11th edition, article by J. Weathers.

conclusion is worth mentioning, as he writes as follows: "Broadly, however, I may say that where the farms are large and corn is chiefly grown, there is little or no prosperity, while where they are small and assisted by pastures or fruit culture, both owners and tenants are doing fairly well."[87] A recognition well worth mentioning, as it comes from an explorer who took at the outset of his inquest a most pessimistic view on unprotected agriculture.

I also ought to mention Essex, where fruit growing has taken of late a notable development, and Hampshire, where the acreage under fruit has trebled since 1880, according to the testimony of the author of the already mentioned *Britannica* article. The same must be said of Worcestershire, and especially of the Evesham district. This last is a most instructive region. Owing to certain peculiarities of its soil, which render it very profitable for growing asparagus and plum trees, and partly owing to the maintenance in this region of the old "Evesham custom" (according to which from times immemorial the ingoing tenant had to pay the outgoing tenant, not the landlord, for the agricultural improvements) — a custom raaintained till nowadays[88] — the small holdings system and the culture of vegetables and fruit have developed to a remarkable extent. The result is that out of a rural area of 10,000 acres, 7,000 have already been taken in small holdings of under fifty acres each, and the demand for them, far from being satisfied, is still on the increase, so that in 1911 there were still nearly four hundred farmers waiting for 2,000 acres. A new town has grown at Evesham, its population of 8,340 persons being almost entirely composed of gardeners and gardeners' labourers; its markets, held twice a week, remind one of markets in the south of France; and the export traffic on the railways radiating from that little town is as lively as if it were a busy industrial spot.

One cannot read the pages given by Mr. Rider Haggard to the Bewdley and Evesham districts without being impressed by what can be obtained from the soil in England, and by what has to be done by the nation and all those who care for its well-being in obtaining from the soil what it is ready to give, if only *labour* be applied to it.

In the Bewdley district we see very well how the efforts of a Small Holdings Society are giving the opportunity to a number of small farmers to transform an indifferent and sometimes very poor or stony land into a fertile soil which yields rich crops of fruit, and upon which the keeping of milch-cows is combined with fruit-growing. We see also how in the big farms, as well as in the small ones, fruit-groiwing is carried on with knowledge and care — and, consequently, with a substantial profit for both the community and the farmers — which makes the author exclaim: "How different in most counties! In Norfolk, for instance (and I may add in Devonshire), the ordinary farm orchard is stocked as a rule with faggot-headed trees pruned only by the wind. Even the dead, wood is left uncut; yet it is common to hear farmers complain of the quality of the fruit, and that it will not pay to grow" (vol. i., p. 338).

Speaking of Catshill, Mr. Haggard gives also a very interesting instance of how a colony of people called "Nailers," who lived formerly by making nails by hand, and compelled to abandon this trade when machine-made nails were introduced, took to agriculture, and how they succeed with it. Some intelligent people having bought a farm of 140 acres and divided it into small farms, from 2 and a half to 8 acres, these small holdings were offered to the nailers; and at the time of

[87] Rural Englaad, 2 vols., London (Longmans, Green), 1902, Vol. ii., p. 57.

[88] F. E. Green, *The Awakening of England*, London (Nelson's), 1911, pp. 49, 50. Speaking of a certain farmer, Mr. Green says: "In the autumn of 1910, when I visited him, he was offered £ 100 for an acre for his standing, crops,and £100 *for the tenant rights.* He refused the offer. *His rent still stands at £2 an acre.*"

Mr. Haggard's visit "every instalment which was due had been paid up." No able-bodied man out of them has gone on to the rates.

But the vale of Evesham is still more interesting. Suffice it to say, that while in most rural parishes the population is decreasing, *it rose in the six parishes of the Evesham Union* from 7,327 to 9,012 in the ten years, 1891 to 1901.

Although the soil of this district offers nothing extraordinary, and the conditions of sale are as bad as anywhere, owing to the importance acquired by the middlemen, we see that an extremely important industry of fruit-growing has developed; so important that in the year 1900 about 20,000 tons of fruit and vegetables were sent from the Evesham stations, in addition to large quantities exported from the small stations within a radius of ten miles round Evesham (Vol. i., p. 350). The soil, of course, is improved by digging into it large quantities of all sorts of manure-soot, fish guano, leather dust for cabbage (chamois dust being the best), and so on — and the most profitable sorts of fruit-trees and vegetables are continually tested; all this being, of course, not the work of some scientist or of one single man, but the product of the collective experience of the district.

It must not be thought, however, that fruit-growing has been overdone. On the contrary, the imports of fruit into the United Kingdom, both for food and for jam-making, continue to be enormous, and to increase every year. Suffice it to say, that this country imports every year about £1,000,000 of tomatoes and £2,000,000 of apples, half a million worth of pears, nearly £30,000 worth of grapes — giving thus a total of £4,200,000 worth of all fruit. And at the same time we learn that immense quantities of land go every year out of culture, to be transformed into game reserves for rich Englishmen and foreigners.

Finally, I also ought to mention the recent development of fruit culture near the Broads of Norfolk, and especially in Ireland; but the examples just given will do to show what is obtained from the land in England where no obstacle is laid to the development of horticulture, and what amount of food can be obtained in the climate and from the soil of this country whenever it is properly cultivated. Let me only add that a similar development of fruit culture has taken place within the last thirty years everywhere in the civilised countries; and that in France, in Belgium, and in Germany the extension taken by horticulture during the last twenty or thirty years has been much greater than in this country.[89] As regards *market-gardening,* it has undoubtedly made remarkable progress in the United Kingdom within recent years. However, accurate data are failing, and those who have travelled over this country with the special purpose of studying its agriculture have not yet given sufficient attention to the recent developments of market-gardening; but it is quite certain that within the last five-and-twenty years it has taken a great development, especially in Ireland, but also in several parts of England, Scotland, and Wales.

Such are, for instance, the neighbourhoods of Penzance, in Cornwall; those of St. Neots, in Huntingdonshire; Scotter, in Lincolnshire, where the agricultural depression — we are told by Mr. Rider Haggard — was not so badly felt as elsewhere on account of market-gardening; Benington, in the same county, where the soil is a rich loam with silty subsoil, and where all sorts of vegetables, potatoes, and flower-bulbs are grown on a large scale, together with wheat.[90] Orpington is a

[89] According to the researches made by the French Ministry of Agriculture, the yearly produce of the French horticulturists attains the value of £ 16,000,000.

[90] Rural England, ii., pp. 76, 212. Spalding, also in Lincolnshire, is another centre for the trade in spring flowers, as well as for intensive farming, co-operative small-holding having been introduced there by the Provident and Small-holdings Club (same work, ii., pp. 238–240). More than 1,000 acres are now given to the growing of flowers — an

well-known centre for market-gardening, as well as for fruit-growing, and in this district culture under glass has also taken lately some extension.

There are many other interesting centres of market-gardening, especially in the neighbourhoods of all large cities, but I will mention only one more — namely, Potton, in Huntingdonshire. It is — we are told by Mr. Haggard — "a stronghold of small cultivators who grow vegetables upon holdings of land varying in size from one up to twenty acres, or even more." It has thus become an important centre for market-gardening, "120 trucks of produce leaving Potton daily during the season for London, in addition to fifty trucks which pass over the Great Northern line from Sandy station, together with much more from sidings and other stations." This is the more interesting as within a short distance from this animated centre "thousands of acres are quite or very nearly derelict, and the farmhouses, buildings, and cottages are slowly rotting down." The worst is that "all this land was cultivated, and grew crops up to the 'eighties."[91]

Another oasis of market-gardening is offered by the county of Bedfordshire. "Being a county of natural small-holdings, carved out before the passing of the 1907 Act," it is rapidly becoming — we are told by Mr. F. E. Green — "a county of market-gardens." The fertility of its soil, the fact that it can easily be worked at any time of the year, and that a race of skilled gardeners has developed there long since, have contributed to that growth; but, of course, the whole is hampered by the heavy rents, which have grown up to £4 an acre for the sites near the station, where manure is received in large quantities from London.[92]

Happily enough, the Bedfordshire County Council has been eager to acquire land for small holdings, and, after having spent £40,000 in the acquisition of land, they have, up to 30th June, 1911, provided one-third of the applicants with 2,759 acres — the total demand, by a thousand applicants, having already attained 12,350 acres.

And yet all this progress still appears insignificant by the side of the demand for vegetables which grows every year (and necessarily *must* grow, as is seen by comparing the low consumption of vegetables in this country with the consumption of home-grown vegetables in Belgium, indicated by Mr. Rowntree in his *Lessons from Belgium*). The result is a steadily increasing importation of vegetables to this country, which has attained now more than £8,000,000.[93]

A branch of horticulture which has increased enormously since the first edition of this book was published, is the *growing of fruit and vegetables in greenhouses*, in the same way as it is done in the Channel Islands. All round London — we are told by Mr. John Weathers in the last edition of the *Encyclopadia Britannica* — the hothouse culture has taken a great development, and, in fact, along the railways which radiate from London in all directions the glass-houses have already

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industry which was introduced only fifteen years ago, when it came Trom Holland. On p. 242 of the same work the reader will find some interesting information about a new "mutualist " venture, the Lincoln Equitable Co-operative Society.

[91] Rural England, ii., 59.

[92] F.E. Green, *The Awakening of England*, pp. 116, 117.

[93] The imports of fruit and vegetables, fresh and preserved, were £ 12,900,000 in 1909, and £ 14,193,000 in 1911, out of which fruit alone must have figured for at least £ 4,000,000. Potatoes alone, imported and retained for home consumption in the United Kingdom, figure in this item for the sums of from £ 6,908,550 in 1908 to 93,314,200 in 1910. The industry of dried fruit, and especially of dried vegetables, has not yet developed In this country, the result being that during the Boer War Britain paid a weekly tribute to Germany for dried vegetables, which attained many thousands of pounds everyweek. A nation cannot let its land be transformed into hunting reserves at the rate it is being done in this country without having to send the best and the most enterprising portion of its Population over-seas, and without relying for its daily food upon its neighbours and commercial rivals.

become a familiar feature of the landscape. Immense quantities of grapes, tomatoes, figs, and of all sorts of early vegetables are grown at Worthing, where eighty-two acres are covered now with glass-houses, as also in the parish of Cheshunt, in Herts, where the area under hothouses is already 130 acres; while a careful estimate put in 1908 the area of individual hothouses in England at about 1,200 acres (*Encyclopadia Britannica*, vol. xi., p, 266). The elements of this culture having been developed by the experience of the Channel Islands growers, and by the wide extension which hothouses for the growing of flowers had taken long since in this country, it may be concluded from the various evidence we have at hand that on the whole this sort of culture is finding its reward, and is now firmly established.

The same, however, cannot yet be said of the *culture maraîchère* of the French market gardeners which is being introduced now into this country. Many attempts have been made in this direction in different parts of the country with varied degrees of success; but little or nothing is known about the results. An attempt on a large scale was made, as is known, by some Evesham gardeners. Having read about this sort of culture in France, and the wonderful results obtained by it, some of the Evesham gardeners wentt went to Paris with the intention of learning that culture from, the Paris *mariaîchers.* Finding that impossible they invited no French gardener to Evesham, gave him three-quarters of an acre, and, after, he had brought his Paris *marais* his glass bells, frames and lights, and, above all his knowledge, he began gardening under the eyes of his Evesham colleagues "Happily enough," he said to an interviewer I do not speak otherwise I should have had to talk all the time and give explanations, instead of working. So I show them my black trousers, and tell them in signs: Begin by making the soil as black as these trousers, then everything will be all right.'" Of course, to be profitable, immense quantities of stable manure are required' as also immense numbers of glassbells and glass-frames, which represent a very costly outlay, and plenty of watering, to say nothing of the powers of observation required for developing a new branch of gardening in new surroundings.

What were the results obtained at Evesham it is difficult to say, the more so as the money results which, according to some papers, were obtained the first year (*brutto* income of £750 from three-quarters of an acre) seem to have been exaggerated for a first-year crop, and thus awakened scepticism with regard to that sort of culture altogether.

Another experiment in the same direction was made on the estate of Maryland, in Essex, which was bought by Mr. Joseph Fels in order to promote small farming in England. It must be said that, apart from the cold, damp climate of this part of England, the heavy clay of Essex represents the least appropriate soil for spade culture. In England, as everywhere, this sort of culture has always been developing in preference *on a light loam*, or in such places, like Jersey, where a meagre granitic soil could easily be manured — in this special case by sea-weeds.

Nevertheless, the aim of Mr. Fels having been chiefly educational, this aim has certainly been achieved, as we have now, in three different works of Mr. Thomas Smith, the manager of the farm, practical manuals teaching the would-be gardener the essentials of "French Gardening."[94]

A French *maraicher* having been invited for this purpose, and 2,500 glass-bells, 1,000 lights for frames, a windmill pump, etc., having been bought at a considerable cost, the work of the French gardener on two acres of land was carefully followed by the manager of the farm, Mr. T.

[94] Thomas Smith, *French Gardening*, London (Utopia Press), 1909, 128 pp.; *The Profitable Culture of Vegetable, for Market Gardeners, Small Holders, and Others*, London (Longmans, Green), 1911, 452 pp., and a short summing up of the first of these works.

Smith, day by day, to be afterwards described and illustrated by photographs for the use of those who would like to try their hand at the same work.

Most of my readers will probably ask first of all: What were the money results of this venture? But it would have been foolish to expect that in this first experiment everything should have run as smoothly as it runs, let us say, in the Channel Islands, where the many years' practice of a whole population has worked out the best methods of culture.

Thus the frames were not ready in time for giving an early crop of melons; and although the melons grown at Maryland were excellent, and gave the first year as much as £188, they would have given much more than that had they been ready in the middle of June, which would have been possible if the frames and lights had been supplied in time.

With all that, the results obtained during the first year were really striking. All taken, Mr. Smith shows that if the gardener has a one-acre garden, and if £494 (say, £550) be spent for 1,000 glass-bells, 300 lights and 100 frames, 500 mats, the water-supply, the packing-shed, the fencing, the cart, horse and harness, etc., and £413 (say, £450) for 500 tons of manure, the rent, rates and water, and the wages and salaries (£250), the gross returns for the first year would reach £300 (making full allowance for "inexperience in this *special* work"). They would reach from £400 to £450 during the second year, there being greater productiveness and a lower expenditure after the loam has been made by heavy manuring, and personal experience has been won, as well t as experience for a given locality.

Taking a one-acre farm, of which only one-third is used for a French garden, the first year's expenditure for bells, lights, fencing, horse manure, water, and rent and taxes would be a little less than £300, and the returns by the end of the first year would be about £150. "Afterwards the returns ought to reach from £200 to £250 each year," Mr. Smith writes.

All that need be added to these words is, that Mr. Smith is extremely cautious in his estimates, and that, seeing the high crops obtained at Maryland, and fully dealt with in Mr. Smith's works, one is entitled to expect even better money results.

Unfortnnately, after having worked at the farm for one year, the experienced French gardener, who had obtained the just-mentioned results, left Maryland. Two young French gardeners, far less experienced, were invited instead, and they began to undo what their predecessor had done, in order to carry on the work on the lines they had learned themselves. So that it is impossible to know yet what the results of these new methods will be.

Every pioneer work has its unforeseen difficulties. But, so far as can be. judged from the facts I have at my disposal, the two ventures have proved that the climate of England is no obstacle to French gardening. Of course, the small amount of sunshine is a great obstacle for ripening the produce as early as it can be ripened in France, even in the suburbs of Paris. But home-grown fruit and vegetables have always many advantages in comparison with imported produce. Another disadvantage — the lack of horse manure — a disadvantage which will go on increasing with the spread of motor cars — is felt in France as well. This is why the French growers are eagerly experimenting with the direct heating of the soil with *thermosiphons.*

Let me add to these remarks that a decided awakening is to be noticed in this country for making a better use of the land than has been made for the last fifty years. There are a few counties where the County Councils, and still more so, the Parish Councils, are doing their best to break at last the land monopoly, and to permit those small farmers who intend to cultivate the soil to do so. Here and there we see a few timid attempts at imparting to the farmers and their children some knowledge of agriculture and horticulture. But all this is being made on too

small a scale, and without a sincere desire to learn from other European nations, and still more so from the United States and Canada, what is being done in these countries to give to agriculture the new character of intensive culture combined with industry, which is imposed upon it by the recent progress of civilasation.

The various data which have been brought together on the preceding pages make short work of the over-population fallacy. It is precisely in the most densely population parts of the world that agriculture has lately made such strides as hardly could have been guessed twenty years ago. A dense population, a high development of industry, and a high development of agriculture and horticulture, go hand in hand: they are inseparable. As to the future, the possibilities of agriculture are such that, in truth, we cannot yet foretell what would be the limit of the population which could live from the produce of a given area. Recent progress, already tested on a great scale, has widened the limits of agricultural prodaction to a quite unforeseen extent and recent discoveries, now tested on a small scale, promise to widen those limits still farther, to a quite unknown degree.[95]

The present tendency of economical development in the world is — we have seen — to induce more and more every nation, or rather every region, taken in its geographical sense, to rely chiefly upon a home production of all the chief necessaries of life. Not to reduce, I mean, the world-exchange: it may still grow in bulk; but to limit it to the exchange of what really must be exchanged, and, at the same time, immensely to increase the exchange of novelties, produce of local or national art, new discoveries and inventions, knowledge and ideas. Such being the tendency of present development, there is not the slightest ground to be alarmed by it, There is not one nation in the world which, being armed with the present powers of agriculture, could not grow on its cultivable area all the food and most of the raw materials derived from agriculture which are required for its population, even if the requirements of that population were rapidly increased as they certainly ought to be. Taking the powers of man over the land and over the forces of nature — such as they are at the present day — we can maintain that two to three inhabitants to each cultivable acre of land would not yet be too much. But neither in this densely populated country nor in Belgium are we yet in such numbers. In this country we have, roughly speaking, one acre of the cultivable area per inhabitant.

Supposing, then, that each inhabitant of Great Britain were compelled to live on the produce of his own land, all he would have to do would be, first, to consider the land of this country as a common inheritance, which must be disposed of to the best advantage of each and all — this is, evidently, an absolutely necessary condition. And next, he would have to cultivate his soil, not in some extravagant way, but no better than land is already cultivated upon thousands and thousands of acres in Europe and America. He would not be bound to invent some new methods, but could simply generalise and widely apply those which have stood the test of experience. He can do it; and in so doing he would save an immense quantity of the work which is now given for buying his food abroad, and for paying all the intermediaries who live upon this trade. Under a rational culture, those necessaries and those luxuries which must be obtained from the soil, undoubtedly can be obtained with much less work than is required now for buying these commodities. I have made elsewhere (in *The Conquest of Bread*) approximate calculations to that effect, but with the data given in this book everyone can himself easily test the truth of this assertion. If we take, indeed, the masses of produce which are obtained under rational culture,

[95] See Appendix T. bar

and compare them with the amount of labour which must be spent for obtaining them under an irrational culture, for collecting them abroad, for transporting them, and for keeping armies of middlemen, we see at once how few days and hours need be given, under proper culture, for growing man's food.

Chapter III. Small Industries and Industrial Village

The two sister arts of agriculture and industry were not always so estranged from one another as they are now. There was a time, and that time is not so far back, when both were thoroughly combined; the villages were then the seats of a variety of industries, and the artisans in the cities did not abandon agriculture; many towns were nothing else but industrial villages. If the medieval city was the cradle of those industries which bordered upon art and were intended to supply the wants of the richer classes, still it was the rural manufacture which supplied the wants of the million, as it does until the present day in Russia, and to a very great extent in Germany and France. But then came the water-motors, steam, the development of machinery, and they broke the link which formerly connected the farm with the workshop. Factories grew up and they abandoned the fields. They gathered where the sale of their produce was easiest, or the raw materials and fuel could be obtained with the greatest advantage. New cities rose, and the old ones rapidly enlarged; the fields were deserted. Millions of labourers, driven away by sheer force from the land, gathered in the cities in search of labour, and soon forgot the bonds which formerly attached them to the soil. And we, in our admiration of the prodigies achieved under the new factory system, overlooked the advantages of the old system under which the tiller of the soil was an industrial worker at the same time. We doomed to disappearance all those branches of industry which formerly used to prosper in the villages; we condemned in industry all that was not a big factory.

True, the results were grand as regards the increase of the productive powers of man. But they proved terrible as regards the millions of human beings who were plunged into misery and had to rely upon precarious means of living in our cities. Moreover, the system, as a whole, brought about those abnormal conditions which I have endeavoured to sketch in the two first chapters. We were thus driven into a corner; and while a thorough change in the present relations between labour and capital is becoming an imperious necessity, a thorough remodelling of the whole of our industrial organisation has also become unavoidable. The industrial nations are bound to revert to agriculture, they are compelled to find out the best means of combining it with industry, and they must do so without loss of time.

To examine the special question as to the possibility of such a combination is the aim of the following pages. Is it possible, from a technical point of view? Is it desirable? Are there, in our present industrial life, such features as might lead us to presume that a change in the above direction would find the necessary elements for its accomplishment? Such are the questions which rise before the mind. And to answer them, there is, I suppose, no better means than to study that immense but overlooked and underrated branch of industries which are described under the names of rural industries, domestic trades, and petty trades: to study them, not in the works of the economists who are too much inclined to consider them as obsolete types of industry, but in their life itself, in their struggles, their failures and achievements.

The variety of forms of organisation which is found in the small industries is hardly suspected by those who have not made them a subject of special study. There are, first, two broad categories: those industries which are carried on in the villages, in connection with agriculture; and those which are carried on in towns or in villages, with no connection with the land — the workers depending for their earnings exclusively upon their industrial work.

In Russia, in France, in Germany, in Austria, and so on, millions and millions of workers are in the first case. They are owners or occupiers of the land, they keep one or two cows, very often horses, and they cultivate their fields, or their orchards, or gardens, considering industrial work as a by-occupation. In those regions especially, where the winter is long and no work on the land is possible for several months every year, this form of small industries is widely spread. In this country, on the contrary, we find the opposite extreme. Few small industries have survived in England in connection with land-culture; but hundreds of petty trades are found in the suburbs and the slums of the great cities, and large portions of the populations of several towns, such as Sheffield and Birmingham, find their living in a variety of petty trades. Between these two extremes there is evidently a mass of intermediate forms, according to the more or less close ties which continue to exist with the land. Large villages, and even towns, are thus peopled with workers who are engaged in small trades, but most of whom have a small garden, or an orchard, or a field, or only retain some rights of pasture on the commons, while part of them live exclusively upon their industrial earnings.

With regard to the sale of the produce, the small industries offer the same variety of organisation. Here again there are two great branches. In one of them the worker sells his produce directly to the wholesale dealer; cabinetmakers, weavers, and workers in the toy trade are in this case. In the other great division the worker works for a "master" who either sells the produce to a wholesale dealer, or simply acts as a middleman who himself receives his orders from some big concern. This the "sweating system," property speaking, under which we find a mass of small trades. Part of the toy trade, the tailors who work for large clothing establishments — very often for those of the State — the women who sew and embroider the "uppers" for the boot and shoe factories, and who as often deal with the factory as with an intermediary "sweater," and so on, are in this case. All possible gradations of feudalisation and subfeudalisation of labour are evidently found in that organisation of the sale of the produce.

Again, when the industrial, or rather technical aspects of the small industries are considered, the same variety of types is soon discovered. Here also there are two great branched: those trades, on the one side, which are purely domestic — that is, those which are carried on in the house of the worker, with the aid of his family, or of a couple of wage-workers; and those which are carried on in separate workshops — all the just-mentioned varieties, as regards connection with land and the divers modes of disposing of the produce, being met with in both these branches. All possible trades — weaving, workers in wood, in metals, in bone, in india-rubber, and so on — may be found under the category of purely domestic trades, with all possible gradations between the purely domestic form of production and the workshop and the factory.

Thus, by the side of the trades which are carried on entirely at home by one or more members of the family, there are the trades in which the master keeps a small workshop attached to his house and works in it with his family, or with a few "assistants" — that is, wage-workers. Or else the artisan has a separate workshop, supplied with wheel-power, as is the case with the Sheffield cutlers. Or several workers come together in a small factory which they maintain themselves, or

hire in association, or where they are allowed to work for a certain weekly rent. And in each of these cases they work either directly for the dealer or for a small master, or for a middleman.

A further development of this system is the big factory, especially of ready-made clothes, in which hundreds of women pay so much for the sewing-machine, the gas, the gas-heated irons, and so on, and are paid themselves so much for each piece of the ready-made clothes they sew, or each part of it. Immense factories of this kind exist in England, and it appeared from testimony given before the "Sweating Committee" that women are fearfully "sweated" in such workshops — the full price of each slightly spoiled piece of clothing being deducted from their very low piecework wages.

And, finally, there is the small workshop (often with hired wheel-power) in which a master employs three to ten workers, who are paid in wages, and sells his produce to a bigger employer or merchant — there being all possible gradations between such a workshop and the small factory in which a few time workers (five, ten to twenty) are employed by an independent producer. In the textile trades, weaving is often done either by the family or by a master who employs one boy only, or several weavers, and after having received the yarn from a big employer, pays a skilled workman to put the yarn in the loom, invents what is necessary for weaving a given, sometimes very complicated pattern, and after having woven the cloth or the ribbons in his own loom or in a loom which he hires himself, he is paid for the piece of cloth according to a very complicated scale of wages agreed to between masters and workers. This last form, we shall see presently, is widely spread up to the present day, especially in the woolen and silk trades; it continues to exist by the side of big factories in which 50, 100, or 5,000 wage-workers, as the case may be, are working with the employers' machinery and are paid in time-wages so much the day or the week.

The small industries are thus quite a world,[1] which, remarkable enough, continues to exist even in the most industrial countries, side by side with the big factories. Into this world we must now penetrate to cast a glimpse upon it: a glimpse only, because it would take volumes to describe its infinite variety of pursuits and organisations, and its indefinitely varied connection, with agriculture as well as with other industries.

Most of the petty trades, except some of those which are connected with agriculture, are, we must admit, in a very precarious position. The earnings are very low, and the employment is often uncertain. The day of labour is by two, three, or four hours longer than it is in well-organised factories, and at certain seasons it reaches an almost incredible length. The crises are frequent and last for years. Altogether, the worker is much more at the mercy of the dealer or the employer, and the employer is at the mercy of the wholesale dealer. Both are liable to become enslaved to the latter, running into debt to him. In some of the petty trades, especially in the fabrication of the plain textiles, the workers are in dreadful misery. But those who pretend that such misery is the rule are totally wrong. Anyone who has lived among, let us say, the watch-makers in Switzerland and knows their inner family life, will recognise that the condition of these workers was out of all comparison superior, in every respect, material and moral, to the conditions of millions of factory hands. Even during such a crisis in the watch trade as was lived through in 1876–1880,

[1] This is why the German economists find such difficulties in delimiting the proper domain of the domestic trades (*Hausindustrie*), and now identify this word with *Verlagssystem*, which means "working either directly or thorough the intermediary of a middleman employer (or buyer) for a dealer or employer, who pays the small producer for the goods he has produced, before they have reached the consumer."

their condition was preferable to the condition of factory hands during a crisis in the woollen or cotton trade; and the workers perfectly well know it themselves.

Whenever a crisis breaks out in some branch of the petty trades, there is no lack of writers to predict that that trade is going to disappear. During the crisis which I witnessed in 1877, living amidst the Swiss watchmakers, the impossibility of a recovery of the trade in the face of the competition of machine-made watches was a current topic in the press. The same was said in 1882 with regard to the silk trade of Lyons, and, in fact, wherever a crisis has broken out in the petty trades. And yet, notwithstanding the gloomy predictions, and the still gloomier prospects of the workers, that form of industry does not disappear. Even when some branch of it disappears, there always remains something of it; some portions of it continue to exist as small industries (watchmaking of a high quality, best sorts of silks, high quality velvets, etc.), or new connected branches grow up instead of the old ones, or the small industry, taking advantage of a mechanical motor, assumes a new form. We thus find it endowed with an astonishing vitality. It undergoes various modifications, it adapts itself to new conditions, it struggles without losing hope of better times to come. Anyhow, it has not the characteristics of a decaying institution. In some industries the factory is undoubtedly victorious; but there are other branches in which the petty trades hold their own position. Even in the textile industries — especially in consequence of the wide use of the labour of children and women — which offer so many advantages for the factory system, the hand-loom still competes with the power-loom.

As a whole, the transformation of the petty trades into great industries goes on with a slowness which cannot fail to astonish even those who are convinced of its necessity. Nay, sometimes we may even see the reverse movement going on — occasionally, of course, and only for a time. I cannot forget my amazement when I saw at Verviers, some thirty years ago, that most of the woollen cloth factories — immense barracks facing the streets by more than a hundred windows each — were silent, and their costly machinery was rusting, while cloth was woven in hand-looms in the weavers' houses, for the owners of those very same factories. Here we have of course, but a temporary fact, fully explained by the spasmodic character of the trade and the heavy losses sustained by the owners of the factories when they cannot run their mills all the year round. But it illustrates the obstacles which the transformation has to comply with. As to the silk trade, it continues to spread over Europe in its rural industry state; while hundreds of new petty trades appear every year, and when they find nobody to carry them on in the villages — as is the case in this country — they shelter themselves in the suburbs of the great cities, as we have lately learned from the inquiry into the "sweating system."

Now, the advantages offered by a large factory in comparison with hand work are self-evident as regards the economy of labour, and especially — *this is the main point* — the facilities both for sale and for having the raw produce at a lower price. How can we then explain the persistence of the petty trades? Many causes, however, most of which cannot be valued in shillings and pence, are at work in favour of the petty trades, and these causes will be best seen from the following illustrations. I must say, however, that even a brief sketch of the countless industries which are carried on on a small scale in this country, and on the Continent, would be far beyond the scope of this chapter. When I began to study the subject some thirty years ago, I never guessed, from the little attention devoted to it by the orthodox economists, what a wide, complex, important, and interesting organisation would appear at the end of a close inquiry. So I see myself compelled to give here only a few typical illustrations, and to indicate the chief lines only of the subject.

The Small Industries in the United Kingdom

We have not for the United Kingdom such statistical data as are obtained in France and Germany by periodical censuses of all the factories and workshops, and the numbers of the workpeople, foremen and clerks, employed on a given day n each industrial and commercial establishment. Consequently, up to the present time all the statements made by economists about the so-called "concentration:" of the industry in this country, and the consequent "unavoidable" disappearance of the small industries, have been based on mere impressions of the writers, — not on statistical data. Up till now we cannot give, as it is done future in these pages for France and Germany, the exact numbers of factories and workshops employing, let us say, from 1,000 to 2,000 persons, from 500 to 1,000, from 50 to 500, less than 50, and so on. It is only since factory inspection has been introduced by the Factory Act of 1895 that we begin to find, in the Reports published since 1900 by the Factory Inspectors (*Annual Report of the Chief Inspector of Factories and Workshops for the year 1898*: London, 1900), information which permits us to get a general idea about the distribution of working men in factories of different sizes, and the extension that the petty trades have retained in this country up till now.[2] One may see it already from the following little table for the year 1897, which I take from the just-mentioned Report. These figures are not yet complete, especially as regards the workshops, but they contain already the greater part of the English industries.

1897	Number of factories and workshops.	Number of operatives of both sexes.	Average number of operatives per establishment.
Textile factories..	10,883	1,051,564	97
Non-textile factories	79,059	2,755,460	35
Various workshops.	88,814	676,776	8
Total...	178,756	4,483,800	25

Let me remark that the Factory Inspectors consider as a *workshop* every industrial establishment which has no mechanical motive power, and as a *factory* every establishment provided with steam, gas, water, or electric power.

These figures, however, are not complete, because only those workshops are included where women and children are employed, as also all the bakeries. The others were not submitted to inspection at the time when this table was compiled. There is, nevertheless, a means to find out the approximate numbers of workpeople employed in the workshops. The number of women and female children employed in the workshops in 1897 was 356,098 and the number of men and boys was 320,678. But, as the proportion of male workers to the female in all the factories was 2,654,716 males to 1,152,308 females, we may admit that the same proportion prevails in the workshops. This would give for the latter something like 820,000 male workers and 1,176,000 persons of both sexes, employed in 147,000 workshops. At the same time, the grand total of persons employed in industry (exclusive of mining) would be 4,983,000.

[2] For more details about this subject, see an article of mine in the *Nineteenth Century*, August, 1900.

We can thus say that *nearly one-fourth* (24 per cent.) *of all the industrial workers of this country are working in workshops having less than eight to ten workers per establishment.*[3]

It must also be pointed out that out of the 4,483,800 workpeople registered in the above-mentioned tables nearly 60,000 were children who were working half-days only, 401,000 were girls less than eighteen years old, 463,000 were boy from thirteen to eighteen who were making full working days like the adults, and 1,077,115 were considered as women (more than eighteen years old). In other words, one-fifth part of all the industrial workers of this country were girls and boys, and more than two-fifths (41 per cent.) were either women or children. All the industrial production of the United Kingdom, with its immense exports, was thus giving work to less than three million adult men — 2,983,000 out of a population of 42,000,000, to whom we must add 972,200 persons working in the mines. As to the textile industry, which supplies almost one-half of the English exports, there are less than 300,000 adult men who find employment in it. The remainder is the work of children, boys, girls, and women.

A fact which strikes us is that the 1,051,564 workpeople — men, women and children — who worked in 1897 in the textile industries of the United Kingdom were distributed over 10,883 factories, which gives only an average of ninety-three persons per factory in all this great industry, notwithstanding the fact that "concentration" has progressed most in this industry, and that we find in it factories employing as many as 5,000 and 6,000 persons.

It is true that the Factory Inspectors represent each separate branch of a given industry as a special establisment. Thus, if an employer or a society owns a spinning mill, a weaving factory, and a special building for dressing and finishing, the three are represented as separate factories. But this is precisely what is wanted for giving us an exact idea about the degree of concentration of a given industry. Besides, it is also known that, for instance, in the cotton industry, in the neighbourhood of Manchester, the spinning, the weaving, the dressing and so on belong very often to different employers, who send to each other the stuffs at different degrees of fabrication; those factories which combine under the same management all the three or four consecutive phases of the manufacture are an exception.

But it is especially in the division of the non-textile industries that we find an enormous development of small factories. The 2,755,460 workpeople who are employed in all the non-textile branches with the exception of mining, are scattered in 79,059 factories, each of which has only an average of thirty-five workers. Moreover, the Factory Inspectors had on their lists 676,776 workpeople employed in 88,814 workshops (without mechanical power), which makes an average of eight persons only per workshop. These last figures are, however, as we saw, below the real ones, as another sixty thousand workshops occupying half a million more workpeople were not yet tabulated.

Such averages as ninety-three and thirty-five workpeople per factory, and eight per workshop, distributed over 178,756 industrial establishments, destroy already the legend according to which

[3] The Chief Inspector, Mr. Whitelegge, wrote to me in 1900 that the workshops which did not enter into his reports represented about one-half of all the workshops. Since that time Mr. Whitelegge has continued to publish his interesting reports adding to them new groups of workshops. However, they still remain incomplete to some extent as regards this last point. In the last Report, published in 1911, we see that 147,000 workshops were registered at the end of 1907, and returns were received from 105,000 of them. But as in 32,000 workshops no women or young persons (below 18) were employed, their returns were not published. The Report for 1907 gives, therefore, only 91,249 workshops in which 638,335 persons were employed (186,064 male and 282,324 female adults, 54,605 male and 113,728 female young persons — that is, full-timers from 14 to 18 years old — and 863 male and 751 female children under 14).

the big factories have already absorbed most of the small ones. The figures show, on the contrary, what an immense number of small factories and workshops resist the absorption by the big factories, and how they multiply by the side of the great industry in various branches, especially those of recent origin.

If we had for the United Kingdom full statistics, giving lists of all the factories, with the number of workpeople employed in each of them, as we have for France and Germany (see below), it would have been easy to find the exact number of factories employing more than 1,000,000, 500, 100, and 50 workmen. But such lists are issued only for the mining industry. As to the statistics published by the Factory Inspectors, they do not contain such data, perhaps because the inspectors have no time to tabulate their figures, or have not the right to do so. Be it as it may, the Report of Mr. Whitelegge for 1897 gives the number of factories (textile and non-textile) and workshops for each of the 119 counties of the United Kingdom and for each of the nearly hundred sub-divisions of all the industries, as well as the number of workpeople in each of these more than 10,000 sub-divisions. So I was enabled to calculate the averages of persons employed in the factories and workshops for each separate branch of industry in each county. Besides, Mr Whitelegge has had the kindness to give me two very important figures — namely, the number of factories employing more than 1,000 workpeople, and the number of those factories where less than ten workers are employed.

Let us take, first of all, the TEXTILE industries, which include cotton, wool, silk, linen, jute, and hemp, as well as machine-made lace and knitting. Many of my readers will probably be astonished to learn that even in the cotton industry a great number of quite small factories continue to exist up to the present day. Even in the West Riding district, which is second only to Lancashire for the number of its cotton mills, and where we find nearly one-third of all the workpeople employed in the cotton industry (237,444 persons), the average for all the 3,210 factories of this district is only seventy-three persons per factory. And even in Lancashire, where we find nearly one-half of all the workpeople employed in the textiles, these 434,609 men, women, and children are scattered in 3,132 factories, each of which has thus an average of only 139 workers. If we remember that in this number there are factories employing from 2,000 to 6,000 persons, one cannot but be struck by the quantity of small factories employing less than 100 persons, and which continue to exist by the side of the great cotton mills. But we shall just see that the same is true for all industries.

As to the Nottinghamshire, which is a centre for machine-made lace and knitting, its 18,434 workpeople are, most of them, working in small factories. The average for the 386 establishments of this county is only forty-eight persons per factory. The great industry is thus very far from having absorbed the small one.

The distribution of the textile factories in the other counties of the United Kingdom is even more instructive. We learn that there are nearly 2,000 textile factories in forty-nine counties, and everyone of these factories has much less than 100 workpeople; while a very considerable number of them employ only from forty to fifty, from ten to twenty, and even less than ten persons.[4]

This could have been foreseen by everyone who has some practical knowledge of industry, but it is overlooked by the theorists, who know industry mostly from books. In every country of

[4] From the curve that I computed it appears that all the textile factories are distributed as to their size as follows: — Not less than 500 operatives, 200 factories, 203,100 operatives; from 499 to 200, 660 factories, 231,000 operatives; from 99 to 50, 1,380 factories, 103,500 operatives; less than 50, 1,410 factories, 42,300 operatives; total, 6,605 factories, 1,022,020 operatives. — Nineteenth Century, August,1900, p. 262.

the world there are by the side of the large factories a great number of small ones, the success of which is due to the variety of their produce and the facilities they offer to follow the vagaries of fashion. This is especially true with regard to the woollens and the mixed stuffs made of wool and cotton.

Besides, it is well known to British manufacturers that at the time when the big cotton mills were established, the manufacturers of spinning and weaving machinery, seeing that they had no more orders coming, after they had supplied this machinery to the great factories, began to offer it at a reduced price and on credit to the small weavers. These last associated — three, five, or more of them — to buy the machinery, and this is why we have now in Lancashire quite a region where a great number of small cotton mills continue to exist till nowadays, without there being any reason to foresee their disappearance. At times they are even quite prosperous.

On the other side, when we examine the various branches of textile industry (cotton, wool, silk jute, etc.), we see that if the great factories dominate in the spinning and weaving of cotton, worsted and flax, as well as in the spinning of silk (the result being that the average for these branches reaches 150 workers per factory for cotton, and 267 for the spinning of flax), all other textile industries belong to the domain of the middle-sized and the small industry. In other words, in the manufacture of woollens, shoddy, hemp, hair, machine-made lace, and mechanical knitting, as also in the weaving of silks, there are, of course, large factories; but the majority of these establishments belong to the domain of the small industry. Thus, for the 3,274 woollen factories, the average is only from twenty to fifty workers per factory; it is also from twenty-seven to thirty-eight for shoddy, and thirty-seven to seventy-six for the other branches. Only for knitting do the averages rise to ninety-three persons per factory; but we are just going to see that the small industry reappears in this branch in force under the name of workshops.

All these important branches of the British textile industry, which give work to more than 240,000 men and women, have thus remained up till now at the stage of a small and middle-sized industry.

If we take now the NON-TEXTILE industries, we find, on the one side, an immense number of small industries which have grown up around the great ones, and owing to them; and, on the other side, a large part of the fundamental industries have remained in the stage of small establishments. The average for all these branches, which give occupation to three-fourths of all the industrial workers of the United Kingdom — that is, 2,755,460 workers — hardly attains, we saw, thirty-five persons per factory — the workshops being not yet included in this division. However, it is especially when we go into details, and analyse the figures which I have calculated for each separate branch, that we fully realise the importance of the petty trades in England. This is what we are going to do, mentioning first what belongs here to the great industry, and studying next the small one.

Following the classification adopted by the Factory Inspectors, we see first that the gasworks belong to the domain of the fairly big establishments (seventy-eight people on the average). The india-rubber factories belong to the same category (125 workers on the average): and amidst the 456 glass-works of the United Kingdom there must be some big ones, as the average is eighty-seven workpeople.

Next come mining and metallurgy, which are carried on, as a rule, on a great scale; but already in the iron foundries we find a great number of establishments belonging to the middle-sized and small industry. Thus at Sheffield I saw myself several foundries employing only from five to six workmen, For the making of huge machinery there is, of course, a number of very large

works, such as those of Armstrong, Whitworth, or those of the State at Woolwich. But it is very instructive to see how very small works prosper by the side of big ones; they are numerous enough to reduce the average to seventy workers per establishment for the 5,318 works of this category.

Shipbuilding and the manufacture of metallic tubes evidently belong to the great industry (averages, 243 and 156 persons per establisment); and the same applies to the two great metallurgical works of the State, which employ between them 23,455 workmen.

Going over to the chemical works, we find again a great industry in the fabrication of alkalies and of matches (only twenty-five works); but, on the contrary, the fabrication of soap and candles, as well as manures and all other sorts of chemical produce, which represents nearly 2,000 factories, belongs almost entirely to the domain of the small industry. The average is only twenty-nine workpeople per factory. There are, of course, half a dozen of very large soap works — one knows them only too well by their advertisements on the cliffs and in the fields; but the low average of twenty-nine workmen proves how many small factories must exist by the side of the soap kings. The 2,500 works engaged in the fabrication of furniture, both in wood and in iron, belong again chiefly to the small industry. The small and very small factories swarm by the side of a few great ones, to say nothing of the thousands of the still smaller workshops. The great storehouses of our cities are for the most part mere exhibitions of furniture made in very small factories and workshops.

In the fabrication of food produce we find several great sugar, chocolate, and preserves works; but by their side we find also a very great number of small establishments, which seem not to complain of the proximity of the big ones, as they occupy nearly two-thirds of the workers employed in this branch. I do not speak, of course, of the village windmills, but one cannot fail to be struck by the immense number of small breweries (2,076 breweries have on the average only twenty-four workmen each) and of the establishments engaged in the fabrication of aerated waters (they number 3,365, and have on the average only eleven operatives per establishment).

In calico-printing we enter once more the domain of great factories; but by their side we find a pretty large number of small ones; so that the average for all this category is 144 workpeople per factory. We find also fourteen great factories, having an average of 394 workpeople each, for dyeing in Turkey red. But we find also by their side more than 100,000 working-men employed in 2,725 small establishments of this class — bleaching, dressing, packing, and so on — and this gives us one more illustration of numerous small industries growing round the main ones.

In the making of ready-made clothing and the fabrication of hats, linen, boots and shoes, and gloves, we see the averages for the factories of this description going up to 80, 100, and 150 persons per factory. But it is here also that countless small workshops come in. It must also be noticed that most of the factories of ready-made clothing have their own special character. The factory buys the cloth and makes the cutting by means of special machinery; but the sewing is done by women, who come to work in the factory. They pay so much the sewing-machine, so much the motor power (if there is one), so much the gas, so much the iron, and so on, and they are on piece work. Very often this becomes a "sweating system" on a large scale. Round the big factories a great number of small workshops are centred.

And, finally, we find great factories for the fabrication of gunpowder and explosives (they employ less than 12,000 workpeople), stuff buttons, and umbrellas (only 6,000 employees). But we find also in the table of workshops that in these last two branches there are thousands of them by the side of a few great factories.

All taken, Mr. Whitelegge writes to me that of factories employing more than 1,000 workpeople each, he finds only sixty-five in the textile industries(102,600 workpeople) and only 128 (355,208 workpeople) in all non-textile industries.

In this brief enumeration we have gone over all that belongs to the great industry. The remainder belongs almost entirely to the domain of the small, and often the very small industry. Such are all the factories for woodwork, which have on the average only fifteen men per establishment, but represent a contingent of more than 100,000 workmen and more than 6,000 employers. The tanneries, the manufacture of all sorts of little things in ivory and bone, and even the brick-works and the potteries, representing a total of 260,000 workpeople and 11,200 employers, belong, with a very few exception, to the small industry.

Then we have the factories dealing with the burnishing and enamelling of metals, which also belong chiefly to the small industry — the average being only twenty-eight workpeople per factory. But what is especially striking is the development of the small and very small industry in the fabrication of agricultural machinery (thirty-two workers per factory), of all sorts of tools (twenty-two on the average), needles and pins (forty-three), ironmongery, sanitary apparatus, and various instruments (twenty-five), even of boilers (forty-eight per factory), chains, cables, and anchors (in many districts this work, as also the making of nails, is made by hand by women).

Needless to say that the fabrication of furniture, which occupies nearly 64,000 operatives, belongs chiefly — more than three-fourths of it — to the small industry. The average for the 1,979 factories of this branch is only twenty-one workpeople, the workshops not being included in this number. The same is true of the factories for the curing of fish, machine-made pastry, and so on, which occupy 38,030 workpeople in more than 2,700 factories, having thus an average of fourteen operatives each.

Jewelry and the manufacture of watches, photographic apparatus, and all sorts of luxury articles, again belong to the small and very small industry, and give occupation to 54,000 persons.

All that belongs to printing, lithography, bookbinding, and stationery again represents a vast field occupied by the small industry, which prospers by the side of a small number of very large establishments. More than 120,000 are employed in these branches in more than 6,000 factories (workshops not yet included).

And, finally, we find a large domain occupied by saddlery, brush-making, the making of sails, basket-making, and the fabrication of a thousand little things in leather, paper, wood, metal, and so on. This class is certainly not insignificant, as it contains more than 4,300 employers and nearly 130,000 workpeople, employed in a mass of very small factories by the side of a few very great ones, the average being only from twenty-five to thirty-five persons per factory.

In short, in the different non-textile industries, the inspectors have tabulated 32,042 factories employing, each of them, less than ten workpeople.

All taken, we find 270,000 workpeople employed in small factories having less than fifty and even twenty workers each, the result being that the very great industry (the factories employing more than 1,000 workpeople per factory) and the very small one (less than ten workers) employ nearly the same number of operatives.

The important part played by the small industry in this country fully appears from this rapid sketch. And I have not yet spoken of the workshops. The Factory Inspectors mentioned, as we saw, in their first report, 88,814 workshops, in which 676,776 workpeople (356,098 women) were employed in 1897. But, as we have already seen, these figures are incomplete. The number of

workshops is about 147,000, and there must be about 1,200,000 persons employed in them (820,000 men and about 356,000 women and children).

It is evident that this class comprises a very considerable number of bakers, small carpenters, tailors, cobblers, cartwrights, village smiths, and so on. But there is also in this class an immense number of workshops belonging to industry, properly speaking — that is, workshops which manufacture for the great commercial market. Some of these workshops may of course employ fifty persons or more, but the immense majority employ only from five to twenty workpeople each.

We thus find in this class 1,348 small establishments, scattered both in the villages and the suburbs of great cities, where nearly 14,000 persons make lace, knitting, embroidery, and weaving in hand-looms; more than 100 small tanneries, more than 20,000 cartwrights, and 746 small bicycle makers. In cutlery, in the fabrication of tools and small arms, nails and screws, and even anchors and anchor chains, we find again many thousands of small work shops employing something like 60,000 workmen. All that, let us remember, without counting those workshops which employ no women or children, and therefore are not submitted to the Factory Inspectors. As to the fabrication of clothing, which gives work to more than 350,000 men and women, distributed over nearly 45,000 workshops, let it be noted that it is not small tailors that is spoken of here, but that mass of *workshops* which swarm in Whitechapel and the suburbs of all great cities, and where we find from five to fifty women and men making clothing for the tailor shops, big and small. In these shops the measure is taken, and sometimes the cutting is made; but the clothing is sewn in the small workshops, which are very often somewhere in the country. Even parts of the commands of linen and clothing for the army find their way to workshops in country places. As to the underclothing and mercery which are sold in the great stores, they are fabricated in small workshops, which must be counted by the thousand.

The same is true of furniture, mattresses and cushions, hats, artificial flowers, umbrellas, slippers, and even cheap jewelry. The great shops, even the largest stores, mostly keep only an assortment of samples. All is manufactured at a very low price, and *day by day,* in thousands of small workshops.

It can thus be said that if we exclude from the class of workshops' employees 100,000 or even 200,000 workpeople who do not work for *industry* properly speaking, and if we add on the other side the nearly 500,000 workers who have not yet been tabulated by the inspectors in 1897, we find a population of more than 1,000,000 men and women who belong entirely to the domain of the small industry, and so must be added to those whom we found working in the small factories. The artisans who are, working single-handed were not included in this sketch.

We thus see that even in this country, which may be considered as representing the highest development of the great industry, the number of persons employed in the small trade continues to be immense. The small industries are as much a distinctive feature of the British industry as its few immense factories and ironworks.

Going over now to what is known about the small industries of this country from direct observation, we find that the suburbs of London, Glasgow, and other great cities swarm with small workshops, and that there are regions where the petty trades are as developed as they are. in Switzerland or in Germany. Sheffield is a well known example in point. The Sheffield cutlery — one of the glories of England — is not. made by machinery: it is chiefly made by hand. There are at Sheffield a number of firms which manufacture cutlery right through from the making of steel to the finishing of tools, and employ wageworkers; and yet even these firms — I am told by Edward Carpenter, who kindly collected for me information about the Sheffield trade — let out

some part of their work to the "small masters." But by far the greatest number of the cutlers work in their homes with their relatives, or in small workshops supplied with wheel-power, which they rent for a few shillings a week. Immense yards are covered with buildings, which are subdivided into numbers of small workshops. Some of these cover but a few square yards, and there I saw smiths hammering, all the day long, blades of knives on a small anvil, close by the blaze of their fires; occasionally the smith may have one helper, or two. In the upper storeys, scores of small workshops are supplied with wheel-power, and in each of them, three, four, or five workers and a "master" fabricate, with the occasional aid of a few plain machines, every description of tools: files, saws, blades of knives, razors, and so on. Grinding and glazing are done in other small workshops, and even steel is cast in a small foundry, the working staff of which consists only of five or six men.

When I walked through these workshops I easily imagined myself in a Russian cutlery village, like Pavlovo or Vorsma. The Sheffield cutlery has thus maintained its olden organisation, and the fact is the more remarkable as the earnings of the cutlers are low as a rule; but, even when they are reduced to a few shillings a week, the cutler prefers to vegetate on his small earnings than to enter as a waged labourer in a "house." The spirit of the old trade organisations, which were so much spoken of in the 'sixties of the nineteenth century, is thus still alive.

Until lately, Leeds and its environs were also the seat of extensive domestic industries. When Edward Baines wrote, in 1857, his first account of the Yorkshire industries (in Th. Baines's *Yorkshire, Past and Present*), most of the woollen cloth which was made in that region was woven by hand.[5] Twice a week the hand-made cloth was brought to the Clothiers' Hall, and by noon it was sold to the merchants, who had it dressed in their factories. Joint-stock mills were run by combined clothiers in order to prepare and spin the wool, but it was woven in the hand-looms by the clothiers and the members of their families. Twelve years later the hand-loom was superseded to a great extent by the power-loom; but the clothiers, who were anxious to maintain their independence, resorted to a peculiar organisation: they rented a room, or part of a room, and sometimes also the power-looms, and they worked independently — a characteristic organisation partly maintained until now, and well adapted to illustrate the efforts of the petty traders to keep their ground, notwithstanding the competition of the factory. And it must be said that the triumphs of the factory were too often achieved only by means of the most fraudulent adulteration and the underpaid labour of the children.

The variety of domestic industries carried on in the Lake District is much greater than might be expected,, but they still wait for careful explorers. I will only mention the hoop-makers, the basket trade, the charcoal-burners, the bobbin-makers, the small iron furnaces working with charcoal at Backbarrow, and so on.[6] As a whole, we do not well know the petty trades of this country, and therefore we sometimes come across quite unexpected facts. Few continental writers on industrial topics would guess, indeed, that twenty-five years ago nails were made by hand by thousands of men, women, and children in the Black Country of South Staffordshire, as also in Derbyshire,[7] and that some of this industry remains still in existence, or that the best needles are made by hand at Redditch. Chains are also made by hand at Dudley and Cradley, and although the Press is periodically moved to speak of the wretched conditions of the chain-makers, men

[5] Nearly one-half of the 43,000 operatives who were employed at that time in the woollen trade of this country were weaving in hand-looms. So also one-fifth of the 79,000 persons employed in the worsted trade.

[6] E. Roscoe's notes in the *English Illustrated Magazine,* May, 1884.

[7] Bevan's Guide to *English Industries.*

and women, the trade still maintains itself; while nearly 7,000 men were busy in 1890 in their small workshops in making locks, even of the plainest description, at Walsall, Wolverhampton, and Willenhall. The various ironmongeries connected with horse-clothing — bits, spurs, bridles, and so on — are also largely made by hand at Walsall.

The Birmingham gun and rifle trades, which also belong to the same domain of small industries, are well known. As to the various branches of dress, there are still important divisions of the United Kingdom where a variety of domestic trades connected with dress is carried on on a large scale. I need only mention the cottage industries of Ireland, as also some of them which have survived in the shires of Buckingham, Oxford, and Bedford; hosiery is a common occupation in the villages of the counties Of Nottingham and Derby; and several great London firms send out cloth to be made into dress in the villages of Sussex and Hampshire. Woollen hosiery is at home in the villages of Leicester, and especially in Scotland; straw-plaiting and hat-making in many parts of the country; while at Northampton, Leicester, Ipswich, and Stafford shoemaking was, till quite lately, a widely spread domestic occupation, or was carried on in small workshops; even at Norwich it remains a petty trade to some extent, notwithstanding the competition of the factories. It must also be said that the recent appearance of large boot and shoe factories has considerably increased the number of girls and women who sew the "uppers" and embroider the slippers, either in their own houses or in sweaters' workshops, while new small factories have developed of late for the making of heels, card-boxes, and so on.

The petty trades are thus an important factor of industrial life even in Great Britain, although many of them have gathered into the towns. But if we find in this country so many fewer rural, industries than on the Continent, we must not imagine that their disappearance is due only to a keener competition of the factories. The chief cause was the compulsory exodus from the villages.

As everyone knows from Thorold Rogers' work, the growth of the factory system in England was intimately connected with that enforced exodus. Whole industries, which prospered till then, were killed downright by the forced clearing of estates.[8] The workshops, much more even than the factories, multiply wherever they find cheap labour; and the specific feature of this country is, that the cheapest labour — that is, the greatest number of destitute people — is to be found in the great. cities. The agitation raised (with no result) in connection with the "Dwellings of the Poor," the "Unemployed," and the "Sweating System," has fully disclosed that characteristic feature of the economic life of England and Scotland; and the painstaking researches made by Mr. Charles Booth have shown that one-quarter of the population of London — that is, 1,000,000 out of the 3,800,000 who entered within the scope of his inquest — would be happy if the heads of their families could have regular earnings of something like 91 a week all the year round. Half of them would be satisfied with even less than that. The same state of things was found by Mr. Seebohm Rowntree at York.[9] Cheap labour is offered in such quantities in the suburbs of all the great cities of Great Britain, that the petty and domestic trades, which are scattered on the Continent in the villages, gather in this country in the cities.

Exact figures as to the small industries are wanting, but a simple walk through the suburbs of London — would do much to realise the variety of petty trades which swarm in the metropolis, and, in fact, in all chief urban agglomerations. The evidence given before the "Sweating System Committee" has shown how far the furniture and ready-made clothing palaces and the "Bonheur

[8] Thorold Rogers, *The Economic Interpretation of History.*

[9] *Poverty: a Study of Town Life*, London (Macmillan), 1901.

des Dames" bazaars of London are mere exhibitions of samples, or markets for the sale of the produce of the small industries. Thousands of sweaters, some of them having their own workshops, and others merely distributing work to sub-sweaters who distribute it again amidst the destitute, supply those palaces and bazaars with goods made in the slums or in very small workshops. The commerce *is* centralised in those bazaars — not the industry. The furniture palaces and bazaars are thus merely playing the part which the feudal castle formerly played in agriculture: they centralise the profits — not the production.

In reality, the extension of the petty trades, side by side with the great factories, is nothing to be wondered at. It is an economic necessity.

The absorption of the small workshops by bigger concerns is a fact which had struck the economists in the 'forties of the last century, especially in the textile trades. It is continued still in many other trades, and is especially striking in a number of very big concerns dealing with metals and war supplies for the different States. But there is another process which is going on parallel with the former, and which consists in the continuous creation of new industries, usually making their start on a small scale. Each new factory calls into existence a number of small workshops, partly to supply its own needs and partly to submit its produce to a further transformation. Thus, to quote but one instance, the cotton mills have created an immense demand for wooden bobbins and reels, and thousands of men in the Lake District set to manufacture them — by hand first, and later on with the aid of some plain machinery. Only quite recently, after years had been spent in inventing and improving the machinery, the bobbins began to be made on a larger scale in factories. And even yet, as the machines are very costly, a great quantity of bobbins are made in small workshops, with but little aid from machines, while the factories themselves are relatively small, and seldom employ more than fifty operatives chiefly children. As to the reels of irregular shape, they are still made by hand, or partly with the aid of small machines, continually invented by the workers. New industries thus grow up to supplant the old ones; each of them passes through a preliminary stage on a small scale before reaching the great factory stage; and the more active the inventive genius of a nation is, the more it has of these budding industries. The countless small bicycle works which have lately grown up in this country, and are supplied with ready-made parts of the bicycle by the larger factories, are an instance in point. The domestic and small workshops fabrication of boxes for matches, boots, hats, confectionery, grocery and so on is another familiar instance.

Besides, the large factory stimulates the birth of now petty trades by creating new wants. The cheapness of cottons and woollens, of paper and brass, has created hundreds of new small industries. Our households are full of their produce — mostly things of quite modern invention. And while some of them already are turned out by the million in the great factory, all have passed through the small workshop stage, before the demand was great enough to require the great factory organisation, The more we may have of new inventions, the more shall we have of such small industries; and again, the more we have of them, the more shall we have of the inventive genius, the want of which is so justly complained of in this country (by W. Armstrong, amongst many others). We must not wonder, therefore, if we see so many small trades in this country; but we must regret that the great number have abandoned the villages in consequence of the bad conditions of land tenure, and that they have migrated in such numbers to the cities, to the detriment of agriculture.

In England, as everywhere, the small industries are an important factor in the industrial life of the country ; and it is chiefly in the infinite variety of the small trades, which utilise the half-

fabricated produce of the great industries, that inventive genius is developed, and the rudiments of the future great industries are elaborated. The small bicycle workshops, with the hundreds of small improvements which they introduced, have been under our very eyes the primary cells out of which the great industry of the motor cars, and later on of the aeroplanes, has grown up. The small village jam-makers were the precursors and the rudiments of the great factories of preserves which now employ hundreds of workers. And soon.

Consequently, to affirm that the small industries are doomed to disappear, while we see new ones appear every day, is merely to repeat a hasty generalisation that was made in the earlier part of the nineteenth century by those who witnessed the absorption of hand-work by machinery work in the cotton industry — a generalisation which, as we saw already, and are going still better to see on the following pages, finds no confirmation from the study of industries, great and small, and is upset by the censuses of the factories and workshops. Far from showing a tendency to disappear, the small industries show, on the contrary, a tendency towards making a further development, since the municipal supply of electrical power — such as we have, for instance, in Manchester — permits the owner of a small factory to have a cheap supply of motive power, exactly in the proportion required at a given time, and to pay only for what is really consumed.

Petty Trades in France

Small industries are met with in France in a very great variety, and they represent a most important feature of national economy. it is estimated, in fact, that while one-half of the population of France live upon agriculture, and one-third upon industry, this third part is equally distributed between the great industry and the small one.[10] This last occupies about 1,650,000 workers and supports from 4,000,000 to 5,000,000 persons. A considerable number of peasants who resort to small industries without abandoning agriculture would have to be added to the just-mentioned items, and the additional earnings which these peasants find in industry are so important that in several parts of France peasant proprietorship could not be maintained without the aid derived from the rural industries.

The small peasants know what they have to expect the day they become factory hands in a town; and so long as they have not been dispossessed by the money-lender of their lands and houses, and so long as the village rights in the communal grazing grounds or woods have not been lost, they cling to a combination of industry with agriculture. Having, in most cases, no horses to plough the land, they resort to an arrangement which is widely spread, if not universal, among small French landholders, even in purely rural districts (I saw it even in HauteSavoie). One of the peasants who keeps a plough and a team of horses tills all the, fields in turn. At the same time, owing to a wide maintenance of the communal spirit, which I have described elsewhere,[11] further support is found in the communal shepherd, the communal wine-press, and various forms of "aids" amongst the peasants. And wherever the village-community spirit is maintained, the small industries persist, while no effort is spared to bring the small plots under higher culture.

[10] *[See Table 7]*

[11] *Mutual Aid: a Factor of Evolution.* London (Heinemann), 1902.

Market-gardening and fruit culture often go hand in hand with small industries. And wherever well-being is found on a relatively unproductive soil, it is nearly always due to a combination of the two sister arts.

The most wonderful adaptations of the small industries to new requirements, and substantial technical progress in the methods of production, can be noted at the same time. It may even be said of France, as it has been said of Russia, that when a rural industry dies out, the cause of its decay is found much less in the competition of rival factories — in hundreds of localities the small industry undergoes a complete modification, or it changes its character in such cases — than in the decay of the population as agriculturists. Continually we see that only when the small landholders have been ruined, as such, by a group of causes — the loss of communal meadows, or abnormally high rents, or the havoc made in some locality by the *marchands de biens* (swindlers enticing the peasants to buy land on credit), or the bankruptcy of some shareholders' company whose shares had been eagerly taken by the peasants[12] — only then do they abandon both the land and the rural industry and emigrate towards the towns.

Otherwise, a now industry always grows up when the competition of the factory becomes too acute — a wonderful, hardly suspected adaptability being displayed by the small industries; or else the rural artisans resort to some form of intensive farming, gardening, etc., and in the meantime some other industry makes its appearance. A closer study of France under this aspect is instructive in a high degree.

It is evident that in most textile industries the power-loom supersedes the hand-loom, and the factory takes, or has taken already, the place of the cottage industry. Cottons, plain linen, and machine-made lace are now produced at such a low cost by machinery that hand-weaving evidently becomes an anachronism for the plainest descriptions of such goods. Consequently, though there were in France, in the year 1876, 328,300 hand-looms as against 121,340 power-looms, it may safely be taken that the number of the former has been considerably reduced within the next twenty years. However, the slowness with which this change is being accomplished is one of the most striking features of the present industrial organisation of the textile trades of France.

The causes of this power of resistance of handloom-weaving become especially apparent when one consults such works as Reybaud's *Le Coton*, which was written in 1863, nearly half a century ago — that is, at a time when the cottage industries were still fully alive. Though an ardent admirer himself of the great industries, Reybaud faithfully noted the striking superiority of well-being in the weavers' cottages as compared with the misery of the factory hands in the cities. Already then, the cities of St. Quentin, Lille, Roubaix and Amiens were great centres for cotton-spinning Mills and cotton-weaving factories. But, at the same time, all sorts of cottons were woven in hand-looms, in the very suburbs of St. Quentin and in a hundred villages and hamlets around it, to be sold for finishing in the city. And Reybaud remarked that the horrible dwellings in town, and the general condition of the factory hands, stood in a wonderful contrast with the relative welfare of the rural weavers. Nearly every one of these last had his own house and a small field which he continued to cultivate.[13]

Even in such a branch as the fabrication of plain cotton velvets, in which the competition of the factories was especially keenly felt, homeweaving was widely spread, in 1863 and even in

[12] See Baudrillart's *Les Populations agricoles de la France: Normandie.*

[13] *Le Coton: son regime, ses problemes.* Paris, 1863, p. 170.

1878, in the villages round Amiens. Although the earnings of the rural weavers were small, as a rule, the weavers preferred to keep to their own cottages, to their own crops and to their own cattle; and only repeated commercial crises, as well as several of the above-mentioned causes, hostile to the small peasant, compelled most of them to give up the struggle, and to seek employment in the factories, while part of them have, by this time, again returned to agriculture or taken to market-gardening.

Another important centre for rural industries was in the neighbourhood of Rouen, where no less than 110,000 persons were employed, in 1863, in weaving cottons for the finishing factories of that city. In the valley of the Andelle, in the department of Eure, each village was at that time an industrial bee-hive; each streamlet was utilised for setting into work a small factory. Reybaud described the condition of the peasants who combined agriculture with work at the rural factory as most satisfactory, especially in comparison with the condition of the slum-dwellers at Rouen, and he even mentioned a case or two in which the village factories belonged to the village communities.

Seventeen years later, Baudrillart[14] depicted the same region in very much the same words; and although the rural factories bad had to yield to a great extent before the big factories, the rural industry was still valued as showing a yearly production of 85,000,000 francs (£2,400,000).

At the present time, the factories must have made further progress; but we still see from the excellent descriptions of M. Ardouin Dumazet, whose work will have in the future almost the same value as Arthur Young's *Travels*,[15] that a considerable portion of the rural weavers has still survived; while at the same time one invariably meets, even nowadays, with the remark that relative well-being is prominent in the villages in which weaving is connected with agriculture.

Up to the present time, M. Ardouin Dumazet writes, "there is an industry which gives work to many hand-looms in the villages; it is the weaving of various stuffs for umbrellas and ladies' boots." Amiens is the chief centre for this weaving.[16] In other places they are making dresses out of Amiens velvet and various stuffs woven at Roubaix. It is a new industry; it has taken the place of the old one, which was making of Amiens a second Lyons.

In the district of Le Thelle, to the south of Beauvais, there is "a multitude of petty trades, of which one hardly imagines the importance. I have seen," M. Dumazet says, "small factories of buttons made from bone, ivory, or motherof-pearl, brushes, shoe-horns, keys for pianos, dominoes, counters and dice, spectacle-cases, small articles for the writing-table, handles for tools, measures, billiard keys — what not!

There is not one single village, however small, the population of which should not have its own industry."[17] At the same time it must not be forgotten that thousands of small articles for the writing-table and for draughtsmen are fabricated on a large scale in the small factories in the same region. Some of the workshops are situated in private houses, and in some of them artistic work is made; but most of them are located in special houses) where the necessary Power is hired by the owner of the workshop. You see here "a fantastic activity" — the word is M. Dumazet's; the division of labour is very great, and everywhere they invent new machine-tools.

[14] *Les Populations agricoles de, la France: Normandie.*

[15] *Voyage en France.* Paris, 1893–1910 (Berget-Levreau, publishers), 56 volumes already published.

[16] Ardouin Dumazet, vol. xvii., p. 242.

[17] Ibid., vol. xvii., pp. 100, 101.

Finally, in the villages of the Vermandois district (department of the Aisne), we find a considerable number of hand-looms (more than 3,000) upon which mixed stuffs made of cotton, wool and silk are Woven.[18]

Of course, it must be recognised that, as a rule, in northern France, Where cottons are fabricated on a large scale in factory towns, hand-weaving in the villages is nearly gone. But, as is seen already from the preceding, new small industries have grown up instead, and this is also the case in many other parts of France.

Taking the region situated between Rouen in the north-east, Orleans in the south-east, Rennes in the north-west, and Nantes in the south-west — that is, the old provinces of Normandy, Perche and Maine, and partly Touraine and Anjou, as they were seen by Ardouin Dumazet in 1895 — we find there quite a variety of domestic and petty industries, both in the villages and in the towns.

At Laval (to the south-east of Rennes), where drills (*coutils*) were formerly woven out of flax in hand-looms, and at Alencon, formerly a great centre for the cottage-weaving of linen, as well as for hand-made lace, Ardouin Dumazet found both the house and the factory linen industry in a lingering state. Cotton takes the lead. Drills are now made out of cotton in the factories, and the demand for flax goods is very small. Both domestic and factory weaving of flax goods are accordingly in a poor condition. The cottagers abandoned that branch of weaving, and the large factories, which had been erected at Alencon with the intention of creating a flax and hemp-cloth industry, had to be closed. Only one factory, occupying 250 hands, remains; while nearly 23,000 weavers, who found occupation at Mans, Fresnay and Alencon in hemp cloths and fine linen, had to abandon that industry. Those who worked in factories have emigrated to other towns, while those who had not broken with agriculture reverted to it. In this struggle of cotton *versus* flax and hemp, the former was victorious.

As to lace, it is made in such quantities by machinery at Calais, Caudry, St. Quentin and Tarare that only high-class artistic lace-making continues on a small scale at Alencon itself, but it still remains a by-occupation in the surrounding country. Besides, at Flers, and at Ferte Mace (a small town to the south of the former), hand-weaving is still carried on in about 5,400 hand-looms, although the whole trade, in factories and villages alike, is in a piteous state since the Spanish markets have been lost. Spain has now plenty of her own cotton mills. Twelve big spinning mills at Conde (where 4,000 tons of cotton were spun in 1883) were abandoned in 1893, and the workers were thrown into a most miserable condition.[19]

On the contrary, in an industry which supplies the home market — namely, in the fabrication of linen handkerchiefs, which itself is of a quite recent growth — we see that cottage-weaving is, even now, in full prosperity. Cholet (in Maineet-Loire, south-west of Angers) is the centre of that trade. It has one spinning mill and one weaving mill, but both employ considerably fewer hands than domestic weaving, which is spread over no less than 200 villages of the surrounding region.[20] Neither at Rouen nor in the industrial cities of Northern France are so many linen handkerchiefs fabricated as in this region in hand-looms, we are told by Ardouin Dumazet.

Within the curve made by the Loire as it flows past Orleans we find another prosperous centre of domestic industries connected with cottons. "From Romorantin [in Loire-et-Cher, south of Orleans] to Argenton and Le Blanc," the same writer says, "we have one immense workshop

[18] Ardouin Dumazet, Vol. xix., P. 10.

[19] Ardouin Dumazet, vol. ii., p. 167.

[20] In Maine-et-Loire, la Vendee, Loire Inferieure, and Deux-Sevres. The same revival takes place in Ireland, where the weaving of handkerchiefs in hand-looms is growing in the shape of a small village industry.

where handkerchiefs are embroidered, and shirts, cuffs, collars and all sorts of ladies' linen are sewn or embroidered. There is not one house, even in the tiniest hamlets, where the women would not be occupied in that trade … and if this work is a mere *passe-temps* in vinegrowing regions, here it has become the chief resource of the population."[21] Even at Romorantin itself, where 400 women and girls are employed in one factory, there are more than 1,000 women who sew linen in their houses.

The same must be said of a group of industrial villages peopled with clothiers in the neighbourhood of another Normandy city, Elbaeuf. When Baudrillart visited them in 1878–1880, he was struck with the undoubted advantages offered by a combination of agriculture with industry. Clean houses, clean dresses, and a general stamp of well-being were characteristic of these villages.

Happily enough, weaving is not the only small industry of both this region and Brittany. On the contrary, scores of other small industries enliven the villages and burgs. At Fougeres (in Ille-et-Vilaine, to the north-east of Reims) one sees how the factory has contributed to the development of various small and domestic trades. In 1830 this town was a great centre for the domestic fabrication of the so-called *chaussons de tresse.* The competition of the prisons killed, however, this primitive industry; but it was soon substituted by the fabrication of soft socks in felt (*chaussons de feutre*). This last industry also went down, and then the fabrication of boots and shoes was introduced, this last giving origin, in its turn, to the boot and shoe factories, of which there are now thirty-three at Fougeres, employing 8,000 workers[22] (yearly production about 5,000,000 pairs). But at the same time domestic industries took a new development. Thousands of women are employed now in their houses in sewing the "uppers" and in embroidering fancy shoes. Moreover, quite a number of smaller workshops grew up in the neighbourhood, for the fabrication of cardboard boxes, wooden heels, and so on, as well as a number of tanneries, big and small. And M. Ardouin Dumazet's remark is, that one is struck to find, owing to these industries, an undoubtedly higher level of well-being in the villages — quite unforeseen in the centre of this purely agricultural region.[23]

In Brittany, in the neighbourhood of Quimperle, a great number of small workshops for the fabrication of the felt hats which are worn by the peasants is scattered in the villages; and rapidly improving agriculture goes hand in hand with that trade. Well-being is a distinctive feature of these villages.[24] At Hennebont (on the southern coast of Brittany) 1,400 workers are employed in an immense factory in the fabrication of tins for preserves, and every year twenty-two to twenty-three tons of iron are transformed into steel, and next into tins, which are sent to Paris, Bordeaux, Nantes, and so on. But the factory has created "quite a world of tiny workshops" in this purely agricultural region: small tin-ware workshops, tanneries, potteries, and so on, while the slags are transformed in small factories into manure.

Agriculture and industry are thus going here hand in hand, the importance of not severing the union being perhaps best seen at Loudeac, a small town in the midst of Brittany (department of Cotes-du-Nord). Formerly the villages in this neighbourhood were industrial, all hamlets being peopled with weavers who fabricated the well-known Brittany linen. Now, this industry having gone down very much, the weavers have simply returned to the soil. Out of an industrial town,

[21] Ardouin Dumazet, vol. i., p. 117 et seq.

[22] Twelve thousand in 1906.

[23] Ardouin Dumazet, vol. v., p. 270.

[24] Ibid., vol. v., p. 215.

Loudeac has become an agricultural market town;[25] and, what is most interesting, these populations conquer new lands for agriculture and turn the formerly quite unproductive *landes* into rich corn fields; while on the northern coast of Brittany, around Dol, on land which began to be conquered from the sea in the twelfth century, market-gardening is now carried on to a very great extent for export to England.

Altogether, it is striking to observe, on perusing M. Ardouin Dumazet's little volumes, how domestic industries go hand in hand with all sorts of small industries in agriculturegardening, poultry-farming, fabrication of fruit preserves, and so on — and how all sorts of associations for sale and export are easily introduced. Mans is, as known, a great centre for the export of geese and all sorts of poultry to England.

Part of Normandy (namely, the departments of Eure and Orne) is dotted with small workshops where all sorts of small brass goods and hardware are fabricated in the villages. Of course, the domestic fabrication of pins is nearly gone, and as for needles, polishing only, in a very primitive form, has been maintained in the villages. But all sorts of small hardware, including nails, lockets, etc., in great variety, are fabricated in the villages, especially round Laigle. Stays are also sewn in small workshops in many villages, notwithstanding the competition of prison work.[26]

Tinchebrai (to the west of Flers) is a real centre for a great variety of smaller goods in iron, mother-of-pearl and horn. All sorts of hardware and locks are fabricated by the peasants during the time they can spare from agriculture, and real works of art, some of which were much admired at the exhibition of 1889, are produced by these humble peasant sculptors in horn, mother-of-pearl and iron. Farther south, the polishing of marble goods is carried on in numbers of small workshops, scattered round Solesmes and grouped round one central establishment where marble pieces are roughly shaped with the aid of steam, to be finished in the small village workshops. At Sable the workers in that branch, who all own their houses and gardens, enjoy a real well-being especially noticed by our traveller.[27]

In the woody regions of the Perche and the Maine we find all sorts of wooden industries which evidently could only be maintained owing to the communal possession of the woods. Near the forest of Perseigne there is a small burg, Fresnaye, which is entirely peopled with workers in wood.

"There is not one house," Ardouin Dumazet writes, "in which wooden goods would not be fabricated. Some years ago there was little variety in their produce; spoons, salt-boxes, shepherds' boxes, scales, various wooden pieces for weavers, flutes and hautboys, spindles, wooden measures, funnels, and wooden bowls were only made. But Paris wanted to have a thousand things in which wood was combined with iron: mouse-traps, cloak-pegs, spoons for jam, brooms… And now every house has a workshop containing either a turninglathe, or some machine-tools for chopping wood, for making lattice-work, and so on… Quite a new industry was born, and the most coquettish things are now fabricated. Owing to this industry the population is happy. The earnings are not high, but each worker owns his house and garden, and occasionally a bit of field."[28]

At Neufchatel wooden shoes are made, and the hamlet, we are told, has a most smiling aspect. To every house a garden is attached,and none of the misery of big cities is to be seen. At Jupilles

[25] Ardouin Dumazet, vol. v., pp. 259–266.

[26] I gave some information about French prison work in a book, In Russian and French Prisons, London, 1888.

[27] Ardouin Dumazet, Vol. ii., p. 51.

[28] Ibid., Vol. i., pp. 305, 306.

and in the surrounding country other varieties of wooden goods are produced: taps, boxes of different kinds, together with wooden shoes; while at the forest of Vibraye two workshops have been erected for turning out umbrella handles by the million for all France. One of these workshops having been founded by a worker sculptor, he has invented and introduced in his workshop the most ingenious machine-tools. About 150 men work at this factory; but it is evident that half a dozen smaller workshops, scattered in the villages, would have answered equally well.

Going now over to a quite different region, the Nievre, in the centre of France, and Haute Marne, in the east — we find that both regions are great centres for a variety of small industries, some of which are maintained by associations of workers, while others have grown up in the shadow of factories. The small iron workshops which formerly covered the country have not disappeared: they have undergone a transformation; and now the country is covered with small workshops where agricultural machinery, chemical produce, and pottery are fabricated; "one ought to go as far as Guerigny and Fourchambault to find the great industry;"[29] while a number of small workshops for the fabrication of a variety of hardware flourish by the side of, and owing to the proximity of, the industrial centres.

Pottery makes the fortune of the valley of the Loire about Nevers. High-class art pottery is made in this town, while in the villages plain pottery is fabricated and exported by merchants who go about with their boats selling it. At Gien a large factory of china buttons (made out of felspar-powder cemented with milk) has lately been established, and employs 1,500 workmen, who produce from 3,500 to 4,500 lb. of buttons every day. And, as is often the case, part of the work is done in the villages. For many miles on both banks of the Loire, in all villages, old people, women and children sew the buttons to the cardboard pieces. Of course, that sort of work is wretchedly paid; but it is resorted to only because there is no other sort of industry in the neighbourhood to which the peasants could give their leisure time.

In the same region of the Haute Marne, especially in the neighbourhood of Nogent, we find cutlery as a by-occupation to agriculture, Landed property is very much subdivided in that part of France, and great numbers of peasants own but from two to three acres per family, or even less. Consequently, in thirty villages round Nogent, about 5,000 men are engaged in cutlery, chiefly of the highest sort (artistic knives are occasionally sold at as much as £20 a piece), while the lower sorts are fabricated in the neighbourhoods of Thiers, in Puy-de-Dome (Auvergne). The Nogent industry has developed spontaneously, with no aid from without, and in its technical part it shows considerable progress.[30] At Thiers, where the cheapest sorts of cutlery are made, the division of labour, the cheapness of rent for small workshops supplied with motive power from the Durolle river, or from small gas motors, the aid of a great variety of specially invented machine-tools, and the existing combination of machine-work with hand-work have resulted in such a perfection of the technical part of the trade that it is considered doubtful whether the factory system could further economise labour.[31] For twelve miles round Thiers, in each direction, all the streamlets are dotted with small work-shops, in which peasants, who continue to cultivate their fields, are at work.

Basket-making is again an important cottage industry in several parts of France, namely in Aisne and in Haute Marne. In this last department, at Villaines, everyone is a basketmaker, "and

[29] Ardouin Dumazet, vol. i., p. 52.

[30] Prof. Issaieff in the Russian *Memoirs of the Petty Trades Commission (Trudy Kustarnoi Kommissii)*, vol. v.

[31] Knives are sold at from 6s. 4d. to 8s. per gross, and razors at 3s. 3d. per gross "for export."

all the basketmakers belong to a co-operative society," Ardouin Dumazet remarks.[32] "There are no employers; all the produce is brought once a fortnight to the co-operative stores and there it is sold for the association. About 150 families belong to it, and each owns a house and some vineyards." At Fays-Billot, also in Haute Marne, 1,500 basket-makers belong to an association; while at Thiérache, where several thousand men are engaged in the same trade, no association has been formed, the earnings being in consequence extremely low.

Another very important centre of petty trades is the French Jura, or the French part of the Jura Mountains, where the watch trade has attained, as known, a high development. When 1 visited these villages between the Swiss frontier and Besançon in the year 1878, I was struck by the high degree of relative well-being which I could observe, even though I was perfectly well acquainted with the Swiss villages in the Val de Saint Imier. It is very probable that the machine-made watches have brought about a crisis in French watch-making as they have in Switzerland. But it is known that part, at least, of the Swiss watch-makers have strenuously fought against the necessity of being enrolled in the factories, and that while watch factories grew up at Geneva and elsewhere, considerable numbers of the watchmakers have taken to divers other trades which continue to be carried on as domestic or small industries. I must only add that in the French Jura great numbers of watch-makers were at the same time owners of their houses and gardens, very often of bits of fields, and especially of communal meadows, and that the communal *fruitières*, or creameries, for the common sale of butter and cheese, are widely spread in that part of France.

So far as I could ascertain, the development of the machine-made watch industry has not destroyed the small industries of the Jura hills. The watch-makers have taken to new branches, and, as in Switzerland, they have created various new industries. From Ardouin Dumazet's travels we can, at anyrate, borrow an insight into the present state of the southern part of this region. In the neighbourhoods of Nantua and Cluses silks are woven in nearly all villages, the peasants giving to weaving their spare time from agriculture, while quite a number of small workshops (mostly less than twenty looms, one of 100 looms) are scattered in the little villages, on the streamlets running from the hills. Scores of small saw-mills have also been built along the streamlet Merloz, for the fabrication of all sorts of little pretty things in wood. At Oyonnax, a small town on the Ain, we have a big centre for the fabrication of combs, an industry more than 200 years old, which took a now development since the last war through the invention of celluloid. No less than 100 or 120 "masters" employ from two to fifteen workers each, while over 1,200 persons work in their houses, making combs out of Irish horn and French celluloid. Wheelpower was formerly rented in small workshops, but electricity, generated by a waterfall, has lately been introduced, and is now distributed in the houses for bringing into motion small motors of from onequarter to twelve horsepower. And it is remarkable to notice that as soon as electricity gave the possibility to return to domestic work, 300 workers left at once the small workshops and took to work in their houses. Most of these workers have their own cottages and gardens, and they show a very interesting spirit of association. They have also erected four workshops for making cardboard boxes, and their production is valued at 2,000,000 fr. every year.[33]

At St. Claude, which is a great centre for briar pipes (sold in large quantities in London with English trade-marks, and therefore eagerly bought by those Frenchmen who visit London, as a souvenir from the other side of the Channel), both big and small workshops, supplied by motive

[32] Ardouin Dumazet, vol. i., p. 213 et seg.

[33] Ardouin Dumazet, vol. viii., p. 40.

force from the Tacon streamlet, prosper by the side of each other. Over 4,000 men and women are employed in this trade, while all sorts of small by-trades have grown by its side (amber and horn mouth-pieces, sheaths, etc.). Countless small workshops are busy besides, on the banks of the two streams, with the fabrication of all sorts of wooden things: match-boxes, beads, sheaths for spectacles, small things in horn, and so on, to say nothing of a rather large factory (200 workers) where metric measures are fabricated for the whole world. At the same time thousands of persons in St. Claude, in the neighbouring villages and in the smallest mountain hamlets, are busy in cutting diamonds (an industry only fifteen years old in this region), and other thousands are busy in cutting various less precious stones. All this is done in quite small workshops supplied by water-power.[34]

The extraction of ice from some lakes and the gathering of oak-bark for tanneries complete the picture of these busy villages, where industry joins hands with agriculture, and modern machines and appliances are so well put in the service of the small workshops.

On the other side, at Besançon, which was, in 1878, when I visited it, a great centre for watch-making, "all taken, nothing has yet been changed in the habits of the workingclass," M. Dumazet wrote in 1901. The watchmakers continued to work in their houses or in small workshops.[35] Only there was no complete fabrication of the watch or the clock. Many important parts — the wheels, etc. — were imported from Switzerland or from different towns of France. And, as is always the case, numerous small secondary workshops for making the watch-cases, the hands, and so on, grew up in that neighbourhood.

The same has to be said of Montbéliard — another important centre of the watch trade. By the side of the manufactures, where all the parts of the mechanism of the watch are fabricated by machinery, there is quite a number of workshops where various parts of the watch are made by skilled workmen; and this industry has already given birth to a new branch — the making of various tools for these workshops, as also for different other trades.

In other parts of the same region, such as Héricourt, a variety of small industries has grown by the side of the great ironmongery factories. The city spreads into the villages, where the population are making coffee-mills, spice-mills, machines for crushing the grain for the cattle, as well as saddlery, small ironmongery, or even watches. Elsewhere the fabrication of different small parts of the watch having been monopolised by the factories, the workshops began to manufacture the small parts of the bicycles, and later on of the motor-cars. In short, we have here quite a world of industries of modern origin, and with them of inventions made to simplify the work of the band.

Finally, omitting a mass of small trades, I will only name the hat-makers of the Loire, the stationery of the Ardèche, the fabrication of hardware in the Doubs, the glove-makers of the Isère, the broom and brush-makers of the Oise (valued at £800,000 per annum), and the house machine-knitting in the neighbourhoods of Troyes. But I must say a few words more about two important centres of small industries: the Lyons region and Paris.

At the present time the industrial region of which Lyons is the centre[36] includes the departments of Rhône, Loire, Drôme, Saône-et-Loire, Ain, the southern part of the Jura department, and the western part of Savoy, as far as Annecy, while the silkworm is reared as far as the Alps,

[34] lnteresting details about the small industries of this region will be found in the articles of Ch. Guicysse, in *Pages libres*, 1902, Nos. 66 and 71.

[35] Ardouin Dumazet, vol. xxiii., pp. 105, 106.

[36] For further details see Appendix U.

the Cévennes Mountains, and the neighbourhoods of Macon. It contains, besides fertile plains, large billy tracks, also very fertile as a rule, but covered with snow during part of the winter, and the rural populations are therefore bound to resort to some industrial occupation in addition to agriculture; they find it in silk-weaving and various small industries. Altogether it may be said that the *région lyonnaise* is characterised as a separate centre of French civilisation and art, and that a remarkable spirit of research, discovery and invention has developed there in all directions — scientific and industrial.

The Croix Rousso at Lyons, where the silkweavers (*canuts*) have their chief quarters, is the centre of that industry, and in IS95 the whole of that hill, thickly covered with houses, five, six, eight and ten storeys high, resounded with the noise of the looms which were busily going in every department of that big agglomeration. Electricity has lately been brought into the service of this domestic industry, supplying motive power to the looms.

To the south of Lyons, in the city of Vienne, hand-weaving is disappearing. "Shoddy" is now the leading produce, and twenty-eight concerns only remain out of the 120 *fabriques* which existed thirty years ago. Old woollen rags, rags of carpets, and all the dust from the carding and spinning in the wool and cotton factories of Northern France, with a small addition of cotton, are transformed here into cloth which flows from Vienne to all the big cities of France — 20,000 yards of "shoddy" every day — to supply the ready-made clothing factories, Hand-weaving has evidently nothing to do in that industry, and in 1890 only 1,300 hand-looms were at work out of the 4,000 which were in motion in 1870. Large factories, employing a total of 1,800 workers, have taken the place of these hand-weavers, while "shoddy" has taken the place of cloth. All sorts of flannels, felt hats, tissues of horse-hair, and so on, are fabricated at the same time. But while the great factory thus conquered the city of Vienne., its suburbs and its nearest surroundings became the centre of a prosperous gardening and fruit culture, which has already been mentioned in chapter iv.

The banks of the Rhône, between Ampuis and Condrieu, are one of the wealthiest parts, of all France, owing to the shrubberies and nurseries, marketgardening, fruit-growing, vinegrowing, and cheese-making out of goats' milk. I-louse industries go there hand in hand with an intelligent culture of the soil; Condrieu, for instance, is a famous centre for embroidery, which is made partly by hand, as of old, and partly by machinery.

In the west of Lyons, at I'Arbresles, factories have grown up for making silks and velvets; but a large part of the population still continue to weave in their houses; while farther west, Panissières is the centre of quite a number of villages in which linen and silks are woven as a domestic industry. Not all these workers own their houses, but those, at least, who own or rent a small piece of land or garden, or keep a couple of cows, are said to be well off, and the land, as a rule, is said to be admirably cultivated by these weavers.

The chief industrial centre of this part of the Lyons region is certainly Tarare. At the time when Reybaud wrote his already-mentioned work, *Le Coton*, it was a centre for the manufacture of muslins and it occupied in this industry the same position as Leeds formerly occupied in this country in the woollen cloth trade. The spinning mills and the large finishing factories were at Tarare, while the weaving of the muslins and the embroidery of the same were made in the surrounding villages, especially in the hilly tracts of the Beaujolais and the Forez. Each peasant house, each farm and *métayerie* were small workshops at that time, and one could see, Reybaud wrote, the lad of twenty embroidering fine muslin after he had finished cleaning the farm stables, without the work suffering in its delicacy from a combination of two such varied pursuits. On the

contrary, the delicacy of the work and the extreme variety of patterns were a distinctive feature of the Tarare muslins and a cause of their success. All testimonies agreed at the same time in recognising that, while agriculture found support in the industry, the agricultural population enjoyed a relative well-being.

By this time the industry has undergone a thorough transformation, but still no less than 60,000 persons, representing a population of about 250,000 souls, work for Tarare in the hilly tracts, weaving all sorts of muslins for all parts of the world, and they earn every year £480,000 in this way.

Amplepuis, notwithstanding its own factories of silks and blankets, remains one of the local centres for such muslins; while close by, Thizy is a centre for a variety of linings, flannels, "peruvian serges," "oxfords," and other mixed woollen-and-cotton stuffs which are woven in the mountains by the peasants. No less than 3,000 hand-looms are thus scattered in twentytwo villages., and about £600,000 worth of various stuffs are woven every year by the rural weavers in this neighbourhood alone; while 15,000 powerlooms are at work in both Thizy and the great city of Roanne, in which two towns all varieties of cottons (linings, flannelettes, apron cloth) and. silk blankets are woven in factories by the million yards.

At Cours, 1,600 workers are employed in making "blankets," chiefly of the lowest sort (even such as are sold at 2s. and even 10d. a piece, for export to Brazil); all possible and imaginable rags and sweepings from all sorts of textile factories (jute, cotton, flax, hemp, wool and silk) are used for that industry, in which the factory is, of course, fully victorious. But even at Roanne, where the fabrication of cottons has attained a great degree of perfection and 9,000 power-looms are at work, producing every year more than 30,000,000 yards — even at Roanne one finds with astonishment that domestic industries are not dead, but yield every year the respectable amount of more than 10,000,000 yards of stuffs. At the same time, in the neighbourhood of that big city the industry of fancylinitting has taken within the last thirty years a sudden development. Only 2,000 women were employed in it in 1864, but their numbers were estimated by M. Dumazet at 20,000; and, without abandoning their rural work, they find time to knit, with the aid of small knitting-machines, all sorts of fancy articles in wool, the annual value of which attains £6360,000.[37]

It must not be thought, however, that textiles and connected trades are the only small industries in this locality. Scores of various rural industries continue to exist besides, and in nearly all of them the methods of production are continually improved. Thus, when the rural making of plain chairs became unprofitable, articles of luxury and stylish chairs began to be fabricated in the villages, and similar transformations are found everywhere.

More details about this extremely interesting region will be found in the Appendix, but one remark must be made in this place. Notwithstanding its big industries and coal mines, this part of France has entirely maintained its rural aspect, and is now one of the best cultivated parts of the country. What most deserves admiration is — not so much the development of the great industries, which, after all, here as elsewhere, are to a great extent international in their origins — as the creative and inventive powers and capacities of adaptation which appear amongst the great mass of these industrious populations. At every step, in the field, in the garden, in the orchard, in the dairy, in the industrial arts, in the hundreds of small inventions in these arts, one

[37] Ardouin Dumazet, vol. viii., p. 266.

sees the creative genius of the folk. In these regions one best understands why France, taking the mass of its population, is considered the richest country of Europe.[38]

The chief centre for petty trades in France is, however, Paris. There we find, by the side of the large factories, the greatest variety of petty trades for the fabrication of goods of every description, both for the home market and for export. The petty trades at Paris so much prevail over the factories that the average number of workmen employed in the 98,000 factories and workshops of Paris is less than ,six, while the number of persons employed in workshops which have less than five operatives is almost twice as big as the number of persons, employed in the larger establishments.[39] In fact, Paris is a great bee-hive where hundreds of thousands of men and women fabricate in small workshops all possible varieties of goods which require skill, taste and invention. These small workshops, in which artistic finish and rapidity of work are so much praised, necessarily stimulate the mental powers of the producers; and we may safely admit that if the Paris workmen are generally considered, and really are, more developed intellectually than the workers of any other European capital, this is due to a great extent to the character of the work they are engaged in — a work which implies artistic taste, skill, and especially inventiveness, always wide awake in order to invent now patterns of goods and steadily to increase and to perfect the technical methods of production. It also appears very probable that if we find a highly developed working population in Vienna and Warsaw, this depends again to a very great extent upon the very considerable development of similar small industries, which stimulate invention and so much contribute to develop the worker's intelligence.

The *Galerie du travail* at the Paris exhibitions is always a most remarkable sight. One can appreciate in it both the variety of the small. industries which are carried on in French towns and the skill and inventing powers of the workers. And the question necessarily arises: Must all this skill, all this intelligence, be swept away by the factory, instead of becoming a new fertile source of progress under a better organisation of production? must all this independence and inventiveness of the worker disappear before the factory levelling? and, if it must, would such a transformation be a progress, as so many economists who have only studied figures and not human beings are ready to maintain?

At anyrate, it is quite certain that even if the absorption of the French petty trades by the big factories were possible — which seems extremely doubtful — the absorption would not be accomplished so soon as that. The small industry of Paris fights hard for its maintenance, and it shows its vitality by the numberless machine-tools which are continually invented by the workers for improving and cheapening the produce.

The numbers of motors which were exhibited at the last exhibitions in the *Galerie du travail* bear a testimony to the fact that a cheap motor, for the small industry, is one of the leading problems of the day. Motors weighing only forty-five lb., including the boiler, were exhibited in 1889 to answer that want. Small two-horsepower engines, fabricated by the engineers of the Jura (formerly watch-makers) in their small works-hops, were at that time another attempt to

[38] Some further details about the Lyons region and St. Etienne are given in Appendix U.

[39] In 1873, out of a total population of 1,851,800 inhabiting Paris, 816,040 (404,408 men and 411,632 women) were living on industry, and out of them only 293,691 were connected with the factories (*grande industrie*), while 522,349 were living on the petty trades (*petite indu8trie*) — Maxime du Camp, *Paris et ses Organes*, vol. vi. It is interesting to note that of late the small workshops where some of the finest work is made in metals, wood, and so on, have begun to be scattered round Paris.

solve the problemto say nothing of the water, gas and. electrical motors.[40] The transmission of steam-power to 230 small workshops which was made by the *Société des Immeubles industriels* was another attempt in the same direction, and the increasing efforts of the French engineers for finding out the best means of transmitting and subdividing power by means of compressed air, "tole-dynamic cables," and electricity are indicative of the endeavours of the small industry to retain its ground in the face of the competition of the factories. (See Appendix V.)

Such are the small industries in France, as they have been described by observers who saw them on the spot. Is is, however, most interesting to have exact statistical items concerning the extension of the small industries, and to know their importance, in comparison with the, great industry. Fortunately enough, a general census of the French industries was made in the year 1896; its results have been published in full, under the title of *Résultats statistiques du recensement des industries et des professions*, and in the fourth volume of this capital work we find an excellent summing up of the main results of the census, written by M. Lucien March. I give a *résumé* of these results in the Appendix, as otherwise I should have been compelled, in speaking of the distribution of great and small industry in France, to repeat very much what I have said in this same chapter, speaking of the United Kingdom. There is so much in common in the distribution of small and large factories in the different branches of industry in both countries that it would have been a tedious repetition. So I give here only the main items and refer the reader to Appendix W.

The general distribution of the workers' population in large, middle-sized, and *small factories in the year 1896 was as follows. First of all there was the great division of independent artisans who worked single-banded, and working men and women who were without permanent employment on the day of the census. Part of this large division belongs to agriculture but, after having deducted the agricultural establishments, M. March arrives at the figures of 483,000 establishments belonging to this category in industry, and 1,047,000 persons of both sexes working in these establishments, or temporarily attached to some industrial establishment. To these we must add 37,705 industrial establishments, where no hired workmen are employed, but the head of the establishment works with the aid of the members of his own family. We have thus, in these two divisions, about 520,700 establishments and 1,084,700 persons which I inscribe in the following table under the head of "No hired operatives." The table then appears as follows: —

	Number of Establisments and clerks	Number of operatives
No hired operatives	520,700	1,084,700
From 1 to 10 employees	539,449	1,134,700
From 11 to 50 "	28,626	585,000
From 51 to 100 "	3,865	268,000
From 101 to 500 "	3,145	616,000
From 501 to 1000 "	295	195,000
More than 1000 "	149	313,000
	575,529	3,111,700
Total (with first division)	1,096,229	4,196,400

[40] Everyone knows what an immense progress has been realised since by the motors used in motor cars and aeroplanes, and what is achieved now by the transmission of electrical power. But I leave these lines as they were written, as a testimony of the way in which the conquest of air began, and of the part taken in it by the French small industry.

These figures speak for themselves and show what an immense importance the small industry has in France. More details, showing the distribution of the great, middle-sized and small industry in different branches will be found in the Appendix, and there the reader will also see what a striking resemblance is offered under this aspect by the industry of France and that of the United Kingdom. In the next chapter it will be seen from a similar census that Germany stands in absolutely the same position.

It would have been very interesting to compare the present distribution of industries in France with what it was previously. But M. Lucien March tells us that "*no statistics previous to 1896 have given us a knowledge of that distribution.*" Still, an inquest made between 1840 and 1845, and which M. March considers "very complete for the more important establishments which employed more than fifty workmen," was worked out by him, and he found that such establishments numbered 3,300 in 1840; in 1896 they had already attained the number of 7,400, and they occupied more than fifty-five per cent. of all the workpeople employed in industry. As to the establishments which employed more than 500 persons and which — numbered 133 in 1840 (six per cent. of all the workpeople), they attained the number of 444 in 1896, and sixteen per cent. of all the workpeople were employed in them.

The conclusion to be drawn from these fact is thus worded by M. March: "To sum up, during the last fifty years a notable concentration of the factories took place in the big establishments; but the just-mentioned results, supported by the statistics of the patents, permit us to recognise that *this concentration does not prevent the maintenance of a mass of small enterprises, the average sizes of which increase but very slowly.*" This last is, in fact, what we have just seen from our brief sketch for the United Kingdom, and we can only ask ourselves whether — such being the facts — the word "concentration" is well chosen. What we see in reality is, the appearance, in *some branches of industry*, of a certain number of large establishments, and especially of middle-sized factories. But this does not prevent in the least that very great numbers of small factories should continue to exist, either in other branches, or in the very same branches where large factories have appeared (the textiles, work in metal), or in branches connected with the main ones, which take their origin in these main ones, as the industry of clothing takes its origin from that of the textiles.

This is the only conclusion which a serious analysis permits us to draw from the facts brought to light by the census of 1896 and subsequent observations. As to the large deductions about "concentration" made by certain economists, they are mere *hypotheses* — useful, of course, for stimulating research, but becoming quit obnoxious when they are represented *as economical laws*, when in reality they are not confirmed at all by the testimony of carefully observed facts.

The various industries which still have retained in Germany the characters of petty and domestic trades have been the subject of many exhaustive explorations, especially by A. M. Thun and Prof. Issaieff, on behalf of the Russian Petty Trades Commission, Emanuel Hans Sax, Paul Voigt, and very many others. By this time the subject has a bulky literature, and such impressive and suggestive pictures have been drawn from life for different regions and trades that I felt tempted to sum up these life-true descriptions. However, as in such a summary I should have to repeat much of what has already been said and illustrated in the preceding chapter, it will probably more interest the general reader to know something about the conclusions which can

be drawn from the works of the German investigators,[41] and to know the conclusions that may be drawn from the three censuses of industries which have been made in Germany in the years 1882, 1895, and 1907. This is what I am going to do.

Unhappily, the discussion upon this important subject has often taken in Germany a passionate and even a personally aggressive character[42] On. the one hand the ultra-conservative elements of German politics tried, and succeeded to some extent, in making of the petty trades and the domestic industries an arm for securing a return to the "olden good times." They even passed a law intended to prepare a reintroduction of the old-fashioned, closed and patriarchal corporations which could be placed under the close supervision and tutorship of the State, and they saw in such a law a weapon against social democracy. On the other hand, the social democrats, justly opposed to such measures, but themselves inclined, in their turn, to take too abstract a view of economical questions, bitterly attack all those who do not merely repeat the stereotyped phrases to the effect that "the petty trades are in decay," and "the sooner they disappear the better," as they will give room to capitalist centralisation, which, according to the social democratic creed, "will soon achieve its own ruin." In this dislike of the small industries they are, of course, at one with the economists of the orthodox school, whom they combat on nearly all other points.[43]

Under such conditions, the polemics about the petty trades and the domestic industries are evidently doomed to remain most unproductive. However, it is pleasant to see that a considerable amount of most conscientious work has boon made for the investigation of the petty trades in Germany; and, by the side of such monographs, from which nothing can be learned but that the petty trades' workers are in a miserable condition, and nothing whatever can be gathered to explain why these workers prefer their conditions to those of factory hands — there is no lack, of very detailed monographs (such as those of Thun, Em. 14. Sax, Paul Voigt on the Berlin cabinetmakers, etc.), in which one sees the whole of the life of these classes of workers, the difficulties which they have to cope with, and the technical conditions of the trade, and finds all the elements for an independent judgment upon the matter.

[41] The remarks of Prof. Issaieff — a thorough investigator of petty trades in Russia, Germany and France — (see *Works of the Commission for the Study of Petty Trades in Russia* (Russian), St. Petersburg, 1879–1887 vol. i.) were for me a valuable guide when I prepared the first edition of this book. Since that time the two industrial censuses of 1895 and 1907 have yielded such a valuable material, that there are quite a number of German works which came to the same conclusions. I shall mention them further on.

[42] See K. Buecher's Preface to the *Untersuchungen über die Lage des Handwerks in Deutschland*, vol. iv.

[43] The foundation for this creed is contained in one of the concluding chapters of Marx's *Kapitall* (the last but one), in which the author spoke of the concentration of capital and saw in it the "fatality of a natural law." In the "forties," this idea of "concentration of capital," originated from what was going on in the textile industries, was continually recurring in the writings of all the French socialists, especially Considérant, and their German followers, and it was used by them as an argument in favour of the necessity of a social revolution. But Marx was too much of a thinker that he should not have taken notice of the subsequent developments of industrial life, which were not foreseen in 1848; if he had lived now, he surely would not have shut his eyes to the formidable growth of the numbers of small capitalists and to the middle-class fortunes which are made in a thousand ways under the shadow of the modern "millionaires." Very likely he would have noticed also the extreme slowness with which the wrecking of small industries goes on — a slowness which could not be predicted fifty or forty years ago, because no one could foresee at that time the facilities which have been offered since for transport, the growing variety of demand, nor the cheap means which are now in use for the supply of motive power in small quantities. Being a thinker, lie would have studied these facts, and very probably he would have mitigated the absoluteness of his earlier formulae, as in fact he did once with regard to the village community in Russia. It would be most desirable that his followers should rely less upon abstract forinulae — easy as they may be as watchwords in political struggles — and try to imitate their teacher in his analysis of concrete economical phenomena.

It is evident that a number of petty trades are already now doomed to disappear; but. there are others, on the contrary, which are endowed with a great vitality, and all chances are in favour of their continuing to exist and to take a further development for many years to come. In the fabrication of such textiles as are woven by millions of yards, and can be best produced with the aid of a complicated machinery, the competition of the hand-loom against the power-loom is evidently nothing but a survival, which may be maintained for some time by certain local conditions, but finally must die away.

The same is true with regard to many branches of the iron industries, hardware fabrication, pottery, and so on. But wherever the direct intervention of taste and inventiveness are required, wherever new patterns of goods requiring a continual renewal of machinery and tools must continually be introduced in order to feed the demand, as is the case with all fancy textiles, even though they be fabricated to supply the millions; wherever a great variety of goods and the uninterrupted invention of new ones goes on, as is the case in the toy trade., in instrument making, watch-making, bicycle making, and so on; and finally, wherever the artistic feeling of the individual worker makes the best part of his goods, as is the case in hundreds of branches of small articles of luxury, there is a wide field for petty trades, rural workshops, domestic industries, and the like. More fresh air, more ideas, more general conceptions, and more co-operation are evidently required in those industries. But where the spirit of initiative has been awakened in one way or another, we see the petty industries taking a new development in Germany, as we have just seen that being done in France.

Now, in nearly all the petty trades in Germany, the position of the workers is unanimously described as most miserable, and the many admirers of centralisation which we find in Germany always insist upon this misery in order to predict, and to call for, the disappearance of "those mediaeval survivals" which "capitalist centralisation" must supplant for the benefit of the worker. The reality is, however, that when we compare the miserable conditions of the workers in the petty trades with the conditions of the wage workers in the factories, in the same regions and in the same trades, we see that the very same misery — prevails among the factory workers. They live upon wages of from nine to eleven shillings a week, in town slums instead of the country. They work eleven hours a day, and they also are subject to the extra misery thrown upon them during the frequently recurring crises. It is only after they have undergone all Sorts of sufferings in their struggles against their employers that some factory workers succeed, more or less, here and there, to wrest from their employers a "living wage" — and this again only in certain trades.

To welcome all these sufferings, seeing in them the action of a "natural law" and a necessary step towards the necessary concentration of industry, would be simply absurd. While to maintain that the pauperisation of all workers and the wreckage of all village industries are a necessary step towards a higher form of industrial organisation would be, not only to affirm much more than one is entitled to affirm under the present imperfect state of economical knowledge, but to show an absolute want of comprehension of the sense of both natural and economic laws. Everyone, on the contrary, who has studied the question of the growth of great industries on its own merits, will undoubtedly agree with Thorold Rogers, who considered the sufferings inflicted upon the labouring classes for that purpose as having been of no necessity whatever, and simply having been inflicted to suit the temporary interests of the few — by no means those of the nation.[44]

[44] *The Economic Interpretation of History.*

Moreover, everyone knows to what extent the labour of children and girls is resorted to, even in the most prosperous factories — even in this country which stands foremost in industrial development. Some figures relative to this subject were given in the preceding chapter. And this fact is not an accident which might be easily removed, as Maurice Block — a great admirer, of course, of the factory systemtries to represent it.[45] The low wages paid to children and youths are now one of the *necessary* elements in the cheapness of the factory produced textiles, and, consequently, of the very competition of the factory with the petty trades. I have mentioned besides, whilst speaking of France, what are the effects of concentrated "industries upon village life and in Thun's work, and in many others as well, one may find enough of ghastly instances of what are the effects of accumulations of girls in the factories. To idealise the modern factory, in order to depreciate the so-called "mediaeval" forms of the small industries, is consequently to say the least — as unreasonable as to idealise the latter and try to bring mankind back to isolated homespinning and home-weaving in every peasant house.

One fact dominates all the investigations which have been made into the conditions of the small industries. We find it in Germany, as well as in France or in Russia. In an immense number of trades it is not the superiority of the technical organisation of the trade in a factory, nor the economies realised on the prime-motor, which militate against the small industry in favour of the factories, but the more advantageous conditions for selling the produce and for buying the raw produce which are at the disposal of big concerns. Wherever this difficulty has been overcome, either by means of association, or in consequence of a market being secured for the sale of the produce, it has always been found-first, that the conditions of the workers or artisans immediately improved; and next, that a rapid progress was realised in the technical aspects of the respective industries. New processes were introduced to improve the produce or to increase the rapidity of its fabrication; new machine-tools were invented; or new motors were resorted to; or the trade was reorganised so as to diminish the costs of production.

On the contrary, wherever the helpless, isolated artisans and workers continue to remain at the mercy of the wholesale buyers, who always — since Adam Smith's time — "openly or tacitly" agree to act as one man to bring down the prices almost to a starvation level — and such is the case for the immense number of the small and village industries their condition is so bad that only the longing of the workers after a certain relative independence, and their knowledge of what awaits them in the factory, prevent them from joining the ranks of the factory hands. Knowing that in most cases the advent of the factory would mean no work at all for most men, and the taking of the children and girls to the factory, they do the utmost to prevent it from appearing at all in the village.

As to combinations in the villages, cooperation and the like, one must never forget how jealously the German, the French, the Russian and the Austrian Governments have hitherto prevented the workers, *and especially the village workers,* from entering into any sort of combination for economical purposes. In France the peasant syndicates were permitted only by the law of 1884. To keep the peasant at the lowest possible level, by means of taxation, serfdom, and the like, has been, and is still, the policy of most continental States. It was only in 1876 that some extension of the association rights was granted in Germany, and even now a mere co-operative association for the sale of the artisans' work is soon reported as a "political association" and submitted as

[45] *Les Progrès de la Science économique depuis Adam Smith,* Paris, 1890, t. i., pp. 460,461.

such to the usual limitations, such as the exclusion of women and the like.[46] A striking example of that policy as regards a village association was given by Prof. Issaieff, who also mentioned the severe measures taken by the wholesale buyers in the toy trade to prevent the workers from entering into direct intercourse with foreign buyers.

When one examines with more than a superficial attention the life of the small industries and their struggles for life, one sees that when they perish, they perish — not because "an economy can be realised by using a hundred horsepower motor, instead of a hundred small motors" — this inconveniency never fails to be mentioned, although it is easily obviated in Sheffield, in Paris, and many other places by hiring workshops with wheel-power, supplied by a central machine, and, still more, as was so truly observed by Prof. W. Unwin, by the electric transmission of power. They do not perish because a substantial economy can be realised in the factory production — in many more cases than is usually supposed, the fact is even the reverse — but because the capitalist who establishes a factory emancipates himself from the wholesale and retail dealers in raw materials; and especially, because he emancipates himself from the buyers of his produce and can deal directly with the wholesale buyer and exporter; or else he concentrates in one concern the different stages of fabrication of a given produce. The pages which Schulze-Gäwernitz gave to the organisation of the cotton industry in England, and to the difficulties which the German cotton-mill owners had to contend with, so long as they were dependent — upon Liverpool for raw cotton, are most instructive in this direction. And what characterises the cotton trade prevails in all other industries as well.

If the Sheffield cutlers who now work in their tiny workshops, in one of the above mentioned buildings supplied with wheel-power, were incorporated in one big factory, the chief advantage which would be realised in the factory would not be an economy in the costs of production, in comparison to the quality of the produce; with a shareholders' company the costs might even increase. And yet the profits (including wages) probably would be greater than the aggregate earnings of the workers, in consequence of the reduced costs of purchase of iron and coal, and the facilities for the sale of the produce. The great concern would thus find its advantages not in such factors as are imposed by the technical necessities of the trade at the time being, but in such factors as could be eliminated by cooperative organisation. All these are elementary notions among practical men.

It hardly need be added that a further advantage which the factory owner has is, that he can find a sale even for produce of the most inferior quality, provided there is a considerable quantity of it to be sold. All those who are acquainted with commerce know, indeed, what an immense bulk of the world's trade consists of "shoddy," *patraque,* "Red Indians' blankets," and the like, shipped to distant countries. Whole cities — we just saw — produce nothing but "shoddy."

Altogether, it may be taken as one of the fundamental facts of the economical life of Europe that the defeat of a number of small trades, artisan work and domestic industries, came through their being incapable of organising the sale of their produce — not from the production itself. The same thing recurs at every page of economical history. The incapacity of organising the sale, without being enslaved by the merchant, was the leading feature of the Mediaeval cities, which gradually fell under the economical and political yoke of the Guild-Merchant, *simply because they were not able to maintain the sale of their manufactures by the community as a whole,* or to

[46] See the discussions in the Reichstag in January, 1909, on the Polish Syndicates, and the application that is made to them of the paragraph of the law of the associations relative to language (*Spraakenzaragraph*).

organise the sale of a new produce in the interest of the community. When the markets for such commodities came to be Asia on the one side, and the New World on the other side, such was fatally the case; since commerce had ceased to be communal, and had become individual, the cities became a prey for the rivalries of the chief merchant families.

Even nowadays, when we see the co-operative societies beginning to succeed in their productive workshops, while fifty years ago they invariably failed in their capacity of producers, we may conclude that the cause of their previous failures was not in their incapacity of properly and economically organising production, but in their inability of acting as sellers and exporters of the produce they bad fabricated. Their present successes, on the contrary, are fully accounted for by the network of distributive societies which they have at their command. The sale has been simplified, and production has been rendered possible *by first organising the market.*

Such are a few conclusions which may be drawn from a study of the small industries in Germany and elsewhere. And it may be safely said, with regard to Germany, that if measures are not taken for driving the peasants from the land on the same scale as they have been taken in this country; if, on the contrary, the numbers of small landholders multiply, they necessarily will turn to various small trades, in addition to agriculture, as they have done, and are doing, in France. Every step that may be taken, either for awakening intellectual life in the villages, or for assuring the peasants' or the country's rights upon the land, will necessarily further the growth of industries in the villages.

In this light it is extremely interesting to see the figures as to the distribution of the German industries into a small, middle-sized, and great industry, which are given by three industrial censuses taken during the last thirty years. But for these figures I refer the reader to the Appendix.[47]

Petty Trades in Other Countries

If it were worth extending our inquiry to other countries, we should find a vast field for most interesting observations in Switzerland. There we should see the same vitality in a variety of petty industries, and we could mention what has been done in the different cantons for maintaining the small trades by three different sets of measures : the extension of co-operation; a wide extension of technical education in the schools and the introduction of new branches of semi-artistic production in different parts of the country; and the supply of cheap motive power in the houses by means of a hydraulic or an electric transmission of power borrowed from the waterfalls. A separate book of the greatest interest and value could be written on this subject, especially on the impulse given to a number of petty trades, old and new, by means of a cheap supply of motive power. Such a book would also offer a great interest in that it would show to what an extent that mingling together of agriculture with industry, which I described in the first edition of this book as "the factory amidst the fields," has progressed of late in Switzerland. It strikes at the present time even the casual traveller.[48]

Belgium would offer an equal interest. Belgium is certainly a country of centralised industry, and a country in which the productivity of the worker stands at a high level, the average annual productivity of each industrial workman — men, women, and children — attaining now the high figure of at least £250 per head. Coal mines in which more than a thousand workers are employed

[47] See Appendix X.
[48] See Appendix V.

are numerous, and there is a fair number of textile factories in each of which from 300 to 700 workers are occupied. And yet, if we exclude from the industrial workers' population of Belgium, which numbered 823,920 persons in 1896 (1,102,240 with the clerks, travellers, supervisors and go on), the 116,300 workpeople who are employed in the coal mines, and nearly 165,000 artisans working single or with the aid of their families, we find that out of the remaining 565,200 workers very nearly one-half — that is, 270,200 persons-work in establishments in which less than fifty persons are employed, while 95,000 persons out of these last are employed in 54,500 workshops, which thus have an average of less than three workers per workshop.[49] We may thus say that — taking the mines out of account more than one-sixth part of the Belgian industrial workers are employed in small workshops which have, on the average, less than three workers each, besides the master, and that four-tenths of all the work-people are employed in factories and workshops having on the average less than thirteen work-people each.[50]

What is still more remarkable is, that the number of small workshops, in which from one to four aids only are employed by the master, attains the considerable figure of 1,867 (2,293 in 1880) in the textile industries, notwithstanding the high concentration of a certain portion[51] of these industries. As to the machinery works and hardware trades, the small workshops in which the master works with from two to four assistants or journeymen are very numerous (more than 13,300), to say nothing of the gun trade which is a petty trade par excellence, and the furniture trade which has lately taken a great development. A highly concentrated industry, and a high productivity, as well as a considerable export trade, which all testify to a high industrial development of the country, thus go hand in hand with a high development of the domestic trades and small industries altogether.

It hardly need be said that in Austria, Hungary, Italy, and even the United States, the petty trades occupy a prominent position, and play in the sum total of industrial activity an even much greater part than in France, Belgium, or Germany. But it is especially in Russia that we can fully appreciate the importance of the rural industries and the terrible sufferings which will be quite uselessly inflicted on the population, if the policy of the State is going to be now the policy advocated by a number of landlords and factory-owners — namely, if the State throws its tremendous weight in favour of a pauperisation of the peasants and an artificial annihilation of the rural trades, in order to create a centralised great industry.[52]

[49] Here is the distribution of workpeople in all the industries, according to the *Annuaire, Statistique* for the year 1909 : Artisans working single-handed or with the aid of their families, 165,000 establishments; very small industry, from one to four workpeople, 54,000 establishments, 95,000 workpeople; small industry, from five to forty-nine workpeople per factory, 14,800 establishments, 177,000 employees; middle-sized and great industry, from 50 to 499 workpeople per factory, 1,500 establishments, 250,000 employees; very great industry, above 500 workpeople per factory, 200 establishments, 160,000 employees. Total, 230,000 employers great and small; or 7 1,000 employers out of 7,000,000 inhabitants if we do not count the independent artisans.

[50] When shall — we have for the United Kingdom a census as complete as we have it for France, Germany, and Belgium? that is, a census in which the employed and the employers will be counted separately — instead of throwing into one heap the owner of the factory, the managers, the engineers, and the workers — and their distribution in factories of different sizes will be given.

[51] *Pewile Industries* : Artisans working single or with the aid of their families, 1,437; from one to four workmen, 430 establishments, 949 work-people; from five to forty-nine workpeople, 774 establishments, 14,051 workers; above fifty, 379 establishments, 66,103 workers.

[52] Since 1907 the Russian Government has inaugurated this policy, and has begun to destroy by violence the village community in the interest of the landlord and the protected industries.

The most exhaustive inquiries into the present state, the growth, the technical development of the rural industries, and the difficulties they have to contend with, have been made in Russia. A house-to-house inquiry which embraces nearly 1,000,000 peasants' houses has been made in various provinces of Russia, and its results already represent 450 volumes, printed by different county councils (*Zemstvos*). Besides, in the fifteen volumes published by the Petty Trades Committee, and still more in the publications of the Moscow Statistical Committee, and of many provincial assemblies, we find exhaustive lists giving the name of each worker, the extent and the state of his fields, his live stock, the value of his agricultural and industrial production, his earnings from both sources, and his yearly budget; while hundreds of separate trades have been described in separate monographs from the technical, economical, and sanitary points of view.

The results obtained from these inquiries were really imposing, as it appeared that out of the 80 or 90 million population of European Russia proper, no less than 7,500,000 persons were engaged in the domestic trades, and that their production reached, at the lowest estimate, more than £150,000,000, and most probably £200,000,000 (2,000,000,000 roubles) every year.[53] It thus exceeded the total production of the great industry. As to the relative importance of the two for the working classes suffice it to say that even in the government of Moscow, which is the chief manufacturing region of Russia (its factories yield upwards of one-fifth in value of the aggregate industrial production of European Russia), the aggregate incomes derived by the population from the domestic industries are three times larger than the aggregate wages earned in the factories.

The most striking feature of the Russian domestic trades is that the sudden start which was made by the factories in Russia did not prejudice the domestic industries. On the contrary, it gave a new impulse to their extension; they grew and developed precisely in those regions where the factories were growing up fastest.

Another most suggestive feature is the following : although the unfertile provinces of Central Russia have been from time immemorial the seat of all kinds of petty trades, several domestic industries of modern origin are developing in those provinces which are best favoured by soil and climate. Thus, the Stavropol government of North Caucasus, where the peasantry have plenty of fertile soil, has suddenly become the seat of a widely developed silkweaving industry in the peasants' houses, and now it supplies Russia with cheap silks which have completely expelled from the market the plain silks formerly imported from France. In Orenburg and on the Black Sea, the petty trades' fabrication of agricultural machinery, which has grown up lately, is another instance in point.

The capacities of the Russian domestic industrial workers for co-operative organisation would be worthy of more than a passing mention. As to the cheapness of the produce manufactured in the villages, which is really astonishing, it cannot be explained in full by the exceedingly long hours of labour and the starvation earnings, because overwork and very low wages are characteristic of the Russian factories as well. It depends also upon the circumstance that the peasant who grows his own food, but suffers from a constant want of money, sells the produce of his industrial labour at any price. Therefore, all manufactured goods used by the Russian peasantry, save the printed cottons, are the production of the rural manufacturers. But many articles of luxury, too, are made in the villages, especially around Moscow, by peasants who continue to cultivate

[53] It appears from the house-to-house inquiry, which embodies 855,000 workers, that the yearly value of the produce which they use to manufacture reaches £21,087,000 (the rouble at 24d.), that is, an average of £25 per worker. An average of E20 for the 7,500,000 persons engaged in domestic industries would already give £150,000,000 for their aggregate production; but the most authoritative investigators consider that figure as below the reality.

their allotments. The silk hats which are sold in the best Moscow shops, and bear the stamp of *Nonveautés Parisiennes,* are made by the Moscow peasants; so also the "Vienna" furniture of the best "Vienna" shops, even if it goes to supply the palaces. And what is most to be wondered at is not the skill of the peasants — agricultural work is no obstacle to acquiring industrial skill — but the rapidity with which the fabrication of fine goods has spread in such villages as formerly manufactured only goods of the roughest description.[54]

Much more ought to be said with regard to the rural industries of Russia, especially to "how how easily the peasants associate for buying new machinery, or for avoiding the middle man in their purchases of raw produce — as soon as misery is no obstacle to the association"[55]. Belgium, and especially Switzerland, could also be quoted for similar illustrations, but the above will be enough to give a general idea of the importance, the vital powers, and the perfectibility of the rural industries.

Conclusions

The facts which we have briefly passed in review show, to some extent, the benefits which could be derived from a combination of agriculture with industry, if the latter could come to the village, not in its present shape of a capitalist factory, but in the shape of a socially organised industrial production, with the full aid of machinery and technical knowledge. In fact, the most prominent feature of the petty trades is that a relative well-being is found only where they are combined with agriculture : where the workers have remained in possession of the soil and continue to cultivate it. Even amidst the weavers of France or Moscow, who have to reckon with the coinpetition of the factory, relative well-being prevails so long as they are not compelled to part with the soil. On the contrary, as soon as high taxation or the impoverishment during a crisis has compelled the domestic worker to abandon his last plot of land to the usurer, misery creeps into his house. The sweater becomes all-powerful, frightful overwork is resorted to, and the whole trade often falls into decay.

Such facts, as well as the pronounced tendency of the factories towards migrating to the villages, which becomes more and more apparent nowadays, and found of late its expression in the 'Garden Cities' movement, are very suggestive. Of course, it would be a great mistake to imagine that industry ought to return to its hand-work stage in order to be combined with agriculture. Whenever a saving of human labour can be obtained by means of a machine, the machine is welcome and will be resorted to; and there is hardly one single branch of industry into which machinery work could not be introduced with great advantage, at least at some of the stages of the manufacture. In the present chaotic state of industry, nails and cheap pen-knives can be made by hand, and plain cottons be woven in the hand-loom; but such an anomaly will not last. The machine will supersede handwork in the manufacture of plain goods. But at the same time, handwork very probably will extend its domain in the artistic finishing of many things which are now made entirely in the factory; and it will always remain an important factor in the growth of thousands of young and new trades.

[54] Some of the produces of the Russian rural industries have lately been introduced in this country, and find a good sale.

[55] Prugavin, in the *Vyestnik Promyshlenvosti,* June, 1884. S. also the excellent work of V. V. (Vorontsoff) *Destinies ol Capitalism in Russia,* 1882 (Russia).

But the question arises, Why should not the cottons, the woollen cloth, and the silks, now woven by hand in the villages, be woven by machinery in the same villages, without ceasing to remain connected with work in the fields? Why should not hundreds of domestic industries, now carried on. entirely by hand, resort to labour-saving machines, as they already do in the knitting trade and many others? There is no reason why the small motor should not be of a much more general use than it is now, wherever there is no need to have a factory; and there is no reason why the village should not have its small factory, wherever factory work is preferable, as we already see it occasionally in certain villages in France.

More than that. There is no reason why the factory, with its motive force and machinery, should not belong to the community, as is already the case for motive power in the abovementioned workshops and small factories in the French portion of the Jura hills. It is evident that now, under the capitalist system, the factory is the curse of the village, as it comes to overwork children and to make paupers out of its male inhabitants; and it is quite natural that it should be opposed by all means by the workers, if they have succeeded in maintaining their olden trades' organisations (as at Sheffield, or Solingen), or if they have not yet been reduced to sheer misery (as in the Jura). But under a more rational social organisation the factory would find no such obstacles : it would be a boon to the village. And there is already unmistakable evidence to show that a move in this direction is being made in a few village communities.

The moral and physical advantages which man would derive from dividing his work between the field and the workshop are selfevident. But the difficulty is, we are told, in the necessary centralisation of the modern industries. In industry, as well as in politics, centralisation has so many admirers ! But in both spheres the ideal of the centralisers badly needs revision. In fact, if we analyse the modern industries, we soon discover that for some of them the co-operation of hundreds, or even thousands, of workers gathered at the same spot is really necessary. The great iron works and mining enterprises decidedly belong to that category; oceanic steamers cannot be built in village factories. But very many of our big factories are nothing else but agglomerations under a common management, of several distinct industries; while others are mere agglomerations of hundreds of copies of the very same machine; such are most of our gigantic spinning and weaving establishments.

The manufacture being a strictly private enterprise, its owners find it advantageous to have all the branches of a given industry under their own management; they thus cumulate the profits of the successive transformations of the raw material. And when several thousand power-looms are combined in one factory, the owner finds his advantage in being able to hold the command of the market. But from a technical point of view the advantages of such an accumulation are trifling and often doubtful. Even so centralised an industry as that of the cottons does not suffer at all from the division of production of one given sort of goods at its different stages between several separate factories : we see it at Manchester and its neighbouring towns. As to the petty trades, no inconvenience is experienced, from a still greater subdivision between the workshops in the watch trade and very many others.

We often hear that one horse-power costs so much in a small engine, and so much less in an engine ten times more powerful; that the pound of cotton yarn costs much less when the factory doubles the number of its spindles. But, in the opinion of the best engineering authorities, such as Prof. W. Unwin, the hydraulic, and especially the electric, distribution of power from a

central station sets aside the first part of the argument.[56] As to its second part, calculations of this sort are only good for those industries which prepare the half-manufactured produce for further transformations. As to those countless descriptions of goods which derive their value chiefly from the intervention of skilled labour, they can be best fabricated in smaller factories which employ a few hundreds, or even a few scores of operatives. This is why the "concentration" so much spoken of is often nothing but an amalgamation of capitalists for the purpose of dominating the market, not for cheapening the technical process.

Even under the present conditions the leviathan factories offer great inconveniences, as they cannot rapidly reform their machinery according to the constantly varying demands of the consumers, How many failures of great concerns, too well known in this country to need to be named, were due to this cause during the crisis of 1886–1890. As for the new branches of industry which I have mentioned at the beginning of the previous chapter, they always must make a start on a small scale; and they can prosper in small towns as well as in big cities, if the smaller agglomerations are provided with institutions stimulating artistic taste and the genius of invention. The progress achieved of late in toy-making, as also the high perfection attained in the fabrication of mathematical and optical instruments, of furniture, of small luxury articles, of pottery and so on, are instances in point. Art and science are no longer the monopoly of the great cities, and further progress will be in scattering them over the country.

The geographical distribution of industries in a given country depends, of course, to a great extent upon a complexus of natural conditions; it is obvious that there are spots which are best suited for the development of certain industries. The banks of the Clyde and the Tyne are certainly most appropriate for ship-building yards, and shipbuilding yards must be surrounded by a variety of workshops and factories. The industries will always find some advantages in being grouped, to some extent, according to the natural features of separate regions. But we must recognise that now they are not at all grouped according to those features. Historical causeschiefly religious wars and national rivalries — have had a good deal to do with their growth and their present distribution; still more so the employers were guided by considerations as to the facilities for sale and export — that is, by considerations which are already losing their importance with the increased facilities for transport, and will lose it still more when the producers produce for themselves, and not for customers far away.

Why, in a rationally organised society, ought London to remain a great centre for the jam and preserving trade, and manufacture umbrellas for nearly the whole of the United Kingdom? Why should the countless Whitechapel petty trades remain where they are, instead of being spread all over the country? There is no reason whatever why the mantles which are worn by English ladies should be sewn at Berlin and in Whitechapel, instead of in Devonshire or Derbyshire. Why should Paris refine sugar for almost the whole of France? Why should one-half of the boots and shoes used in the United States be manufactured in the 1,500 workshops of Massachusetts? There is absolutely no reason why these and like anomalies should persist. The industries must

[56] I may add from my own experience that such is also the opinion of several Manchester employers: "I am saving a great deal by using municipal electric power in my factory, instead of the steam-engine." I was told by one of the most respected members of the Manchester community: "I pay for motive power according to the number of persons I employ — two hundred at certain times, and fifty in other parts of the year. I need not buy coal and stock it in advance for all the year; I have saved the room that was occupied by the steam. engine; and the room above it is not heated and shaken by the engine as it used to be."

be scattered all over the world; and the scattering of industries amidst all civilised nations will be necessarily followed by a further scattering of factories over the territories of each nation.

In the course of this evolution, the natural produce of each region and its geographical conditions certainly will be one of the factors which will determine the character of the industries going to develop in this region. But when we see that Switzerland has become a great exporter of steam-engines, railway engines, and steam-boats — although she has no iron ore and no coal for obtaining steel, and even has no seaport to import them; when we see that Belgium has succeeded in. being a great exporter of grapes, and that Manchester has managed to become a seaport — we understand that in the geographical distribution of industries, the two factors of local produces and of an advantageous position by the sea are not yet the dominant factors. We begin to understand that, all taken, it is the intellectual factor — the spirit of invention, the capacity of adaptation, political liberty, and so on — which counts for more than all others.

That all the industries find an advantage in being carried on in close contact with a great variety of other industries the reader has seen already from numerous examples. Every industry requires technical surroundings. But the same is also true of agriculture.

Agriculture cannot develop without the aid of machinery, and the use of a perfect machinery cannot be generalised without industrial surroundings : without mechanical workshops, easily accessible to the cultivator of the soil, the use of agricultural machinery is not possible. The village smith would not do. If the work of a thrashing-machine has to be stopped for a week or more, because one of the cogs in a wheel has been broken, and if to obtain a new wheel one must send a special messenger to the next province — then the use of a thrashingmachine is not possible. But this is precisely what I saw in my childhood in Central Russia; and quite lately I have found the very same fact mentioned in an English autobiography in the first half of the nineteenth century. Besides, in all the northern part of the temperate zone, the cultivators of the soil must have some sort of industrial employment during the long winter months. This is what has brought about the great development of rural industries, of which we have just seen such interesting examples. But this need is also felt in the soft climate of the Channel Islands, notwithstanding the extension taken by horticulture under glass. We need such industries. Could you suggest us any?" wrote to me one of my correspondents in Guernsey.

But this is not yet all. Agriculture is so much in need of aid from those who inhabit the cities, that every summer thousands of men leave their slums in the towns and go to the country for the season of crops. The London destitutes go in thousands to Kent and Sussex as bay-makers and hop-pickers, it being estimated that Kent alone requires 80,000 additional men and women for hop-picking; whole villages in France and their cottage industries are abandoned in the summer, and the peasants wander to the more fertile parts of the country; hundreds of thousands of human beings are transported every summer to the prairies of Manitoba and Dacota. Every summer many thousands of Poles spread at harvest time over the plains of Mecklenburg, Westphalia, and even France; and in Russia there is every year an exodus of several millions of men who journey from the north to the southern prairies for harvesting the crops; while many St. Petersburg manufacturers reduce their production in the summer, because the operatives return to their native villages for the culture of their allotments.

Agriculture cannot be carried on without additional hands in the summer; but it still more needs temporary aids for improving the soil, for tenfolding its productive powers. Steam-digging, drainage, and manuring would render the heavy clays in the north-west of London a much richer soil than that of the American prairies. To become fertile, those clays want only plain, unskilled

human labour, such as is necessary for digging the soil, laying in drainage tubes, pulverising phosphorites, and the like; and that labour would be gladly done by — the factory workers if it were properly organised in a free community for the benefit of the whole society. The soil claims that sort of aid, and it would have it under a proper organisation, even if it were necessary to stop many mills in the summer for that purpose. No doubt the present factory owners would consider it ruinous if they had to stop their mills for several months every year, because the capital engaged in a factory is expected to pump money every day and every, hour, if possible. But that is the capitalist's view of the matter, not the community's view.

As to the workers, who ought to be the real. managers of industries, they will find it healthy not to perform the same monotonous work all the year round, and they will abandon it for the summer, if indeed they do not find the means of keeping the factory running by relieving each other in groups.

The scattering of industries over the country — so as to bring the factory amidst the fields, to make agriculture derive all those profits which it always finds in being combined with industry (see the Eastern States of America) and to produce a combination of industrial with agricultural work — is surely the next step to be made, as soon as a reorganisation of our present conditions is possible. It is being made already, here and there, as we saw on the preceding pages. This, step is imposed by the very necessity of producing for the producers themselves'. it is imposed by the necessity for each healthy man and woman to spend a part of their lives in manual work in the free air; and it will be rendered the more necessary when the great social movements, which have now become unavoidable, come to disturb the present international trade, and compel each nation to revert to her own resources for her own main tenance. Humanity as a whole, as well as each separate individual, will be gainers by the change, and the change will take, place.

However, such a change also implies a thorough modification of our present system of education. It implies a society composed of men and women, each of whom is able to work with his or her hands, as well as with his or her brain, and to do so in more directions than one. This "integration of capacities" and "integral education" I am now going to analyse.

Chapter IV: Brain Work and Manual Work

In olden times men of science, and especially those who have done most to forward the growth of natural philosophy, did not despise manual work and handicraft. Galileo made his telescopes with his own hands. Newton learned in his boyhood the art of managing tools; he exercised his young mind in contriving most ingenious machines, and when he began his researches in optics he was able himself to grind the lenses for his instruments, and himself to make the well-known telescope, which, for its time, was a fine piece of workmanship. Leibnitz was fond of inventing machines: windmills and carriages to be moved without horses preoccupied his mind as much as mathematical and philosophical speculations. Linnaeus became a botanist while helping his father — a practical gardener — in his daily work. In short, with our great geniuses handicraft was no obstacle to abstract researches — it rather favoured them. On the other hand, if the workers of old found but few opportunities for mastering science, many of them had, at least, their intelligences stimulated by the very variety of work which was performed in the then unspecialised workshops; and some of them had the benefit of familiar intercourse with men of science. Watt and Rennie were friends with Professor Robinson; Brindley, the road-maker, despite his fourteenpence-a-day wages, enjoyed intercourse with educated men, and thus developed his remarkable engineering faculties the son of a well-to-do family could "idle" at a — wheelwright's shop, so as to become later on a Smeaton or a Stephenson.

We have changed all that. Under the pretext of division of labour, we have sharply separated the brain worker from the manual worker. The masses of the workmen do not receive more scientific education than their grandfathers did; but they have been deprived of the education of even the same workshop, while their boys and girls are driven into a mine or a factory from the age of thirteen, and there they soon forget the little they may have learned at school. As to the men of science, they despise manual labour. How few of them would be able to make a telescope, or even a plainer instrument! Most of them are not capable of even designing a scientific instrument, and when they have given a vague suggestion to the instrument-maker, they leave it with him to invent the apparatus they need. Nay, they have raised the contempt of manual labour to the height of a theory. "The man of science," they say "must discover the laws of nature, the civil engineer must apply them, and the worker must execute in steel or wood, in iron or stone, the patterns devised by the engineer. He must work, with machines invented for him, not by him. No matter if he does not understand them and cannot improve them: the scientific man and the scientific engineer will take care of the progress of science and industry."

It may be objected that nevertheless there is a class of men who belong to none of the above three divisions. When young they have been manual workers, and some of them continue to be; but, owing to some happy circumstances, they have succeeded in acquiring some scientific knowledge, and thus they have combined science with handicraft. Surely there are such men; happily enough there is a nucleus of men who have escaped the so-much-advocated specialisation of labour, and it is precisely to them that industry owes its chief recent inventions. But in old Europe, at least, they are the exceptions; they are the irregulars — the Cossacks who have broken

the ranks and pierced the screens so carefully erected between the classes. And they are so few, in comparison with the ever-growing requirements of industry — and of science as well, as I am about to prove — that all over the world we hear complaints about the scarcity of precisely such men.

What is the meaning, in fact, of the outcry for technical education which has been raised at one and the same time in England, in France, in Germany, in the States, and in Russia, if it does not express a general dissatisfaction with the present division into scientists, scientific engineers, and workers? Listen to those who know industry, and you will see that the substance of their complaints is this: "The worker whose task has been specialised by the permanent division of labour has lost the intellectual interest in his labour, and it is especially so in the great industries: he has lost his inventive powers. Formerly, he invented very much. Manual workers — not men of science nor trained engineers — have invented, or brought to perfection, the prime motors arid all that mass of machinery which has revolutionised industry for the last hundred years. But since the great factory has been enthroned, the worker, depressed by the monotony of his work, invents no more. What can a weaver invent who merely supervises four looms, without knowing anything either about their complicated movements or how the machines grew to be what they are? What can a man invent who is condemned for life to bind together the ends of two threads with the greatest celerity, and knows nothing beyond making a knot?

"At the outset of modern industry, three generations of workers *have* invented; now they cease to do so. As to the inventions of the engineers, specially trained for devising machines, they are either devoid of genius or not practical enough. Those 'nearly to nothings,' of which Sir Frederick Bramwell spoke once at Bath, are missing in their inventions those nothings which can be learned in the workshop only, and which permitted a Murdoch and the Soho workers to make a practical engine of Watt's schemes. None but he who knows the machine — not in its drawings and models only, but in its breathing and throbbings — who unconsciously thinks of it while standing by it, can really improve it. Smeaton and Newcomen surely were excellent engineers; but in their engines a boy had to open the steam valve at each stroke of the piston; and it was one of those boys who once managed to connect the valve with the remainder of the machine, so as to make it open automatically, while he ran away to play with other boys. But in the modern machinery there is no room left for naive improvements of that kind. Scientific education on a wide scale has become necessary for further inventions, and that education is refused to the workers. So that there is no issue out of the difficulty, unless scientific education and handicraft are combined together unless integration of knowledge takes the place of the present divisions."

Such is the real substance of the present movement in favour of technical education. But, instead of bringing to public consciousness the, perhaps, unconscious motives of the present discontent, instead of widening the views of the discontented and discussing the problem to its full extent, the mouthpieces of the movement do not mostly rise above the shopkeeper's view of the question. Some of them indulge in jingo talk about crushing all foreign industries out of competition, while the others see in technical education nothing but a means of somewhat improving the flesh-machine of the factory and of transferring a few workers into the upper class of trained engineers.

Such an ideal may satisfy them, but it cannot satisfy those who keep in view the combined interests of science and industry, and consider both as a means for raising humanity to a higher level. We maintain that in the interests of both science and industry, as well as of society as a whole, every human being, without distinction of birth, ought to receive such an education as

would enable him, or her, to combine a thorough knowledge of science with a thorough knowledge of handicraft. We fully recognise the necessity of specialisation of knowledge, but we maintain that specialisation must follow general education, and that general education must be given in science and handicraft alike. To the division of society into brain workers and manual workers we oppose the combination of both kinds of activities; and instead of "technical education," which means the maintenance of the present division between brain work and manual work, we advocate the *education integrale*, or complete education, which means the disappearance of that pernicious distinction.

Plainly stated, the aims of the school under this system ought to be the following: To give such an education that, on leaving school at the age of eighteen or twenty, each boy and each girl should be endowed with a thorough knowledge of science — such a knowledge as might enable them to be useful workers in science — and, at the same time, to give them a general knowledge of what constitutes the bases of technical training, and such a skill in some special trade as would enable each of them to take his or her place in the grand world of the manual production of wealth.[1] I know that many will find that aim too large, or even impossible to attain, but I hope that if they have the patience to read the following pages, they will see that we require nothing beyond what can be easily attained. In fact, *it has been attained*; and what has been done on a small scale could be done on a wider scale, were it not for the economical and social causes which prevent any serious reform from being accomplished in our miserably organised society.

The experiment has been made at the Moscow Technical School for twenty consecutive years with many hundreds of boys; and, according to the testimonies of the most competent judges, at the exhibitions of Brussels, Philadelphia, Vienna, and Paris, the experiment has been a success. The Moscow school admitted boys not older than fifteen,[2] and it required from boys of that age nothing but a substantial knowledge of geometry and algebra, together with the usual knowledge of their mother tongue; younger pupils were received in the preparatory classes. The school was divided into two sections — the mechanical and the chemical; but as I personally know better the former, and as it is also the more important with reference to the question before us, so I shall limit my remarks to the education given in the mechanical section.

After a five or six years' stay at the school, the students left it with a thorough knowledge of higher mathematics, physics, mechanics, and connected sciences — so thorough, indeed, that it was not second to that acquired in the best mathematical faculties of the most eminent European universities. When myself a student of the mathematical faculty of the St. Petersburg University, I had the opportunity of comparing the knowledge of the students at the Moscow Technical School with our own. I saw the courses of higher geometry some of them had compiled for the use of their comrades; I admired the facility with which they applied the integral calculus to dynamical problems, and I came to the conclusion that while we, University students, had more knowledge of a general character (for instance, in mathematical astronomy), they, the students

[1] In their examination of the causes of unemployment in York, based not on economists' hypotheses, but on a close study of the real facts in each individual case (*Unemployment: a Social Study*, London, 1911), Seebohm Rowntree and Mr. Bruno Lasker have come to the conclusion that the chief cause of unemployment is that young people, after having left the school (where they learn no trade), find employment in such professions as greengrocer boy, newspaper boy, and the like, which represent "a blind alley." When they reach the age of eighteen or twenty, they must leave, because the wages are a boy's wages, — and they know no trade whatever!

[2] Unfortunately, I must already say "admitted" instead of "admits." With the reaction which began after 1881, under the reign of Alexander Ill., this school was "reformed"; that means that all the spirit and the system of the school were destroyed.

of the Technical School, were much more advanced in higher geometry, and especially in the applications of higher mathematics to the intricate problems of dynamics, the theories of heat and elasticity. But while we, the students of the University, hardly knew the use of our hands, the students of the Technical School fabricated with *their own hands*, and without the help of professional workmen, fine steam-engines, from the heavy boiler to the last finely turned screw, agricultural machinery, and scientific apparatus — all for the trade — and they received the highest awards for the work of their hands at the international exhibitions. They were scientifically educated skilled workers — workers with university education — highly appreciated even by the Russian manufacturers who so much distrust science.

Now, the methods by which these wonderful results were achieved were these: In science, learning from memory was not in honour, while independent research was favoured by all means. Science was taught hand in hand with its applications, and what was learned in the schoolroom was applied in the workshop. Great attention was paid to the highest abstractions of geometry as a means for developing imagination and research.

As to the teaching of handicraft, the methods were quite different from those which proved a failure at the Cornell University, and differed, in fact, from those used in most technical schools. The student was not sent to a workshop to learn some special handicraft and to earn his existence as soon as possible; but the teaching of technical skill was prosecuted in the same systematical way as laboratory work is taught in the universities, according to a scheme elaborated by the founder of the school, M. Dellavos, and now applied at Chicago and Boston. It is evident that drawing was considered as the first step in technical education. Then the student was brought, first, to the carpenter's workshop, or rather laboratory, and there he was thoroughly taught to execute all kinds of carpentry and joinery. They did not teach the pupil to make some insignificant work of house decoration, as they do in the system of the *slöjd* — the Swedish method, which is taught especially at the Nääds school — but they taught him, to begin with, to make very accurately a wooden cube, a prism, a cylinder (with the planing jack), and then — all fundamental types of joining. In a word, he had to study, so to say, the philosophy of joinery by means of manual work. No efforts were spared in order to bring the pupil to a certain perfection in that branch — the real basis of all trades.

Later on, the pupil was transferred to the turner's workshop, where he was taught to make in wood the patterns of those things which he would have to make in metal in the following workshops. The foundry followed, and there he was taught to cast those parts of machines which he had prepared in wood; and it was only after he had gone through the first three stages that lie was admitted to the smith's and engineering workshops. Such was the system which English readers will find described in full in a work by Mr. Ch. H. Ham.[3] As for the perfection of the mechanical work of the students, I cannot do better than refer to the reports of the juries, at the above-named exhibitions.

In America the same system has been introduced, in its technical part, first, in the Chicago Manual Training School, and later on in the Boston Technical School — the best, I am told, of the sort — and finally at Tuskagee, in the excellent school for coloured young men. In this country, or rather in Scotland, I found the system applied with full success, for some years, under the

[3] *Manual Training: the Solution of Social and Industrial Problems*. By Ch. H. Ham. London: Blackie & Son, 1886. I can add that like results were achieved also at the Krasnoufimsk *Realschule*, in the province of Orenburg, especially with regard to agriculture and agricultural machinery. The achievements of the school, however, are so interesting that they deserve more than a short mention.

direction of Dr. Ogilvie at Gordon's College in Aberdeen. It is the Moscow or Chicago system on a limited scale. While receiving substantial scientific education, the pupils are also trained in the workshops — but not for one special trade, as it unhappily too of ten is the case. They pass through the carpenter's workshop, the casting in metals, and the engineering workshop; and in each of these they learn the foundations of each of the three trades sufficiently well for supplying the school itself with a number of useful things. Besides, as far as I could ascertain from what I saw in the geographical and physical classes, as also in the chemical laboratory, the system of "through the hand to the brain," and *vice versâ*, is in full swing, and it is attended with the best success. The boys *work* with the physical instruments, and they study geography in the field, instruments in hands, as well as in the class-room. Some of their surveys filled my heart, as an old geographer, with joy.[4]

The Moscow Technical School surely was not an ideal school.[5] It totally neglected the humanitarian education of the young men. But we must recognise that the Moscow experiment — not to speak of hundreds of other partial experiments — has perfectly well proved the possibility of combining a scientific education of a very high standard with the education which is necessary for becoming an excellent skilled workman. It has proved, moreover, that the best means for producing really good skilled labourers is to seize the bull by the horns, and to grasp the educational problem in its great features, instead of trying to give some special skill in some handicraft, together with a few scraps of knowledge in a certain branch of some science. And it has shown also what can be obtained, without over-pressure, if a rational economy of the scholar's time is always kept in view, and theory goes hand in hand with practice. Viewed in this light, the Moscow results do not seem extraordinary at all, and still better results may be expected if the same principles are applied from the earliest years of education.

Waste of time is the leading feature of our present education. Not only are we taught a mass of rubbish, but what is not rubbish is taught so as to make us waste over it as much time as possible. Our present methods of teaching originate from a time when the accomplishments required from an educated person were extremely limited; and they have been maintained, notwithstanding the immense increase of knowledge which must be conveyed to the scholar's mind since science has so much widened its former limits. Hence the over-pressure in schools, and hence, also, the urgent necessity of totally revising both the subjects and the methods of teaching, according to the new wants and to the examples already given here and there, by separate schools and separate teachers.

It is evident that the years of childhood ought not to be spent so uselessly as they are now. German teachers have shown how the very plays of children can be made instrumental in conveying to the childish mind some concrete knowledge in both geometry and mathematics. The children who have made the squires of the theorem of Pythagoras out of pieces of coloured cardboard, will not look at the theorem, when it comes in geometry, as on a mere instrument of torture devised by the teachers; and the less so if they apply it as the carpenters do. Complicated problems of

[4] It is evident that the Gordon's College industrial department is not a mere copy of any foreign school; on the contrary, I cannot help thinking that if Aberdeen has made that excellent move towards combining science with handicraft, the move was a natural outcome of what has been practised long since, on a smaller scale, in the Aberdeen daily schools.

[5] What this school is now, I don't know. In the first years of Alexander III's reign it was wrecked, like so many other good institutions of the early part of the reign of Alexander II. But the system was not lost. It was carried over to America.

arithmetic, which so much harassed us in our boyhood, are easily solved by children seven and eight years old if they are put in the shape of interesting puzzles. And if the *Kindergarten* — German teachers often make of it a kind of barrack in which each movement of the child is regulated beforehand — has often become a small prison for the little ones, the idea which presided at its foundation is nevertheless true. In fact, it is almost impossible to imagine, without having tried it, how many sound notions of nature, habits of classification, and taste for natural sciences can be conveyed to the children's minds; and, if a series of concentric courses adapted to the various phases of development of the human being were generally accepted in education, the first series in all sciences, save sociology, could be taught before the age of ten or twelve, so as to give a general idea of the universe, the earth and its inhabitants, the chief physical, chemical, zoological, and botanical phenomena, leaving the discovery of the laws of those phenomena to the next series of deeper and more specialised studies.

On the other side, we all know how children like to make toys themselves, how they gladly imitate the work of full-grown people if they see them at work in the workshop or the building-yard. But the parents either stupidly paralyse that passion, or do not know how to utilise it. Most of them despise manual work and prefer sending their children to the study of Roman history, or of Franklin's teachings about saving money, to seeing them at a work which is good for the "lower classes only." They thus do their best to render subsequent learning the more difficult.

And then come the school years, and time is wasted again to an incredible extent. Take for instance, mathematics, which every one ought to know, because it is the basis of all subsequent education, and which so few really learn in our schools. In geometry, time is foolishly wasted by using a method which merely consists in committing geometry to memory. In most cases, the boy reads again and again the proof of a theorem till his memory has retained the succession of reasonings. Therefore, nine boys out of ten, if asked to prove an elementary theorem two years after having left the school will be unable to do it, unless mathematics is their speciality. They will forget which auxiliary lines to draw, and they never have been taught to *discover* the proofs by themselves. No wonder that later on they find such difficulties in applying geometry to physics, that their progress is despairingly sluggish, and that so few master higher mathematics.

There is, however, the other method which permits the pupil to progress, as a whole, at a much speedier rate, and under which he who once has learned geometry will know it all his life long. Under this system, each theorem is put as a problem; its solution is never given beforehand, and the pupil is induced to find it by himself. Thus, if some preliminary exercises with the rule and the compass have been made, there is not one boy or girl, out of twenty or more, who will not be able to find the means of drawing an angle which is equal to a given angle, and to prove their equality, after a few suggestions from the teacher; and if the subsequent problems are given in a systematic succession (there are excellent text-books for the purpose), and the teacher does not press his pupils to go faster than they can go at the beginning, they advance from one problem to the next with an astonishing facility, the only difficulty being to bring the pupil to solve the first problem, and thus to acquire confidence in his own reasoning.

Moreover, each abstract geometrical truth must be impressed on the mind in its concrete form as well. As soon as the pupils have solved a few problems on paper, they must solve them in the playing-ground with a few sticks and a string, and they must apply their knowledge in the workshop. Only then will the geometrical lines acquire a concrete meaning in the children's minds; only then will they see that the teacher is playing no tricks when he asks them to solve

problems with the rule and the compass without resorting to the protractor; only then will they *know* geometry.

"Through the eyes *and* the hand to the brain" this is the true principle of economy of time in teaching. I remember, as if it were yesterday, how geometry suddenly acquired for me a new meaning, and how this new meaning, facilitated all ulterior studies. It was as we were mastering at school a Montgolfier balloon, and I remarked that the angles at the summits of each of the twenty strips of paper out of which we were going to make the balloon must cover less than the fifth part of a right angle each. I remember, next, how the sinuses and the tangents ceased to be mere cabalistic signs when they permitted us to calculate the length of a stick in a working profile of a fortification; and how geometry in space became plain when we began to make on a small scale a bastion with embrasures and barbettes — an occupation which obviously was soon prohibited on account of the state into which We brought our clothes. " You look like navvies," was the reproach addressed to us by our intelligent educators, while we were proud precisely of being navvies, and of discovering the use of geometry.

By compelling our children to study real things from mere graphical representations, instead of *making* those things themselves, we compel them to waste the most precious time; we uselessly worry their minds; we accustom them to the worst methods of learning; we kill independent thought in the bud; and very seldom we succeed in conveying a real knowledge of what we are teaching. Superficiality, parrot like repetition, slavishness and inertia of mind are the results of our method of education. We do not teach our children how to learn.

The very beginnings of science are taught on the same pernicious system. In most schools even arithmetic is taught in the abstract way, and mere rules are stuffed into the poor little heads. The idea of a unit, which is arbitrary and can be changed at will in our measurement (the match, the box of matches, the dozen of boxes, or the gross; the metre, the centimetre the kilometre, and so on), is not impressed on mind, and therefore when the children come to the decimal fractions they are at a loss to understand them. In this country, the United States and Russia, instead of accepting the decimal system, which is the system of our numeration, they still torture the children by making them learn a system of weights and measures which ought to have been abandoned long since. The pupils lose at that full two years, and when they come later on to problems in mechanics and physics, schoolboys and schoolgirls spend most of their time in endless calculations which only fatigue them and inspire in them a dislike of exact science. But even there, where the decimal measures have been introduced, much time is lost in school simply because the teachers are not accustomed to the idea that every measure is only approximate, and that it is absurd to calculate with the exactitude of one gramme, or of one metre, when the measuring itself does not give the elements of such an exactitude. Whereas in France, where the decimal system of measures and money is a matter of daily life, even those workers who have received the plainest elementary education are quite familiar with decimals. To represent twenty-five centimes, or twenty-five centimetres, they write "zero twenty-five," while most of my readers surely remember how this same zero at the 'head of a row of figures puzzled them in their boyhood. We do all that is possible to render' algebra unintelligible, and our children spend one year before they have learned what is not algebra at all, but a mere system of abbreviations, which can be learned by the way, if it is taught together with arithmetic.[6]

[6] To those readers who are really interested in the education of children, M. Leray, the French translator of this book, recommended a series of excellent little works "conceived," he wrote, "in the very spirit of the ideas developed in

The waste of time in physics is simply revolting. While young people very easily understand the principles of chemistry and its formula, as soon as they themselves make the first experiments with a few glasses and tubes, they mostly find the greatest difficulties in grasping the mechanical introduction into physics, partly because they do not know geometry, and especially because they are merely shown costly machines instead of being induced to make themselves plain apparatus for illustrating the phenomena they study.

Instead of learning the laws of force with plain instruments which a boy of fifteen can easily make, they learn them from mere drawings, in a purely abstract fashion. Instead of making themselves an Atwood's machine with a broomstick and the wheel of an old clock, or verifying the laws of falling bodies with a key gliding on an inclined string, they are shown a complicated apparatus, and in most cases the teacher himself does not know how to explain to them the principle of the apparatus, and indulges in irrelevant details. And so it goes on from 'the beginning to the end, with but a few honourable exceptions.[7]

If waste of time is characteristic of our methods of teaching science, it is characteristic as well of the methods used for teaching handicraft. We know how years are wasted when a boy serves his apprenticeship in a workshop; but the same reproach can be addressed, to a great extent, to those technical schools which endeavour at once to teach some special handicraft, instead of resorting to the broader and surer methods of systematical teaching. Just as there are in science some notions and methods which are preparatory to the study of all sciences, so there are also some fundamental notions and methods preparatory to the special study of any handicraft.

Reuleaux has shown in that delightful book, the *Theoretische Kinematik* , that there is, so to say, a philosophy of all possible machinery. Each machine, however complicated, can be reduced to a few elements — plates, cylinders, discs, cones, and so on — as well as to a few tools-chisels, saws, rollers, hammers, etc.; and, however complicated its movements, they can be decomposed into a

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this chapter. Their leading principle is that 'in order to be soundly educative, all teaching must be objective, especially at the outset.' and that 'systematical abstraction, if it be introduced into the teaching without an objective (concrete) preparation, is noxious.'" M. Leray meant the series of initiations published by the French publishers, Hachette : *Initiation mathématique*, by C. A. Laisant, a book completed by the *Initiateur mathématique*, which is a game with small cubes, very ingenious and giving in a concrete form the proofs of arithmetics, the metric system, algebra and geometry; *Initiation astronomique*, by C. Flammarion; *Initiation chimique*, by Georges Darzens; *Initiation à la mécanique*, by Ch. Ed. Guillaume; and *Initiation zoologique*, by E. Brucker. The authors of these works had — it would not be just not to mention it — predecessors in Jean Mace's *L' Arithmétique du grand-papa*, and René Leblanc, I, whose excellent manual, *Les Sciences physiques à l'Ecole primaire*" — M. Leray says that from his own experience upon pupils from eleven to thirteen years old — "gives even to the dullest children the taste or even the passion for physical experiment."

[7] Take, for instance, the description of Atwood's machine in any course of elementary physics. You will find very great attention paid to the wheels on which the axle of the pulley is made to lie; hollow boxes, plates and rings, the clock, and other accessories will be mentioned before one word is said upon the leading idea of the machine, which is to slacken the motion of a falling body by making a falling body of small weight move a heavier body which is in the state of inertia, gravity acting on it in two opposite directions. That was the inventor's idea; and if it is made clear, the pupils see at once that to suspend two bodies of equal weight over a pulley, and to make them move by adding a small weight to one of them, is one of the means (and a good one) for slackening the motion during the falling; they see that the friction of the pulley must be reduced to a minimum, either by using the two pairs of wheels, which so much puzzle the text-book makers, or by any other means; that the, clock is a luxury, and the "plates and rings" are mere accessories: in short, that Atwood's idea can be realised with the wheel of a clock fastened, as a pulley, to a wall, or on the top of a broomstick secured in a vertical position. In this case the pupils will understand the *idea* of the machine and of its inventor, and they will accustom themselves to separate the leading idea from the accessories; while in the other case they merely look with curiosity at the tricks performed by the teacher with a complicated machine, and the few who finally understand it spend a quantity of time in the effort. In reality, *all apparatus used to illustrate the fundamental laws of physics ought to be made by the children themselves.*

few modifications of motion, such as the transformation of circular motion into a rectilinear, and the like, with a number of intermediate links. So also each handicraft can be decomposed into a number of elements. In each trade one must know how to make a plate with parallel surfaces, a cylinder, a disc, a square, and a round hole; how to manage a limited number of tools, all tools being mere modifications of less than a dozen types; and how to transform one kind of motion into another. This is the foundation of all mechanical handicrafts; so that the knowledge of how to make in wood those primary elements, how to manage the chief tools in wood-work, and how to transform various kinds of motion ought to be considered as the very basis for the subsequent teaching of all possible kinds of mechanical handicraft. The pupil who has acquired that skill already knows one good half of all possible trades.

Besides, none can be a good worker in science unless he is in possession of good methods of scientific research; unless he has learned to observe, to describe with exactitude, to discover mutual relations between facts seemingly disconnected, to make inductive hypotheses and to verify them, to reason upon cause and effect, and so on. And none can be a good manual worker unless he has been accustomed to the good methods of handicraft altogether. He must grow accustomed to conceive the subject of his thoughts in a concrete form, to draw it, or to model, to hate badly kept tools and bad methods of work, to give to everything a fine touch of finish, to derive artistic enjoyment from the contemplation of gracious forms and combinations of colours, and dissatisfaction from what is ugly. Be it handicraft, science, or art, the chief aim of the school is not to make a specialist from a beginner, but to teach him the elements of knowledge and the good methods of work, and, above all, to give him that general inspiration which will induce him, later on, to put in whatever he does a sincere longing for truth, to like what is beautiful, both as to form and contents, to feel the necessity of being a useful unit amidst other human units, and thus to feel his heart at unison with the rest of humanity.

As for avoiding the monotony of work which would result from the pupil always mere cylinders and discs, and never making full machines or other useful things, there are thousands of means for avoiding that want of interest, and one of them, in use at Moscow, is worthy of notice. It was, not to give work for mere exercise, but to utilise everything which the pupil makes, from his very first steps. Do you remember how you were delighted, in your childhood, if your work was utilised, be it only as a part of something useful? So they did at Moscow. Each plank planed by the pupils was utilised as a part of some machine in some of the other workshops. When a pupil came to the engineering workshop, and was set to make a quadrangular block of iron with parallel and perpendicular surfaces, the block had an interest in his eyes, because, when he had finished it, verified its angles and surfaces, and corrected its defects, the block was not thrown under the bench — it was given to a more advanced pupil, who made a handle to it, painted the whole, and sent it to the shop of the school as a paper-weight. The systematical teaching thus received the necessary attractiveness.[8]

It is evident that celerity of work is a most important factor in production. So it might be asked if, under the above system, the necessary speed of work could be obtained. But there are two kinds of celerity. There is the celerity which I saw in a Nottingham lace-factory: full-grown men, with shivering hands and heads, were feverishly binding together the ends of two threads

[8] The sale of the pupils' work was not insignificant, especially when they reached the higher classes, and made steam-engines. Therefore the Moscow school, when I knew it, was one of the cheapest in the world. It gave boarding and education at a very low fee. But imagine such a school connected with a farm school, which grows food and exchanges it at its cost price. What will be the cost of education then?

from the remnants of cotton-yarn in the bobbins; you hardly could follow their movements. But the very fact of requiring such kind of rapid work is the condemnation of the factory system. What has remained of the human being in those shivering bodies? What will be their outcome? Why this waste of human force, when it could produce ten times the value of the odd rests of yarn? This kind of celerity is required exclusively because of the cheapness of the factory slaves; so let us hope that no school will ever aim at this kind of quickness in work.

But there is also the time-saving celerity of the well-trained worker, and this is surely achieved best by the kind of education which we advocate. However plain his work, the educated worker makes it better and quicker than the uneducated. Observe, for instance how a good worker proceeds in cutting anything — say a piece of cardboard — and compare his movements with those of an improperly trained worker. The latter seizes the cardboard, takes the tool as it is, traces a line in a haphazard way, and begins to cut; half-way he is tired, and when he has finished his work is worth nothing; whereas, the former will examine his tool and improve it if necessary; he will trace the line — with exactitude, secure both cardboard and rule, keep the tool in the right way, cut quite easily, and give you a piece of good work.

This is the true time-saving celerity, the most appropriate for economising human labour; and the best means for attaining it is an education of the most superior kind. The great masters painted with an astonishing rapidity; but their rapid work was the result of a great development of intelligence and imagination, of a keen sense of beauty, of a fine perception of colours. And that is the kind of rapid work of which humanity is in need.

Much more ought to be said as regards the duties of the school, but I hasten to say a few words more as to the desirability of the kind of education briefly sketched in the preceding pages. Certainly, I do not cherish the illusion that a thorough reform in education, or in any of the issues indicated in the preceding chapters, will be made as long as the civilised nations remain under the present narrowly egotistic system of production and consumption. All we can expect, as long as the present conditions last, is to have some microscopical attempts at reforming here and there on a small scale-attempts which necessarily will prove to be far below the expected results, because of the impossibility of reforming on a small scale when so intimate a connection exists between the manifold functions of a civilised nation. But the energy of the constructive genius of society depends chiefly upon the depths of its conception as to what ought to be done, and how; and the necessity of recasting education is one of those necessities which are most comprehensible to all, and are most appropriate for inspiring society with those ideals, without which stagnation or even decay are unavoidable.

So let us suppose that a community — a city, or a territory which has, at least, a few millions of inhabitants — gives the above-sketched education to all its children, without distinction of birth (and we *are* rich enough to permit us the luxury of such an education), without asking anything in return from the children but what they will give when they have become producers of wealth. Suppose such an education is given, and analyse its probable consequences.

I will not insist upon the increase of wealth which would result from having a young army of educated and well-trained producers; nor shall I insist upon the social benefits which would be derived from erasing the present distinction between the brain workers and the manual workers, and from thus reaching the concordance of interest and harmony so much wanted in our times of social struggles. I shall not dwell upon the fulness of life which would result for each separate individual, if he were enabled to enjoy the use of both his mental and bodily powers; nor upon the advantages of raising manual labour to the place of honour it ought to occupy in society,

instead of being a stamp of inferiority, as it is now. Nor shall I insist upon the disappearance of the present misery and degradation, with all their consequences — vice, crime, prisons, price of blood, denunciation, and the like — which necessarily would follow. In short, I will not touch now the great social question, upon which so much has been written and so much remains to be written yet. I merely intend to point out in these pages the benefits which science itself would derive from the change.

Some will say, of course, that to reduce men of science to the*rôle* of manual workers would mean the decay of science and genius. But those who will take into account the following considerations probably will agree that the, result ought to be the reverse — namely, such a revival of science and art, and such a progress in industry, s we only can only faintly foresee from what we know about times of the Renaissance. It has become a commonplace to speak with emphasis about the progress of science during the nineteenth century; and it is evident that our century, if compared with centuries past, has much to be proud of. But, if we take into account that most of the problems which our century has solved already bad been indicated, and their solutions foreseen, a hundred years ago, we must admit that the progress was not so rapid as might have been expected, and that something hampered it.

The mechanical theory of heat was very well foreseen in the last century by Rumford and Humphry Davy, and even in Russia it was advocated by Lomomnosoff.[9] However, much more than half a century elapsed before the theory appeared in science. Lamarck, and even Linnæus, Geoffroy Saint-Hilaire, Erasmus Darwin, and several others were fully aware of the variability of species; they were opening the way for the construction of biology on the principles of variation; but here, again, half a century was wasted before the variability of species as brought again to the front; and we all remember how Darwin's ideas were carried on and forced on the attention of people, chiefly by persons who were not professional scientists themselves; and yet in Darwin's hands the theory of evolution surely was narrowed, owing to the overwhelming importance given to only one factor of evolution.

For many years past astronomy has been needing a careful revision of the Kant and Laplace's hypothesis; but no theory is yet forthcoming which would compel general acceptance. Geology surely has made, wonderful progress in the reconstitution of the paleontological record, but dynamical geology progresses at a despairingly slow rate; while all future progress in the great question as to the laws of distribution of living organisms on the surface of the earth is hampered by the want of knowledge as to the extension of glaciation during the Quaternary epoch.[10]

[9] In an otherwise, also remarkable memoir on the Arctic Regions.

[10] The rate of progress in the recently so popular Glacial Period question was strikingly slow. Already Venetz in 1821 and Esmarck in 1823 had explained the erratic phenomena by the glaciation of Europe. Agassiz came forth with the glaciation of the Alps, the, Jura mountains, and Scotland, about 1840; and five years later, Guyot had published his maps of the routes followed by Alpine boulders. But forty-two years elapsed after Venetz wrote before one geologist of mark (Lyell) dared timidly to accept his theory, even to a limited extent — the most interesting fact being that Guyot's maps, considered as irrelevant in 1845, were recognised as conclusive after 1863. Even now — more than half a century after Agassiz's first work — Agassiz's views are not yet either refuted or generally accepted. So also Forbes's views upon the plasticity of ice. Let me add, by the way, that the whole polemics as to the viscosity of ice is a striking instance of how facts, scientific terms, and experimental methods quite familiar to building engineers, were ignored by those who took part in the polemics. If these, facts, terms and methods were taken into account, the polemics would not have rated for years with no result. Like instances, to show how science suffers from a want of acquaintance with facts and methods of experimenting both well known to engineers, florists, cattle-breeders, and so on, could be produced in numbers.

In short, in each branch of science a revision of the current theories as well as new wide generalisations are wanted. And if the, revision requires some of that inspiration of genius which moved Galileo and Newton, and which depends in its appearance upon general causes of human development, it requires also an increase in the number of scientific workers. When facts contradictory to current theories become numerous, the theories must be revised (we saw it in Darwin's case), and thousands of simple intelligent workers in science are required to accumulate the necessary facts.

Immense regions of the earth still remain unexplored; the study of the geographical distribution of animals and plants meets with stumbling-blocks at every step. Travellers cross continents, and do not know even how to determine the latitude nor how to manage a barometer. Physiology, both of plants and animals, psycho-physiology, and the psychological faculties of man and animals are so many branches of knowledge requiring more data of the simplest description. History remains a *fable convenue* chiefly because it wants fresh ideas, but also because it wants scientifically thinking workers to reconstitute the life of past centuries in the same way as Thorold Rogers or Augustin Thierry have done it for separate epochs.

In short, there is not one, single science which does not suffer in its development from a want of men and women endowed with a philosophical conception of the universe, ready to apply their forces of investigation in a given field however limited, and having leisure for devoting themselves to scientific pursuits. In a community such as we suppose, thousands of workers would be ready to answer any appeal for exploration. Darwin spent almost thirty years in gathering and analysing facts for the elaboration of the theory of the origin of species. Had he lived in such a society as we suppose he simply would have made an appeal to volunteers for facts and partial exploration, and thousands of explorers would have answered his appeal. Scores of societies would have come to life to debate and to solve each of the partial problems involved in the theory, and in ten years the theory would have been verified; all those factors of evolution which only now begin to receive due attention would have appeared in their full light. The rate of scientific progress would have been tenfold; and if the individual would not have the same claims on posterity's gratitude as he has now, the unknown mass would have done the work with more speed and with more prospect for ulterior advance than the individual could do in his lifetime. Mr. Murray's dictionary is an illustration of that kind of work — the work of the future.

However, there is another feature of modern science which speaks more strongly yet in favour of the change we advocate. While industry, especially by the end of the last century and during the first part of the, present, has been inventing on such a scale as to revolutionise the very face of the earth, science has been losing its inventive powers. Men of science invent no more, or very little. Is it not striking, indeed, that the steam-engine, even in its leading principles, the railway-engine, the steamboat, the telephone, the phonograph, the weaving-machine, the lace-machine, the lighthouse, the macadamised road, photography, in black and in colours, and thousands, of less, important little things, have *not* been invented by professional men of science, although none of them would have refused to associate his name with any of the above-named inventions? Men who hardly had received any education at school, who had merely picked up the crumbs of knowledge from the tables of the rich, and who made their experiments with the most primitive means — the attorney's clerk Smeaton, the instrument-maker Watt, the brakesman Stephenson, the jeweller's apprentice Fulton, the millwright Rennie, the mason Telford, and hundreds of others whose very names remain unknown, were, as Mr. Smiles justly says, "the real makers of modern civilisation"; while the professional men of science, provided with all means for acquir-

ing knowledge and experimenting, have invented little, in the formidable array of implements, machines, and prime-motors which has shown to humanity how to utilise and to manage the forces of nature.[11] The fact is striking, but its explanation is very simple: those men — the Watts and the Stephensons — knew something which the *savants* do not know — they knew the use of their hands; their surroundings stimulated their inventive powers; they knew machines, their leading and their work; they had breathed the atmosphere of the workshop and the building-yard.

We know how men of science will meet the reproach. They will say: "We discover the laws of nature, let others apply them; it is a simple division of labour." But such a rejoinder would be utterly untrue. The march of progress is quite the reverse, because in a hundred cases against one the mechanical invention comes before the discovery of the scientific law. It was not the dynamical theory of heat which came before the steam-engine — it followed it.

When thousands of engines already were transforming heat into motion under the eyes of hundreds of professors, and when they had done so for half a century, or more; when thousands of trains, stopped by powerful brakes, were disengaging heat and spreading sheaves of sparks on the rails at their approach to the stations; when all over the civilised world heavy hammers and perforators were rendering burning hot the masses of iron they were hammering and perforating — then, and then only, Séguin, senior, in France, and a doctor, Mayer, in Germany, ventured to bring out the mechanical theory of heat with all its consequences: and yet the men of science ignored the work of Séguin and Almost drove Mayer to madness by obstinately clinging to their mysterious caloric fluid. Worse than that, they described Joule's first determination of the mechanical equivalent of heat as "unscientific."

When thousands of engines had been illustrating for some time the impossibility of utilising all the heat disengaged by a given amount of burnt fuel, then came the second law of Clausius. When all over the world industry already was transforming motion into heat, sound, light, and electricity, and each one into each other, then only came Grove's theory of the "correlation of physical forces"; and Grove's work had the same fate before the Royal Society as Joule's. The publication of his memoir was refused till the year 1856.

It was not the theory of electricity which gave us the telegraph. When the telegraph was invented, all we knew about electricity was but a few facts more or less badly arranged in our books; the theory of electricity is not ready yet; it still waits for its Newton, notwithstanding the brilliant attempts of late years. Even the empirical knowledge of the laws of electrical currents was in its infancy when a few bold men laid a cable at the bottom of the Atlantic Ocean, despite the warnings of the authorised men of science.

The name of "applied science" is quite misleading, because, in the great majority of cases, invention, far from being an application of science, on the contrary creates a new branch of science. The American bridges were no application of the theory of elasticity; they came before the theory, and all we can say in favour of science is, that in this special branch theory and practice developed in a parallel way, helping one another. It was not the theory of the explosives which led to the discovery of gunpowder; gunpowder was in use for centuries before the action of the gases in a gun was submitted to scientific analysis. And so on. One could easily multiply the illustrations by quoting the great processes of metallurgy; the alloys and the properties they

[11] Chemistry is, to a great extent, an exception to the rule. Is it not because the chemist is to such an extent a manual worker? Besides, during the last ten years we see a decided revival in scientific inventiveness, especially in physics — that is, in a branch in which the engineer and the man of science meet so much together.

acquire from the addition of very small amounts of some metals or metalloids the recent revival of electric lighting; nay, even the weather forecasts which truly deserved the reproach of being " unscientific when they were started for the first time by that excellent observer of shooting stars, Mathieu de la Drôme and by an old Jack tar, Fitzroy — all of these could be mentioned as instances in point.

Of course, we have a number of cases in which the discovery, or the invention, was a mere application of a scientific law (cases, like the discovery of the, planet Neptune), but in the immense majority of cases the discovery, or the invention, is unscientific to begin with. It belongs much more to the domain of art — art taking the precedence over science, as Helmholtz has so well shown in one of his popular lectures — ,and only after the invention has been made, science comes to interpret it. It is obvious that each invention avails itself of the previously accumulated knowledge and modes of thought; but in most cases it makes a start in advance upon what is known; it makes a leap in the unknown, and thus opens a quite new series of facts for investigation. This character of invention, which is to make a start in advance of former knowledge, instead of merely applying a law, makes it identical, as to the processes of mind, with discovery; and, therefore, people who are slow in invention are also slow in discovery.

In most cases, the inventor, however inspired by the general state of science at a given moment, starts with a very few settled facts at his disposal. The scientific facts taken' into account for inventing the steam-engine, or the telegraph. or the phonograph were strikingly elementary. So that we can affirm that what we presently know is already sufficient for resolving any of the great problems which stand in the order of the day — prime-motors without the use of steam, the storage of energy, the transmission of force, or the flying-machine. If these problems are not yet solved, it is merely because of the want of inventive genius, the scarcity of educated men endowed with it, and the present divorce between science and industry.[12] On the one side, we have men who are endowed with capacities for invention, but have neither the necessary scientific knowledge nor the means for experimenting during long years: and, on the other side, we have men endowed with knowledge and facilities for experimenting, but devoid of inventive genius, owing to their education, too abstract, too scholastic, too bookish, and to the surroundings they live in — not to speak of the patent system. which divides and scatters the efforts of the inventors instead of combining them.[13]

The flight of genius which has characterised the workers at the outset of modern industry has been missing in our professional men of science. And they will not recover it as long as alley remain strangers to the world, amidst their dusty bookshelves; as long as they are not workers themselves, amidst other workers, at the blaze of the iron furnace, at the machine in the factory, at the turning-lathe in the engineering workshop; sailors amidst sailors on the sea, and fishers in the fishing-boat, woodcutters in the forest, tillers of the soil in the field.

Our teachers in art — Ruskin and his school — have repeatedly told us of late that we must not expect a revival of art as long as handicraft remains what it is; they have shown how Greek and mediaeval art were daughters of handicraft how one was feeding the other. The same is

[12] I leave on purpose these lines as they were in the first edition. All these desiderata are already accomplished facts.

[13] The same remark ought to be made as regards the sociologists, and still more so the economists. What are most of them, including the socialists, doing, but studying chiefly the books previously written and the systems, instead of studying the facts of the economical life of the nations, and the thousands of attempts at giving to agriculture and industry new forms of organisation and new methods which are now made everywhere in Europe and America?

true with regard to handicraft and science; their separation is the decay of both. As to the grand inspirations which unhappily have been so much neglected in most of the recent discussions about art — and which are missing in science a well these can be expected only when humanity, breaking its present bonds, shall mate a new start in the higher principles of solidarity, doing away with the present duality of moral sense and philosophy.

It is evident, however, that all men and women cannot equally enjoy the pursuit of scientific work. The variety of inclinations is such that some will find more pleasure in science, some others in art, and others again in some of the numberless branches of the production of wealth. But, whatever the occupations preferred by everyone, everyone will be the more useful in his own branch if he is in possession of a serious scientific knowledge. And, whosoever he might be — scientist or artist physicist or surgeon, chemist or sociologist, historian or poet — he would be the gainer if he spent a part of his life in the workshop or the farm (the workshop *and* the farm), if he were in contact with humanity in its daily work, and had the satisfaction of knowing that he himself discharges his duties as an unprivileged producer of wealth.

How much better the historian and the sociologist would understand humanity if they knew it, not in books only, not in a few of its representatives, but as a whole, in its daily life, daily work, and daily affairs! How much more medicine would trust to hygiene, and how much less to prescriptions, if the young doctors were the nurses of the sick and the nurses received the education of the doctors of our time! And how much the poet would gain in his feeling of the beauties of nature, how much better would he know the human heart, if he met the rising sun amidst the tillers of the soil, himself a tiller; if he fought against the storm with the sailors on board ship; if he knew the poetry of labour and rest, sorrow and joy, struggle and conquest! *Greift nur hinein in's volle Menschenleben!* Goethe said; *Ein jeder lebt's — nicht vielen ist's bekannt.* But how few poets follow his advice!

The so-called "division of labour" has grown under a system which condemned the masses to toil all the day long, and all the life long, at the same wearisome kind of labour. But if we take into account how few are the real producers of wealth in our present society, and how squandered is their labour we must recognise that Franklin was right in saying that to work five hours a day would generally do for supplying each member of a civilised nation with the comfort now accessible for the few only.

But we have made some progress since Franklin's time, and some of that progress in the hitherto most backward branch of production — agriculture — has been indicated in the preceding pages. Even in that branch the productivity of labour can be immensely increased, and work itself rendered easy and pleasant. If everyone took his share of production, and if production were socialised — as political economy, if it aimed at the satisfaction of the ever-growing needs of all, would advise us to do — then more than one half of the working day would remain to everyone for the pursuit of art, science, or any hobby he or she might prefer; and his work in those fields would be the more profitable if he spent the other half of the day in productive work — if art and science were followed from mere inclination, not for mercantile purposes. Moreover, a community organised on the principles of all being workers would be rich enough to conclude that every man and woman, after having; reached a certain age — say of forty or more — ought to be relieved from the moral obligation of taking a direct part in the performance of the necessary manual work, so as to be able entirely to devote himself or herself to whatever he or she chooses in the domain of art, or science, or any kind of work. Free pursuit in new branches of art and knowledge, free creation, and free development thus might be fully guaranteed.. And such a

community would not know misery amidst wealth. It would not know the duality of conscience which permeates out life and stifles every noble effort. It would freely take its flight towards the highest regions of progress compatible with human nature.

Chapter V: Conclusion.

Readers who have had the patience to follow the facts accumulated in this book, especially those who have given them thoughtful attention, will probably feel convinced of the immense powers over the productive forces of Nature that man has acquired within the last half a century. Comparing the achievements indicated in this book with the present state of production, some will, I hope, also ask themselves the question which will be ere long, let us hope, the main object of a scientific political economy: Are the means now in use for satisfying human needs, under the present system of permanent division of functions and production for profits, really *economical?* Do they really lead to economy in the expenditure of human forces ? Or, are they not mere wasteful survivals from a past that wads plunged into darkness, ignorance and oppression, and never took into consideration the economical and social value of the human being?

In the domain of agriculture it may be taken as proved that if a small part only of the time that is now — given in each nation or region to field culture was given to well thought out and socially carried out permanent improvements of the soil, the duration of work which would be required afterwards to grow the yearly bread-food for an average family of five would be less than a fortnight every year; and that the work required for that purpose would not be the hard toil of the ancient slave, but work which would be agreeable to the physical forces of every healthy man and woman in the country.

It has been proved that by following the methods of intensive market-gardening — partly under glass — vegetables and fruit can be grown in such quantities that men could be provided with a, rich vegetable food and a profusion of fruit, if they simply devoted to the task of growing them the hours which everyone willingly devotes to work in the open air, after having spent most of his day in the factory, the mine, or the study. Provided, of course, that the production of food-stuffs should not be the work of the isolated individual, but the planned-out and combined action of human groups.

It has also been proved — and those who care to verify it by themselves may easily do so by calculating the real expenditure for labour which was lately made in the building of workmen's houses by both private persons and municipalities[1] — that under a proper combination of labour, twenty to twenty-four months of one man's work would be sufficient to secure for ever, for a family of five, an apartment or a house provided with all the comforts which modern hygiene and taste could require.

And it has been demonstrated by actual experiment that, by adopting methods of education, advocated long since and partially applied here and there, it is most easy to convey to children of an average intelligence, before they have reached the age of fourteen or fifteen, a broad general

[1] These figures may be computed, for instance, from the data contained in "The Ninth Annual Report of the Commissioner of Labour of the United States, for the year 1893: Building and Loan Associations." In this country the cost of a workman's cottage is reckoned at about £200, which would represent 700 to 800 days of labour. But we must not forget how much of this sum is a toll raised by the capitalists and the landlords upon everything that is used in building the cottage: the bricks and tiles, the mortar, the wood, the iron, etc.

comprehension of Nature, as well as of human societies; to familiarise their minds with sound methods of both scientific research and technical work, and inspire their hearts with a deep feeling of human solidarity and justice; and that it is extremely easy to convey during the next four or five years a reasoned, scientific knowledge of Nature's laws, as well as a knowledge, at once reasoned and practical, of the technical methods of satisfying man's material needs. Far from being inferior to the "specialised" young persons manufactured by our universities, the *complete* human being, trained to use his brain and his hands, excels them, on the contrary, in all respects, especially as an initiator and an inventor in both science and technics.

All this has been proved. It is an acquisition of the times we live in — an acquisition which has been won despite the innumerable obstacles always thrown in the way of every initiative mind. It has been won by the obscure tillers of the soil, from whose hands greedy States, land lords and middlemen snatch the fruit of their labour even before it is ripe; by obscure teachers who only too often fall crushed under the weight of Church, State, commercial competition, inertia of mind and prejudice.

And now, in the presence of all these conquests — what is the reality of things?

Nine-tenths of the whole population of grain-exporting countries like Russia, one-half of it in countries like France which live on home grown food, work upon the land-most of them in the same way as the slaves of antiquity did, only to obtain a meagre crop from a soil, and with a machinery which they cannot improve, because taxation, rent and usury keep them a]ways as near as possible to the margin of starvation. In this twentieth century, whole populations still plough with the same plough as their medaeval ancestors, live in the same incertitude of the morrow, and are as carefully denied education as their ancestors; and they have, in claiming their portion of bread, to march with their children and wives against their own sons' bayonets, as their grandfathers did hundreds of years ago.

In industrially devloped countries, a couple of months' work, or even much less than that, would be sufficient to produce for a family a rich and varied vegetable and animal food. But the researches of Engel (at Berlin) and his many followers tell us that the workman's family has to spend one full half of its yearly earnings — that is, to give six months of labour, and often more — to provide its food. And what food! Is not bread and dripping the staple food of more than one-half of English children ?

One month of work every year would be quite sufficient to provide the worker with a healthy dwelling. But it is from 25 to 40 per cent. of his yearly earnings — that is, from three to five months of his working time every year — that he has to spend in order to get a dwelling, in most cases unhealthy and far too small; and this dwelling will never be his own, even though at the age of forty-five or fifty he is sure to be sent away from the factory, because the work that he used to do will by that time be accom plished by a machine and a child.

We all know that the child ought, at least, to be familiarised with the forces of Nature which some day he will have to utilise; that he ought to be prepared to keep pace in his life with the steady progress of science and technics; that he ought to study science and learn a trade. Every-one will grant thus much; but what do we do? From the age of ten or even nine we send the child to push a coal-cart in a mine, or to bind, with a little monkey's agility, the two ends of threads broken in a spinning gin. From the age of thirteen we compel the girl — a child yet — to work as a "woman" at the weaving-loom, or to stew in the poisoned, over-heated air of a cotton-dressing factory, or, perhaps, to be poisoned in the death chambers of a Staffordshire pottery. As to those who have the relatively rare luck of receiving some more education, we crush

their minds by useless overtime, we con sciously deprive them of all possibility of them selves becoming producers; and under an educational system of which the motive is "profits," and the means "specialisation," we simply work to death the women teachers who take their educational duties in earnest. What floods of use]ess sufferings deluge every so-called civilised land in the world!

When we look back on ages past, and see there the same sufferings, we may say that perhaps then they were unavoidable on account of the ignorance which prevailed. But human genius, stimulated by our modern Renaissance, has already indicated new paths to follow.

For thousands of years in succession to grow one's food was the burden, almost the curse, of mankind. But it need be so no more. If you make yourselves the soil, and partly the temperature and the moisture which each crop requires, you will see that to grow the yearly food of a family, under rational conditions of culture, requires so little labour that it might almost be done as a mere change from other pursuits. If you return to the soil, and co-operate with your neighbours instead of erecting high walls to conceal yourself from their looks; if you utilise what experiment has already taught us, and call to your aid science and technical invention, which never fail to answer to the call — look only at what they have done for warfare — you will be astonished at the facility with which you can bring a rich and varied food out of the soil. You will admire the amount of sound knowledge which your children will acquire by your side, the rapid growth of their intelligence, and the facility with which they will grasp the laws of Nature, animate and inanimate.

Have the factory and the workshop at the gates of your fields and gardens, and work in them. Not those large establishments, of course, in which huge masses of metals have to be dealt with and which are better placed at certain spots indicated by Nature, but the countless variety of workshops and factories which are required to satisfy the infinite diversity of tastes among civilised men. Not those factories in which children lose all the appearance of children in the atmosphere of an industrial hell, but those airy and hygienic, and consequently economical, factories in which human life is of more account than machinery and the making of extra profits, of which we already find a few samples here and there; factories and workshops into which men, women and children will not be driven by hunger, but will be attracted by the desire of finding an activity suited to their tastes, and where, aided by the motor and the machine, they will choose the branch of activity which best suits their inclinations.

Let those factories and workshops be erected, not for making profits by selling shoddy or use-less and noxious things to enslaved Africans, but to satisfy the unsatisfied needs of millions of Europeans. And again, you will be struck to see with what facility and in how short a' time your needs of dress and of thousands of articles of luxury can be satisfied, when production is carried on for satisfying real needs rather than for satisfying shareholders by high profits or for pouring gold into the pockets of promoters and bogus directors. Very soon you will yourselves feel interested in that work, and you will have occasion to admire in your children their eager desire to become acquainted with Nature and its forces, their inquisitive inquiries as to the powers of machinery, and their rapidly developing inventive genius.

Such is the future — already possible, already realisable; such is the present — already condemned and about to disappear. And what prevents us from turning our backs to this present and from marching towards that future, or, at least, making the first steps towards it, is not the " failure of science," but first of all our crass cupidity — the cupidity of the man who killed the

hen that was laying golden eggs — and then our laziness of mind — that mental cowardice so carefully nurtured in the past.

For centuries science and so-called practical wisdom have said to man: "It is good to be rich, to be able to satisfy, at least, your material needs; but the only means to be rich is to so train your mind and capacities as to be able to compel other men-slaves, serfs or wage-earners — to make these riches for you. You have no choice. Either you must stand in the ranks of the peasants and the artisans who, whatsoever economists and moralists may promise them in the future, are now periodically doomed to starve after each bad crop or during their strikes and to be shot down by their own sons the moment they lose patience. Or you must: train your faculties so as to be a military commander of the masses, or to be accepted as one of the wheels of the governing machinery of the State or to become a manager of men in commerce or industry." For many centuries there was no other choice, and men followed that advice, without finding in it happiness, either for themselves and their own children, or for those whom they pretended to preserve from worse misfortunes.

But modern knowledge has another issue to offer to thinking men. It tells them that in order to be rich they need not take the bread from the mouths of others; but that the more rational outcome would be a society in which men, with the work of their own hands and intelligence, and by the aid of the machinery already invented and to be invented, should themselves create all imaginable riches. Technics and science will not be lagging behind if production takes such a direction. Guided by observation, analysis and experiment, they will answer all possible demands. They will reduce the time which is necessary for producing wealth to any desired amount, so as to leave to everyone as much leisure as he or she may ask for. They surely cannot guarantee happiness, because happiness depends as much, or even more, upon the individual himself as upon his surroundings. But they guarantee, at least, the happiness that can be found in the full and varied exercise of the different capacities of the human being, in work that need not be overwork, and in the consciousness that one is not endeavouring to base his own happiness upon the misery of others.

These are the horizons which the above inquiry opens to the unprejudiced mind.

Appendix

A. British Investments Abroad

The important question as to the amount of British capital invested in the colonies and in other countries has only quite lately received due attention. For the last ten years or so one could find in the "Reports of the Commissioner of Inland Revenue" a mention of the revenue derived from British capital invested in foreign loans to States and Municipalities and in railway companies; but these returns were still incomplete. Consequently, Mr. George Paish made in 1909 and 1911 an attempt at determining these figures with more accuracy in two papers which he read before the Statistical Society.[1]

Mr. Paish based his researches on the Income Tax, completing, these data by special researches about private investments, which do not appear in the Income Tax returns. He has not yet got to the end of his investigation; but, all taken, he estimates that the yearly income received by this country from abroad from different sources reaches £300,000,000 every year.

[1] "Great Britain's Capital Investments in Other Lands" (*Journal of the Statistical Society,* September 1909, vol. lxxii., pp. 475–495), followed by a most interesting discussion; and " Great Britain's Capital Investments in India, Colonial and Foreign Countries," same journal, January 1911, vol. lxxiv., pp.167–200.

B. French Imports

About one-tenth part of the cereals consumed in France is still imported; but, as will be seen in a subsequent chapter, the progress in agriculture has lately been so rapid that even without Algeria France will soon have a surplus of cereals. Wine is imported, but nearly as much is exported. So that coffee and oil-seeds remain the only food articles of durable importance for import. For coal and coke France is still tributary to Belgium, to this country, and to Germany; but it is chiefly the inferiority of organization of coal extraction which stands in the way of the home supply. The other important items of imports are: raw cotton (from £12,440,000 to £18,040,000 in 1903–1910), raw wool (from £15,160,000 to £23,200,000), and raw silk (from £10,680,000 to £17,640,000), as well as hides and furs, oil-seeds, and machinery (about £10,000,000). The exports of manufactured goods were £80,000,000 in 1890, and in subsequent years from £119,000,000 to 137,000,000. Exports of textiles, exclusive of yarn and linen, £29,800,000 in 1890, and £34,440,000 in 1908–1910; while the imports of all textiles are insignificant (from £5,000,000 to £7,000,000).

C. Growth of Industry in Russia

The growth of industry in Russia will be best seen from the following:

	1880-81. Cwts.	1893-94. Cwts.	1910. Cwts.
Cast iron	8,810,000	25,450,000	61,867,000
Iron (iron and steel)	5,770,000	9,700,000	61,540,700
Steel	6,030,000	9,610,000	
Railway rail	3,960,000	4,400,000	10,408,300
Coal	64,770,000	160,000,000	530,570,000
(imports of coal)	from 80,000,000 to 100,000,000		
Naptha	6,900,000	108,700,000	189,267,000
Sugar	5,030,000	11,470,000	28,732,000
Raw cotton, home grown (cont.)	293,000	1,225,000	3,736,000
Cottons, grey, and yarnl	23,640,000	42,045,000	86,950,000
Cottons, printed	6,160,000	7,720,000	37,680,000

	1900.	1908.
All cottons	£56,156,000	£94,233,000
All woolens	19,064,000	25,388,000
Linen	7,076,600	9,969,000
Silk	3,335,000	3,969,000

The recent growth of the coal and iron industries in South Russia (with the aid of Belgian capital) was very will illustrated at the Turin Exhibition of 1911. From less than 100,000 tons in 1860, the extraction of coal and anthracite rose to 16,840,460 metric tons in 1910. The extraction of iron ore rose from 377,000 tons in 1890 to 3,760,000 tons in 1909. The production of cast iron, which was only 29,270 tons in 1882, reached 2,067,000 tons in 1910, and the amount of refined iron and steel and their produce rose from 27,830 tons in 1882 to 1,641,960 tons in 1910. In short, South Russia is becoming an exporting centre for the iron industry. (P. Palcinsky, in Russian *Mining Journal*, 1911, Nos. 8 and 12.)

D. Iron Industry in Germany

The following tables will give some idea of the growth of mining and metallurgy in Germany.

The extraction of minerals in the German Empire, in metric tons, which are very little smaller than the English ton (0.984), was:

	1883. Tons.	1893. Tons.	1910. Tons.
Coal	55,943,000	76,773,000	152,881,500
Lignite	14,481,000	22,103,000	69,104,900
Iron Ore	8,616,000	12,404,000	28,709,700
Zinc Ore	678,000	729,000	718,300
Mineral salts (chiefly potash)	1,526,000	2,379,000	9,735,700

Since 1894 the iron industry has taken a formidable development, the production of pig-iron reaching 12,644,900 metric tons in 1909 (14,793,600 in 1910), and that of half-finished and finished iron and steel, 14,186,900 tons; while the exports of raw iron, which were valued at £1,195,000 in 1903, doubled in seven years, reaching £2,250,000 in 1910.

E. Machinery in Germany

The rapid progress in the fabrication of machinery in Germany is best seen from the growth of the German exports as shown by the following table:

	1890.	1895.	1907.
Machines and parts thereof	£2,450,000	£3,215,000	£17,482,500
Sewing-machines parts thereof	315,000	430,000	1,202,500
Locomotives and locomobiles	280,000	420,000	1,820,000

Three years later the first of these items had already reached £25,000,000, and the export of bicycles, motorcars, and motor-buses, and parts thereof, was valued at £2,904,000.

Everyone knows that German sewing-machines, motor-bus frames, and a considerable amount of tools find their way even into this country, and that German tools are plainly recommended in English books.

F. Cotton Industry in Germany

Dr. G. Schulze-Gaewernitz, in his excellent work, *The Cotton Trade in England and on the Continent* (English translation by Oscar S. Hall, London, 1895), called attention to the fact that Germany had certainly not yet attained, in her cotton industry, the high technical level of development attained by England; but he showed also the progress realised. The cost of each yard of plain cotton, notwithstanding low wages and long hours, was still greater in Germany than in England, as seen from the following tables. Taking a certain quality of plain cotton in both countries, he gave (p. 151, German edition) the following comparative figures:

	England.	Germany.
Hours of labour	9 hours	12 hours
Average weekly earnings of the operatives	16s. 3d.	11s. 8d.
Yards woven per week per operative	706 yards	466 yards
Cost per yard of cotton	0.275d.	0.303d.

But he remarked also that in all sorts of printed cottons, in which fancy, colours and invention play a predominant part, *the advantages were entirely on the side of the smaller German factories.*

In the spinning mills the advantages, on the contrary, continued to remain entirely on the side of England, the number of operatives per 1,000 spindles being in various countries as follows (p. 91, English edition):

	Per 1000 spindles.
Bombay	25 operatives.
Italy	13 ”
Alsace	9.5 ”
Mulhouse	7.5 ”
Germany, 1861	20 ”
” 1882	8 to 9 ”
England, 1837	7 ”
” 1887	3 ”

Considerable improvements had taken place already in the ten years 1884–1894. “India shows us, since 1884, extraordinary developments,” Schulze-Gaewernitz remarked, and “there is no doubt that Germany also has reduced the number of operatives per 1,000 spindles since the last Inquest.” “From a great quantity of materials lying before me, I cull,” he wrote, “the following, which, however, refers solely to leading and technicallay distinguished spinning mills:

	Per 1000 spindles.
Switzerland	6-2 operatives
Mulhouse	5-8 ”
Baden and Wurtemberg	6-2 ”
Bavaria	6-8 ”
Saxony (new and splendid mills)	7-2 ”
Vosges, France (old spinning mills)	8-9 ”
Russia	16-6 ”

The average counts of yarn for all these were between twenties and thirties.”

It is evident that considerable progress has been realised since Schulze-Gaewernitz wrote these lines. As an exporter of cotton yarn and cottons, Germany has made rapid strides. Thus, in 1903, she exported £1,625,000 worth of cotton yarn, and £15,080,000 worth of cottons. For 1910 the figures given by the *Statistisches Jahrbuch for 1911* were already £2,740,000 and £18,255,000 respectively.

G. Mining and Textiles in Austria

To give an idea of the development of industries in Austria-Hungary, it is sufficient to mention the growth of her mining industries and the present state of her textile industries. The value of the yearly extraction of coal and iron ore in Austria appears as follows:

	1880.	1890.	1910.
Coal	£1,611,000	£25,337,000	£57,975,000
Brown coal	1,281,300	23,033,000	56,715,000
Raw iron	1,749,000	22,759,000	49,367,000

At the present time the exports of coal entirely balance the imports.

As to the textile industries the imports of raw cotton into Austria-Hungary reached in 1907 the respectable value of £12,053,400. For raw wool and wool yarn they were £6,055,60O worth, and for silk, £1,572,000; while £3,156,200 worth of woollens were exported.

According to the census of 1902 *(Statistisches Jahrbuch* for 1911), there were already, in Austria-Hungary, 1,408,855 industrial establishments, occupying 4,049,320 workpeople, and having a machinery representing 1,787,90O horse-power. The textile trades alone tad in their service 257,500 horse-power (as against 113,280 in 1890).

The small industry evidently prevailed, nearly one of all the workpeople (2,066,120) being employed in 901,202 establishments, which had only from one to twenty persons each; while 443,235 workpeople were employed in 10,661 establishments (from twenty to 100 work people each). Still, the great industry has already made its appearance in some branches — there being 3,021 establishments which employed more than 100 workers each, and representing an aggregate of 1,053,790 workpeople. Out of them 105 establishments employed even more than 1,000 persons each (115 establishments, 179,876 workpeople in 1910).

In Hungary industry is also rapidly developing; it occupied 1,127,130 persons in 1902 (34,160 in the textiles, and 74,000 in mining). In 1910 the exports of all textiles (stuffs and yarns) from Hungary reached the sum of £7,040,500.

H. Cotton Manufacture in India

The views taken in the text about the industrial development of India are confirmed by a mass of evidence. One of them, coming from authorised quarters, deserves special attention. In an article on the progress of the Indian cotton manufacture, the *Textile Recorder* (15th October, 1888) wrote:

"No person connected with the cotton industry can be ignorant of the rapid progress of the cotton manufacture in India. Statistics of all kinds have recently beep brought before the public, showing the increase of production in the country; still it does not seem to be clearly understood that this increasing output of cotton goods must seriously lower the demand upon Lancashire mills, and that it is not by any means improbable that India may at no very distant period be no better customer than the United States is now."

One hardly need add at what price the Indian manufacturers obtain cheap cottons. The report of the Bombay Factory Commission which was laid before Parliament in August, 1888, contained facts of such horrible cruelty and cupidity as would hardly be imagined by those who have forgotten the disclosures of the inquiry made in this country in 1840 — 1842. The factory engines are at work, as a rule, from 5 A.M. till 7, 8, or 9 P.M., and the workers remain at work for twelve, thirteen, fourteen hours, only releasing one another for meals. In busy times it happens that the same set of workers remain at the gins and presses night and day with half an hour's rest in the evening. In some factories the workers have their meals at the gins, and are so worn out after eight and ten days' uninterrupted work that they supply the gins mechanically "three parts asleep."

"It is a sad tale of great want on one side, and cruel cupidity on the other," the official report concludes. However, it would be absolutely erroneous to conclude that Indian manufactures can compete with the British ones as long as they continue the terrible exploitation of human labour which we see now. Forty years ago the British manufactures offered absolutely the same terrible picture of cruel cupidity. But times will come when Indian workers will restrain the cupidity of the capitalists, and the manufacturers of Bombay will be none the worse for that in their competition with the British manufactures.

The figures relative to the latest growth of the textile industries in India, given in the text, fully confirm the previsions expressed twenty-five years ago. As to the conditions of the workpeople in the Indian cotton-mills, they continue to remain abominable.

I. The Cotton Industry in the States

A few years ago the cotton industry in the United States attracted the attention of the Manchester cotton manufacturers, and we have now two very interesting works written by persons who went specially to the States in order to study the rapid progress made there in spinning and weaving.[1]

These two inquiries fully confirm what has been said in the text of this book about the rapid progress made in the American industry altogether, and especially in the development of a very fine cotton-weaving machinery. In his preface to Mr. Young's book, Mr. Helm says: "The results of this inquiry may not incorrectly be called a revelation for Lancashire. It was, indeed, already known to a few on this side of the ocean that there were wide differences between the methods and organization of American and English cotton-mills. But it is only between the last three or four years that suspicion has arisen amongst us that our competitors in the United States have been marching faster than we have in the path of economy of production."

The most important difference between the British and American methods was, in Mr. Helm's opinion, in "the extensive use of the automatic loom." Mr. Young's investigation on the subject left no doubts that the employment of this loom "substantially reduces the cost of production, and at the same time increases the earnings of the weaver, because it permits him to conduct more looms" (p. 15). Altogether, we learn from Mr. Helm's remarks that there are now 85,000 automatic looms running in the United States, and that "the demand for weavers is greater than ever" (p. 16). In a Rhode Island mill, 743 ordinary looms required 100 weavers, while 2,000 Northrop (or Draper) looms could be conducted by 134 weavers only, which means an average of fifteen looms for each weaver, and altogether these looms are spreading very rapidly. But it is not only in the looms that such improvements have been introduced. "The spinning frames," we are told by Mr. Young, "containing 112 spindles a side, were tended by girls who ran four, six, eight, or ten sides each, according to the girl's dexterity. The average for good spinners was about eight sides (896 spindles)" (p. 10).

In a New Bedford fine-spinning mill the ring-spinners were minding 1,200 spindles each (p. 16).

It is important to note the speed at which the cotton industry has been developing lately in the States. The census of 1900 gave a total of 19,008,350 spindles. But in 1909 we find already 28,178,860 spindles for cotton alone (34,500,000, including silk, wool, and worsted). And, what is still more important, most of this increase fell upon the Southern States, where machinery is also more perfect, both for spinning and weaving, and where most of the work is being done by the whites. In a South Carolina print-cloth mill, containing 1,000 Draper looms, the average for narrow looms was 15 looms to each weaver. (T.W. Uttley, *l.c.,* pp. 4, 50, etc.)

[1] T.M. Young, *The American Cotton Industry.* Introduction by Elijah Helm, Secretary to the Manchester Chamber of Commerce, London 1902; and T.W. Uttley, *Cotton Spinning and Manufacturing in the United States: A report ... of a tour of the American cotton manufacturing centres made in 1903 and 1904.* Publications of Manchester Universty, Economic Series, No. II., Manchester, 1905.

As for the American competition in the Chinese markets, Mr. Helm gives imposing figures.

J. Mr. Giffen's and Mr. Flux's Figures Concerning the Position of the United Kingdom in International Trade

A few remarks concerning these figures may be of some avail.

When a sudden fall in the British and Irish exports took place in the years 1882–1886, and the alarmists took advantage of the bad times to raise the never-forgotten war-cry of protection, especially insisting on the damages made to British trade by "German competition," Mr. Giffen analysed the figures of international trade in his "Finance Essays," and in a report read in 1888 before the Board of Trade Commission. Subsequently, Mr. A. W. Flux analysed again the same figures, extending them to a later period. He confirmed Mr. Giffen's conclusions and endeavoured to prove that the famous "German competition" is a fallacy.

Mr. Giffen's conclusions, quoted by Mr. A. W. Flux ("The Commercial Supremacy of Great Britain," in *Economical Journal*, 1894, iv., p. 457), were as follows:

"On the whole, the figures are not such as to indicate any great and overwhelming advance in German exports, in comparison with those of the United Kingdom. There is greater progress in certain direction, but, taken altogether, no great disproportionate advance, and in many important markets for the United Kingdom Germany hardly appears at all."

In this subdued form, *with regard to German competition alone* — and due allowance being made for figures in which no consideration is given to what sort of goods make a given value of exports, and in what quantities — Mr. Giffen's statement could be accepted. But that was all.

If we take, however, Mr. Giffen's figures as they are reproduced in extended tables (on pp. 461–467 of the just quoted paper), tabulated with great pains in order to show that Germany's part in the imports to several European countries, such as Russia, Italy, Servia, etc., had declined, as well as the part of the United Kingdom , all we could conclude from these figures was, that there were other countries besides Germany — namely, the United States and Belgium — which competed very effectively with England, France, and Germany for supplying what manufactured goods were taken by Russia, Italy, Servia, etc., from abroad.

At the same time such figures gave no idea of the fact that where manufactured metal goods were formerly supplied, coal and raw metals were imported for the home manufacture of those same goods; or, where dyed and printed cottons were imported, only yarn was required. The whole subject is infinitely more complicated that it appeared in Mr. Giffen's calculations; and, valuable as his figures may have been for appeasing exaggerated fears, they contained no answer whatever to the many economic questions involved in the matters treated by Mr. Giffen.

The conclusions which I came to in these lines in the first edition of this book found further confirmation in the subsequent economical development of all nations in that same direction. The result is, that — apart from the extraordinary exports of the years 1910 and 1911 (which I venture to explain by the general prevision of a great European war going to break out) — the exports

from this country, apart from their usual periodical fluctuations, continued to remain what they were, in proportion to the increasing population, and many of them became less profitable; while the exports from all other countries increased in a much greater proportion.

K. Market-Gardening in Belgium

In 1885 the superficies given to market gardening in Belgium was 99,600 acres. In 1894 a Belgian professor of agriculture, who has kindly supplied me with notes on this subject, wrote:

"The area has considerably increased, and I believe it can be taken at 112,000 acres (45,000 hectares), if not more." And further on: "Rents in the neighbourhood of the big towns, Antwerp, Liege, Ghent, and Brussels, attain as much as £5, 16s. and £8 per acres; the cost of instalment is from £13 to £25 per acre; the yearly cost of manure, which is the chief expense, attains from £8 to £16 per acre the first year, and then from £5 to £8 every year." The gardens are of the average size of two and a half acres, and in each garden from 200 to 400 frames are used. About the Belgian market-gardeners the same remark must be made as has been made concerning the French *maraichers*. They work awfully hard, having to pay extravagant rents, and to lay money aside, with the hope of some day being able to buy a piece of land, and to get rid of the blood-sucker who absorbs so much of their money returns; having moreover every year to buy more and more frames in order to obtain their produce earlier and earlier, so as to fetch higher prices for it, they work like slaves. But it must be remembered that in order to obtain the same amount of produce under glass, in greenhouses, the work of *three men only*, working fifty-five hours a week, is required in Jersey for cultivating one acre of land under glass.

But I must refer my readers to the excellent work of my friend, B. Seebohm Rowntree's *Land and Labour: Lessons from Belgium*, London (Macmillan), 1910, a strong volume of more than 600 pages, which is the result of several years of laborious studies. It is full of figures and personal observations, and will be consulted with advantage for all the questions dealing with the economical life of Belgium.

L. The Channel Islands — The Scilly Islands

The excellent state of agriculture in Jersey and Guernsey has often been mentioned in the agricultural and general literature of this country, so I need only refer to the works of Mr. W. E. Bear (*Journal of the Agricultural Society*, 1888; *Quarterly Review*, 1888; *British Farmer*, etc.) and to the exhaustive work of D. H. Ansted and R. G. Latham, *The Channel Islands*, third edition, revised by E. Toulmin Nicolle, London (Allen), 1893.

Many English writers — certainly not those just named — are inclined to explain the successes obtained in Jersey by the wonderful climate of the islands and the fertility of the soil. As to climate, it is certainly true that the yearly record of sunshine in Jersey is greater than in any English station. It reaches from 1,842 hours a year (1890) to 2,300 (1893), and thus exceeds the highest aggregate sunshine recorded in any English station by from 168 to 336 hours (exclusively high maximum in 1894) a year; May and August seeming to be the best favoured months.[1] But, to quote from the just mentioned work of Ansted and Latham:

"There is, doubtless, in all the islands, and especially in Guernsey, *an absence of sun heat* and of the direct action of the sun's rays *in summer*, which must have its effect, and *a remarkable prevalence of cold, dry, east wind in late spring, retarding vegetation*" (p. 407). Everyone who has spent, be it only two or three weeks in late spring in Jersey, must know by experience how true this remark is. Moreover, there are the well-known Guernsey, fogs, and "owing also to rain and damp the trees suffer from mildew and blight, as well as from various aphides." The same authors remark that the nectarine does not succeed in Jersey in the open air "owing to the absence of autumn heat"; that "the wet autumns and cold summers do not agree with the apricot;" and so on.

If Jersey potatoes are, on the average, three weeks in advance of those grown in Cornwall, the fact is fully explained by the continual improvements made in Jersey in view of obtaining, be it ever so small, quantities of potatoes a few days in advance, either by special care taken to plant them out as soon as possible, protecting them from the cold winds, or by choosing tiny pieces of land naturally protected or better exposed. The difference in price between the earliest and the later potatoes being immense, the greatest efforts are made to obtain an early crop.

The decline of prices per ton is best seen from the following prices in 1910:

[1] *Ten Years of Sunshine in the British Isles*, 1881–1890

Week ending	Quantities exported. Tons.	Prices. £	s.	d.
April 2-30	210	30	11	0
May 7	600	18	12	8
” 14	1,250	15	12	0
” 21	2,000	13	0	0
” 28	5,500	10	3	8
June 4	7,825	8	13	4
” 11	9,200	6	5	8
” 18	13,000	4	17	6
” 25	9,650	4	8	10
July 2	6,600	3	13	8
” 9	1,900	2	18	6
” 16	145	3	9	4
” 23	10	3	18	0
Total	57,890	£381,373		

The quantities of early potatoes exported varied during the years 1901 to 1910 from 47,530 tons to 77,800 tons, and their value from £233,289 to £475,889.

As to the fertility of the soil, it is still worse advocacy, because there is no area in the United Kingdom of equal size which would be manured to such an extent as the area of Jersey and Guernsey is by means of artificial manure. In the seventeenth century, as may be seen from the first edition of Falle's *Jersey*, published in 1694, the island "did not produce that quantity as is necessary for the use of the inhabitants, who must be supplied from England in time of peace, or from Dantzic in Poland." In *The Groans of the Inhabitants of Jersey*, published in London in 1709, we find the same complaint. And Quayle, who wrote in 1812 and quoted the two works just mentioned, in his turn complained in these terms: "The quantity at this day raised is quite inadequate to their sustenance, apart from the garrison" (*General View of the Agriculture and the Present State of the Islands on the Coast of Normandy*, London, 1815, p. 77.) And he added: "After making all allowance, the truth must be told; the grain crops are here foul, in some instances execrably so." And when we consult the modern writer, Ansted, Latham, and Nicolle, we learn that the soil is by no means rich. It is decomposed granite, and easily cultivable, but "it contains no organic matter besides what man has put into it."

This is certainly the opinion anyone will come to if he only visits thoroughly the island and looks attentively to its soil — to say nothing of the Quenvais where, in Quayle's time, there was, "an Arabian desert" of sands and hillocks covering about seventy acres (p. 24), with a little better but still very poor soil in the north and west of it. The Fertility of the soil has entirely been made, first, by the *vraic* (sea-weeds), upon which the inhabitants have maintained communal rights; later on, by considerable shipments of manure, in addition to the manure of the very considerable living stock which is kept in the island; and finally, by an admirably good cultivation of the soil.

Much more than sunshine and good soil, it was the conditions of land-tenure and the low taxation which contributed to the remarkable development of agriculture in Jersey. First of all, the people of the Isles know but little of the tax-collector. While the English pay, in taxes, an average of 50s. per head of population; while the French peasant is over-burdened with taxes of

all imaginable descriptions; and the Milanese peasant has to give to the Treasury full 30 per cent. Of his income — all taxes paid in the Channel Islands amount to but 10s. per head in the town parishes and to much less than that in the country parishes. Besides, of indirect taxes, none are known but the 2s. 6d. paid for each gallon of the imported spirits and 9d. per gallon of imported wine.

As to the conditions of land-tenure, the inhabitants have happily escaped the action of Roman Law, and they continue to live under the *coutumier de Normandie* (the old Norman common law). Accordingly, more than one-half of the territory is owned by those who themselves till the soil; there is no landlord to watch the crops and to raise the rent before the farmer has ripened the fruit of his improvements; there is nobody to charge so much for each cart-load of sea-weeds or sand taken to the fields; everyone takes the amount he likes, provided he cuts the weeds at a certain season of the year, and digs out the sand at a distance of sixty yards from the high-water mark. Those who buy land for cultivation can do so without becoming enslaved to the money-lender. One-fourth part only of the permanent rent which the purchaser undertakes to pay is capitalised and has to be paid down on purchase (often less than that), the remainder being a perpetual rent in wheat which is valued in Jersey at fifty to fifty-four *sous de France* per cabot. To seize properly for debt is accompanied with such difficulties that is seldom resorted to (Quayle's *General View*, pp. 41–46). Conveyances of land are simply acknowledged by both parties on oath, and cost nearly nothing. And the laws of inheritance are such as to preserve the homestead, notwithstanding the debts that the father may have run into (*ibid.*, pp. 35–41).

After having shown how small are the farms in the islands (from twenty to five acres, and very many less than that) — there being "less than 100 farms in either island that exceed twenty-five acres; and of these only about half a dozen in Jersey exceed fifty acres" — Messrs. Ansted, Latham, and Nicolle remark:

"In no place do we find so happy and so contented a country as in the Channel Islands ..." "The system of land-tenure has also contributed in no small degree to their prosperity ..." "The purchaser becomes the absolute owner of the property, and his position cannot be touched so long as the interest of these [wheat] rents be paid. He cannot be compelled, as in the case of mortgage, to refund the principal. *The advantages of such a system are too patent to need any further allusion.*" (*The Channel Islands*, third edition, revised by E. Toulmin Nicolle, p. 401; see also p. 443.)

The following will better show how the cultivable area is utilised in Jersey (*The Evening Post Royal Almanack*):

	1894 Acres	1911. Acres.
Corn Crops…		
Wheat	1,709	656
Barley and bere	113	125
Oats and rye	499	1,213
Beans and peas	16	34
Green crops		
Potatoes	7,007	8,911
Turnips and swedes	111	61
Mangolds	232	137
Other green crops	447	176
Clover, sainfoin and grasses under rotation		
For hay	2,842	2,720
Not for hay	2,208	1,731
Permanent pasture or grass		
For hay	1,117	944
Not for hay	3,057	2,522
Bare fallow	–	53
Fruit		
Small fruit	–	99
Orchards and small fruit	–	1,151
Other crops	–	240
	21,252	20,733

The export value *per acre* varied in different years from £27, 6s. in 1893 to £66, 1s. in 1894, and even £95, 18s. in 1904.

As regards greenhouse culture, a friend of mine, who has worked as a gardener in Jersey, has collected for me various information relative to the productivity of culture under glass. Out of it the following may be taken as a perfectly reliable illustration, in addition to those given in the text:

Mr. B.'s greenhouse has a length of 300 feet and a width of 18 feet, which makes 5,400 square feet, out of which 900 square feet are under the passage in the middle. The cultivable are is thus 4,500 square feet. There are no brick walls, but brick pillars and boards are used for front walls. Hot-water heating is provided, but is only used occasionally, to keep off the frosts in winter — the crops being early potatoes (which require no heating), followed by tomatoes. The latter are Mr. B.'s speciality. Catch crops of radishes, etc., are taken. The cost of the greenhouse, without the heating apparatus, is 10s. per running foot of greenhouse, which makes £150 for one-eighth of an acre under glass, or a little less than 7d. per glass-roofed square foot.

The crops are: potatoes, four cabots per perch — that is, three-quarters of a ton of early potatoes from the greenhouse; and tomatoes, in the culture of which Mr. B. attains extraordinary results. He puts in only 1,000 plants thus giving to his plants more room than is usually given; and he cultivates a corrugated variety which gives very heavy crops but does not fetch the same

	1894.	1911.
Horses used solely for agriculture	2,252	2,188
Unbroken horses	83	69
Mares solely for breeding	16	–
Horses	2,351	2,257
Cows and heifers in milk or in calf	6,709	6,710
Other cattle:- Two years or more	864	
One year to two years	2,252	5,321
Less than one year	2,549	
Total cattle	12,374	12,031
Sheep, all ages	332	186
Pigs, including sows for breeding	6,021	4,639

Living Stock

	1887.	1888.	1889.
Bulls	102	100	92
Cows and heifers	1,395	1,639	1,629

Exports

	Average.Tons	£
1887-1890	54,502	308,713
1891-1894	62,885	413,609
1901-1905	66,731	455,773
1906	51,932	308,229
1907	77,800	377,259
1908	53,100	356,305
1909	62,690	332,404
1910	57,890	381,373

Potatoes exported

prices as the smooth varieties. In 1896 his crop was four tons of tomatoes, and so it would have been in 1897 — each plant giving an average of twenty pounds of fruit, while the usual crop is from eight to twelve pounds per plant.

The total crop was thus four and three-quarter tons of vegetables, to which the cach crops must be added — thus corresponding to 85,000 lb. per acres (over 90,000 lb. with the catch crops). I again omit the money returns, and only mention that the expenditure for fuel and manure was about £10 a year, and that the Jersey average is three men, each working fifty-five hours a week (ten hours a day), for every acre under glass.

The Scilly Islands. — These islands also give a beautiful illustration of what may be obtained from the soil by an intensive cultivation. When shipping and supplying pilots became a decaying source of income, the Scillonians took to the growing of potatoes. For many years, we are told by Mr. J. G. Uren (*Scilly and the Scillonians*, Plymouth, 1907), this was a very profitable industry. The crop was ready at least a month in advance of any other source of supply on the mainland. Every year about 1,000 tons of potatoes were exported. "In its palmy days the potato harvest in Scilly was the great event of the year. Gangs of diggers were brought across from the mainland," and the prices went occasionally up to £28 a ton for the earliest potatoes. Gradually, however, the export of potatoes was reduced to less than one-half of what it was formerly. Then the inhabitants of the islands went for fishing, and later on they began to grow flowers. Frost and snow being practically unknown in the islands, this new industry succeeded very well. The arable are of the islands is about 4,000 acres, which are divided into small farms, less than from fifteen to twenty acres, and these farms are transmitted, according to the local custom, from father to son.

It is not long ago that they began to grow wild narcissuses, to which they soon added daffodils (a hundred varieties), and lilies, especially arum-lilies, for Church decoration. All these are grown in narrow strips, sheltered from the winds by dwarf hedges. Movable glass-houses are resorted to shelter the flowers for a certain time, and in this way the gardeners have a succession of crops, beginning soon after Christmas, and lasting until April or May.

The flowers are shipped to Penzance, and thence carried by rail in special carriages. At the top of the season thirty to forty tons are shipped in a single day. The total exports, which were only 100 tons in 1887, have now reached 1,000 in 1907.

M. Irrigated Meadows in Italy

In the *Journal de l'Agriculture* (2nd Feb., 1889) the following was said about the *marcites* of Milan:

> "On part of these meadows water runs constantly, on others it is left running for ten hours every week. The former give six crops every year; since February, eighty to 100 tons of grass, equivalent to twenty and twenty-five tons of dry hay, being obtained from the hectare (eight to ten tons per acres). Lower down, thirteen tons of dry hay per acre is the regular crop. Taking eighty acres placed in average conditions, they will yield fifty-six tons of green grass per hectare — that is, fourteen tons of dry hay, or the food of three milch cows to the hectare (two and a half acres). The rent of such meadows is from £8 to £9, 12s. per acre."

For Indian corn, the advantages of irrigation are equally apparent. On irrigated lands, crops of from seventy-eight to eighty-nine bushels per acre are obtained, as against from fifty-six to sixty-seven bushels on unirrigated lands, also in Italy, and twenty-eight to thirty-three bushels in France (Garola, *Les Cereales*).

N. Planted Wheat

The Rothamsted Challenge

Sir A. Cotton delivered, in 1893, before the Balloon Society, a lecture on agriculture, in which lecture he warmly advocated deep cultivation and planting the seeds of wheat wide apart. He published it later on as a pamphlet (*Lecture on Agriculture*, 2nd edition, with Appendix. Dorking, 1893). He obtained, for the best of his sort of wheat, an average of "fifty-five ears per plant, with three oz. of grain of fair quality — perhaps sixty-three lbs. per bushel" (p. 10). This corresponded to ninety bushels per acre — that is, his result was very similar to those obtained at the Tomblaine and Capelle agricultural stations by Grandeau and F. Dessprez, whose work seems not to have been known to Sir A. Cotton. True, Sir A. Cotton's experiments were not conducted, or rather were not reported, in a thoroughly scientific way. But the more desirable it would have been, either to contradict or to confirm his statements by experiments carefully conducted at some experimental agricultural station. Unfortunately, so far as I know, no such experiments have yet been made, and the possibility of profitably increasing the wheat crop by the means indicated by Sir A. Cotton has still to be tested in a scientific spirit.

O. Replanted Wheat

A few words on this method which now claims the attention of the experimental stations may perhaps not be useless.

In Japan, rice is always treated in this way. It is treated as our gardeners treat lettuce and cabbage — that is, it is let first to germinate; then it is sown in special warm corners, well inundated with water and protected from the birds by strings drawn over the ground. Thirty-five to fifty-five days later, the young plants, now fully developed and possessed of a thick network of rootlets, are *replanted* in the open ground. In this way the Japanese obtain from twenty to thirty-two bushels of *dressed* rice to the acre in the poor provinces, forty bushels in the better ones, and from sixty to sixty-seven bushels on the best lands. The average, in six rice-growing states of North America, is at the same time only nine and a half bushels.[1]

In China, replanting is also in general use, and consequently the idea has been circulated in France by M. Eugene Simon and the late M. Toubeau, that replanted wheat could be made a powerful means of increasing the crops in Western Europe.[2]

So far as I know, the idea has not yet been submitted to a practical test; but when one thinks of the remarkable results obtained by Hallet's method of planting; of what the market-gardeners obtain by replanting once and even twice; and of how rapidly the work of planting is done by market-gardeners in Jersey, one must agree that in replanted wheat we have a new opening worthy of the most careful consideration. Experiments have not yet been made in this direction; but Prof. Grandeau, whose opinion I have asked on this subject, wrote to me that he believes the method must have a great future. Practical market-gardeners (Paris *maraicher*) whose opinion I have asked, see, of course, nothing extravagant in that idea.

With plants yielding 1,000 grains each — and in the Capelle experiment they yielded and average of 600 grains — the yearly wheat-food of one individual man (5*65 bushels, or 265 lbs.), which is represented by from 5,000,000 to 5,500,000 grains, could be grown on a space of 250 square yards; while for an experienced hand replanting would represent no more than ten to twelve hours' work. With a proper machine-tool, the work could probably be very much reduced. In Japan, two men and two women plant with rice three-quarters of an acre in one day (Ronna, *Les Irrigations*, vol. iii., 1890, p. 67 *seq.*). That means (Fesca, *Japanesische Landwirthschaft*, p. 33) from 33,000 to 66,000 plants, or, let us say, a minimum of 8,250 plants a day for one person. The Jersey gardeners plant from 600 (inexperienced) to 1,000 plants per hour (experienced).

[1] Dr. M. Fesca, *Beitrage zur Kenntniss der Japanesischen Landwirthschaft*, Part ii., p. 33 (Berlin, 1893). The economy in seeds is also considerable. While in Italy 250 kilogrammes to the hectare are sown, and 160 kilogrammes in South Carolina, the Japanese use only sixty kilogrammes for the same area, (Semler, *Tropische Agrikultur*, Bd. Iii., pp. 20–28.)

[2] Eugene Simon, *La cite chinoise* (translated into English); Toubeau, *La repartition metrique des impots*, 2 vols., Paris (Guillaumin), 1880.

P. Imports of Vegetables to the United Kingdom

That the land in this country is not sufficiently utilized for market-gardening, and that the largest portion of the vegetables which are imported from abroad could be grown in this country, has been said over and over again, within the last twenty-five years.

It is certain that considerable improvements have taken place lately — the area under market, and especially the area under glass for the growth of fruit and vegetables, having largely been increased of late. Thus, instead of 38,957 acres, which were given to market-gardening in Great Britain in 1875, there were, in 1894, 88,210 acres, exclusive of vegetable crops on farms, given to that purpose (*The Gardener's Chronicle*, 20th April, 1895, p. 483). But that increase remains a trifle in comparison with similar increases in France, Belgium, and the United States. In France, the area given to market-gardening was estimated in 1892 by M. Baltet (*L'horticulture dans les cinq parties du monde*, Paris, Hachette, 1895) at 1,075,000 acres — four times more, in proportion to the cultivable area, than in this country; and the most remarkable of it is that considerable tracts of land formerly treated as uncultivable have been reclaimed for the purposes of market-gardening as also of fruit growing.

As things stand now in this country, we see that very large quantities of the commonest vegetables, each of which could be grown in this country, are imported.

Lettuces are imported — not only from the Azores or from the south of France, but they continue until June to be imported from France where they are mostly grown — not in the open air, but in frames. Early cucumbers, also grown in frames, are largely imported from Holland, and are sold so cheaply that many English gardeners have ceased to grow them.[1]

Even beetroot and pickling cabbage are imported from Holland and Brittany (the neighbourhoods of Saint Malo, where I saw them grown in a sandy soil, which would grow nothing without a heavy manuring with guano, as a second crop, after a first one of potatoes); and while onions were formerly largely grown in this country, we see that, in 1894, 5,288,512 bushels of onions, £765,049 worth, were imported from Belgium (chief exporter), Germany, Holland, France, and so on.

Again, that early potatoes should be imported from the Azores and the south of France is quite natural. It is not so natural, however, that more than 50,000 tons of potatoes (58,060 tons, £521,141 worth, on the average during the years 1891–1894) should be imported from the Channel Islands, because there are hundreds if not thousands of acres in South Devon, and most probably in other parts of the south coast too, where early potatoes could be grown equally well. But besides the 90,000 tons of early potatoes (over £700,000 worth) which are imported to this country, enormous quantities of late potatoes are imported from Holland, Germany, and Belgium; so that the total imports of potatoes reach from 200,000 to 450,000 tons every year. Moreover, this country imports

[1] The Gardener's Chronicle, 20th April, 1895, p. 483. The same, I learn from a German grower near Berlin, takes place in Germany.

every year all sorts of green vegetables, for the sum of at least £4,000,000 and for £5,000,000 all sorts of fruit (apart from exotic fruit); while thousands of acres lie idle, and the country population is driven to the cities in search of work, without finding it.

Q. Fruit-Culture in Belgium

It appears from the Annuaire statistique de la belgique that, out of a cultivated area of 6,443,500 acres, the following areas were given in Belgium, at the time of the last census, to fruit-growing, market-gardening, and culture under glass: Orchards, 117,600 acres ; market-gardens, 103,460 acres; vineries, 173 acres (increased since); growing of trees for afforestation, gardens, and orchards, 7,475 acres; potatoes, 456,000 acres. Consequently, Belgium is able to export every year about £250,000 worth more vegetables, and nearly £500,000 worth more fruit, than she imports. As to the vineries, the land of the communes of Hoeylart and Overyssche near Brussels is almost entirely covered with glass, and the exports of home-grown grapes attained, in 1910, 6,800 tons, in addition to 34,000 tons of other home-grown fruit. Besides, nearly 3,000 acres in the environs of Ghent are covered with horticultural establishments which export palms, azaleas, rhododendrons, and laurels all over the world, including Italy and the Argentine.

R. Culture under Glass in Holland

Holland in its turn has introduced gardening in hothouses on a great scale. Here is a letter which I received in the summer of 1909 from a friend:

> "Here is a picture-postcard which J. (a professor of botany in Belgium) has brought from Holland, and which he asks me to send you. [The postcard represents an immense space covered with frames and glass lights.] Similar establishments cover many square kilometres between Rotterdam and the sea, in the north of Heuve. At the time when J. was there (June 10) they had cucumbers, quite ripe, and melons as big as a head in considerable numbers, extent without heating. The gardeners sow also radishes, carrots, lettuce, under the same glass. The different produce comes one after the other. They also cultivate large quantities of strawberries in frames.
>
> "The glass-frames are transported at will, so as to keep under glass for several days or weeks the plants sown in any part of the garden. J. is full of admiration for the knowledge of the gardeners. Instead of the usual routine, they apply the last progress of science. He was told that glass is broken very seldom; they have acquired the art of handling glass-frames with facility and great skill.
>
> "Besides the frames represented on the photograph, the region between Rotterdam and the sea, which is named Westland, has also countless glass-houses, where they cultivate, with or without heating, grapes, peaches, northern cherries, haricot beans, tomatoes, and other fruit and vegetables. These cultures have reached a very high degree of perfection. The gardeners take the greatest care to fight various plant diseases. They also cultivate ordinary fruit — apples, pears, gooseberries, strawberries, and so on — and vegetables in the open air. Westland being very much exposed to strong winds, they have built numerous walls, which break the wind, and serve at the same time for the culture of fruit upon the walls.
>
> "All the region feels the favourable influence of the agricultural school of Naaldwijk, which is situated almost in the centre of the Westland."

S. Prices Obtained in London for Dessert Grapes Cultivated Under Glass

The Fruit and Market-Gardener gives every week the prices realized by horticultural and intensive gardening produce, as well as by flowers, at the great market of Covent Garden. The prices obtained for dessert grapes — Colmar and Hamburg — are very instructive. I took two years — 1907–1908 — which differ from ordinary years by the winters having been foggy, which made the garden produce somewhat late.

In the first days of January the Colmar grapes arriving from the Belgium hothouses were still sold at relatively low prices — from 6d. to 10d. the pound. But the prices slowly rose in January and February; the Hamburg grapes were late that year, and therefore in the middle of March and later on in April the Colmars fetched from 1s. 6d. to 2s. 6d.

The English grapes, coming from Worthing and so on, are certainly preferred to those that come from Belgium or the Channel Islands. By the end of April, 1907, and at the beginning of May, they were even sold at 2s. and 4s. the pound. The best and largest grapes for the dinners are evidently fetching fancy prices.

But at last the Hamburg grapes, which were late in 1907 and 1908, began to arrive from Belgium, the Channel Islands, and England, and the prices suddenly fell. By the end of May the Belgian Hamburgs fetched only from 10d. to 1s. 4d. the pound, and the prices were still falling. In June and July the gardeners could only get from 5d. to 7d., and during the months of September, October, and November, 1908, the best Guernsey grapes were quoted at 6d. the pound. Very beautiful ones fetched only 4d. the pound.

It was only in the first days of November that the prices went up to 10d. and 1s. 1d. But already, in the second half of December, the new crop of Colmars began to pour in from Belgium, and the prices fell to 9d., and even to 6d. per pound about Christmas.

We thus see that, notwithstanding a great demand for the best hothouse grapes, with big grains and quite fresh cut, these grapes are sold in the autumn almost at the same prices as grapes grown under the beautiful sun of the south.

As to the quantities of grapes imported to this country, the figures are also most instructive. The average for the three years 1905–1907 was 81,700,000 lbs., representing a value of £2,224,500.

T. The Use of Electricity in Agriculture

In the first editions of this book I did not venture to speak about the improvements that could be obtained in agriculture with the aid of electricity, or by watering the soil with cultures of certain useful microbes. I preferred to mention only well-established facts of intensive culture; but now it would be impossible not to mention what has been done in these two directions.

More than thirty years ago I mentioned in *Nature* the increase of the crops obtained by a Russian landlord who used to place at a certain height above his experimental field telegraph wires, through which an electric current was passed. A few years ago, in 1908, Sir Oliver Lodge gave in the *Daily Chronicle* of July 15 the results of similar experiments made in a farm near Evesham by Messrs. Newman and Bomford, with the aid of Sir Oliver Lodge's son, Mr. Lionel Lodge.

A series of thin wires was placed above an experimental field at distances of ten yards from each other. These wires were attached to telegraph poles, high enough not to stand in the way of the carts loaded with corn. Another field was cultivated by the side of the former, in order to ascertain what would be the crops obtained without the aid of electricity.

The poles, five yards high, were placed far away from each other, so that the wires were quite loose. Owing to the high tension of the currents that had to be passed through the wires, the insulators on the poles were very powerful. The currents were positive and of a high potential — about 100,000 volts. The escape of electricity under these accounts was so great that it could be seen in the dark. One could also feel it on the hair and the face while passing under the wires.

Nevertheless, the expenditure of electric force was small, Sir Oliver Lodge writes; because, it the potential was high, the quantity of consumed energy was, notwithstanding that, very small. It is known, indeed, that this is also the case with the discharges of atmospheric electricity, which are terrible in consequences of their high tension, but do not represent a great loss of energy. An oil motor of two horse-power was therefore quite sufficient.

The results were very satisfactory. The wheat crop in the electrified field was, in the years 1906–1907, by 29 to 40 per cent. greater, and also of better quality, than in the non-electrified field. The straw was also from four to eight inches longer.

For strawberries the increase of the crop was 35 per cent., and 25 per cent for beetroot.

As to the inoculation of useful microbes by means of watering the soil with cultures of nitrifying bacteria, experiments on a great scale have been made in Prussia upon some peat-bogs. The German agricultural papers speak of these experiments as having given most satisfactory results.

Most interesting results have also been obtained in Germany by heating the soil with a mixture of air and hot steam passed along the ordinary propagate this system, and the photographs of the results published by the Society in a pamphlet, *Gartenkultur*, *Bodenheizung*, *Klimaverbesserung* (Berlin, 1906), seem to prove that with a soil thus heated the growth of certain vegetables is accelerated in some extent.

U. Petty Trades in the Lyons Region

The neighbourhoods of St. Etienne are a great centre for all sorts of industries, and among them the petty trades occupy still an important place. Ironworks and coal-mines with their smoking chimney, noisy factories, roads blackened with coal, and a poor vegetation give the country the well-known aspects of a "Black Country." In certain towns, such as St. Chamond, one finds numbers of big factories in which thousands of women are employed in the fabrication of *passementerie*. But side by side with the great industry the petty trades also maintain a high development. Thus we have first the fabrication of silk ribbons, in which no less than 50,000 men and women were employed in the year 1885. Only 3,000 or 4,000 looms were located then in the factories; while the remainder — that is, from 1,200 to 1,400 looms — belonged to the workers themselves, both at St. Etienne and in the surrounding country.[1]

As a rule the women and the girls spin the silk or make the winding off, while the father with his sons weave the ribbons. I saw these small workshops in the suburbs of St. Etienne, where complicated ribbons (with interwoven addresses of the manufacture), as well as ribbons of high artistic finish, were woven in three to four looms, while in the next room the wife prepared the dinner and attended to household work.

There was a time when the wages were high in the ribbon trade (reaching over ten francs a day), and M. Euvert wrote me that half of the suburban houses of St. Etienne had been built by the *passementiers* themselves. But the affairs took a very gloomy aspect when a crisis broke out in 1884. No orders were forthcoming and the ribbon weavers had to live on casual earnings. All their economies were soon spent, "How many," M. Euvert wrote, "have been compelled to sell for a few hundred francs the loom for which they had paid as many thousand francs." What an effect this crisis has had on the trade I could not say, as I have no recent information about his region. Very probably a great number of the ribbon weavers have emigrated to St. Etienne, where artistic weaving is continued, while the cheapest sorts of ribbon must be made in factories.

The manufacture of arms occupies from 5,000 to 6,000 workers, half of whom are in St. Etienne, and the remainder in the neighbouring country. All work is done in small workshops, save in the great arm factory of the State, which sometimes will employ from 10,000 to 15,000 persons, and sometimes only a couple of thousand men.

Another important trade in the same region is the manufacture of hardware, which is all made in small workshops, in the neighbourhoods of St. Etienne, Le Chambon, Firminy, Rive de Giers, and St. Bonnet le Château. The work is pretty regular, but the earnings are low as a rule. And

[1] I am indebted for the following information to M.V. Euvert, President of the Chamber of Commerce of St. Etienne, who sent me, while I was in the Clairvaux prison, in April, 1885, a most valuable sketch of the various industries of the region, in reply to a letter of mine, and I avail myself of the opportunity for expressing to M. Euvert my best thanks for his courtesy. This information has now an historical value only. But it is such an interesting page of the history of the small industries that I retain it as it was in the first edition, the more so as it is most interesting to compare it with the pages given in the text to the present conditions of the same industries.

yet the peasants continue to keep those trades, as they cannot go on without some industrial occupation during part of the year.

The yearly production of silk stuffs in France attained no less than 7,558,000 kilogrammes in 1881;[2] and most of the 5,000,000 to 6,000,000 kilogrammes of raw silk which were manufactured in the Lyons region were manufactured by hand.[3]

Twenty years before — that is, about 1865 — there were only from 6,000 to 8,000 power-looms, and when we take into account both the prosperous period of the Lyons silk industry about 1876, and the crisis which it underwent in 1880–1886, we cannot but wonder about the slowness of the transformation of the industry. Such is also the opinion of the President of the Lyons Chamber of Commerce, who wrote me that the domain of the power-loom is increased every year, "by including new kinds of stuffs, which formerly were reputed as unfeasible in the power-looms; but," he added, "the transformation of small workshops into factories still goes on so slowly that the total number of power-looms reaches only from 20,000 to 25,000 out of an aggregate of from 100,000 to 110,000." (Since that time it certainly must have considerably increased.)

The leading features of the Lyons silk industry are the following:

The preparatory work — winding off, warping and so on — is mostly made in small workshops, chiefly at Lyons, with only a few workshops of the kind in the villages. Dyeing and finishing are also made — of course, in great factories — and it is especially in dyeing, which occupies 4,000 to 5,000 hands, that the Lyons manufacturers have attained their highest repute. Not only silks are dyed there, but also cottons and wools, and not only for France, but also to some extent for London, Manchester, Vienna, and even Moscow. It is also in this branch that the best machines have to be mentioned.[4]

As to the weaving, it is made, as we just saw, on from 20,000 to 25,000 power-looms and from 75,000 to 90,000 hand-looms, which partly are at Lyons (from 15,000 to 18,000 hand-looms in 1885) and chiefly in the villages. The workshops, where on might formerly find several *compagnons*

Employed by one master, have a tendency to disappear, the workshops mostly having now but from two to three hand-looms, on which the father, the mother, and the children are working together. In each house, in each storey of the Croix Rousse, you find until now such small workshops. The *fabricant* gives the general indications as to the kind of stuff he desires to be woven, and his draughtsmen design the pattern, but it is the workman himself who must find the way to weave in threads of all colours the patterns sketched on paper. He thus continually creates something new; and many improvements and discoveries have been made by workers whose very names remain unknown.[5]

The Lyons weavers have retained until now the character of being the elite of their trade in higher artistic work in silk stuffs. The finest, really artistic brocades, satins and velvets, are woven in the smallest workshops, where one or two looms only are kept. Unhappily the unsettled character of the demand for such a high style of work is often a cause of misery amongst them. In

[2] It had been 5,134,000 kilogrammes in 1872. *Journal de la Société de Statistique de Paris*, September, 1883.

[3] I take these figures from a detailed letter which the President of the Lyons Chamber of Commerce kindly directed to me in April, 1885, to Clairvaux, in answer to my inquiries about the subject. I avail myself of this opportunity for addressing to him my best thanks for his most interesting communication.

[4] *La fabrique lyonnaise de soieries. Son passé, son prêsent*. Imprimé par ordre de la Chambre de Commerce de Lyon, 1873. (Published in connection with the Vienna Exhibition.)

[5] Marius Morand, *L'organisation ouvrière de la fabrique lyonnaise*; paper read before the Association Française pour l'avencement des Sciences, in 1873.

former times, when the orders for higher sorts of silks became scarce, the Lyons weavers resorted to the manufacture of stuffs of lower qualities: *foulards, **crepes**, tulles*, of which Lyons had the monopoly in Europe. But now the commoner kinds of goods are manufactured by the million, on the one side by the factories of Lyons, Saxony, Russia, and Great Britain, and on the other side by peasants in the neighbouring departments of France, as well as in the Swiss villages of the cantons of Basel and Zurich, and in the villages of the Rhine provinces, Italy, and Russia.

The emigration of the French silk industry from the towns to the villages began long ago — that is, about 1817 — but it was especially in the sixties that this movement took a great development. About the year 1872 nearly 90,000 hand-looms were scattered, not only in the Rhône department, but also in those of Ain, Isère, Loire, Saône-et-Loire, and even those of Drôme, Ardèche, and Sovoie. Sometimes the looms were supplied by the merchants, but most of them were bought by the weavers themselves, and it was the especially women and girls who worked on them at the hours free from agriculture. But already since 1835 the emigration of the silk industry from the city to the villages began in the shape of great factories erected in the villages, and such factories continue to spread in the country, making terrible havoc amidst the rural populations.

When a new factory is built in a village it attracts at once the girls, and partly also the boys of the neighbouring peasantry. The girls and boys are always happy to find an independent livelihood which emancipates them from the control of the family. Consequently, the wages of the factory girls are extremely low. At the same time the distance from the village to the factory being mostly great, the girls cannot return home every day, the less so as the hours of labour are usually long. So they stay all the week at the factory, in barracks, and they only return home on Saturday evening; while at sunrise on Monday a waggon makes the tour of the villages, and brings them back to the factory. Barrack life — not to mention its moral consequences — soon renders the girls quite unable to work in the fields. And, when they are grown up, they discover that they cannot maintain themselves at the low wages offered by the factory; but they can no more return to peasant life. It is easy to see what havoc the factory is thus doing in the villages, and how unsettled is its very existence, based upon the very low wages offered to country girls. It destroys the peasant home, it renders the life of the town worker still more precarious on account of the competition it makes to him; and the trade itself is in a perpetual state of unsettledness.

Some information about the present state of the small industries in this region will be found in the text; but, unfortunately, we have no modern description of the industrial life of the Lyon's region, which we might compare with the above.

V. Small Industries at Paris

It would be impossible to enumerate here all the varieties of small industries which are carried on at Paris; nor would such an enumeration be complete because every year new industries are brought into life. I therefore will mention only a few of the most important industries.

A great number of them are connected, of course, with ladies' dress. The *confections* — that is, the making of various parts of ladies' dress — occupy no less than 22,000 operatives at Paris, and their production attains £3,000,000 every year, while annual production is valued at £2,400,000. Linen, shoes, gloves, and so on, are as many important branches of the petty trades and the Paris domestic industries, while one-fourth part of the stays which are sewn in France (£500,000 out of £2,000,000) are made in Paris.

Engraving, book-binding, and all kinds of fancy stationery, as well as the manufacture of musical and mathematical instruments, are again as many branches in which the Paris workmen excel. Basket-making is another very important item, the finest sorts only being made in Paris, while the plainest sorts are made in the centres mentioned in the text (Haute Marne, Aisne, etc.). Brushes are also made in small workshops, the trade being valued at £800,000 both at Paris and in the neighbouring department of Oise.

For furniture, there are at Paris as many as 4,340 workshops, in which three or four operatives per workshop are employed on the average. In the watch trade we find 2,000 workshops with only 6,000 operatives, and their production, about £1,000,000, reaches nevertheless nearly one-third part of the total watch production in France. The *maroquinerie* gives the very high figure of £500,000, although it employs only 1,000 persons, scattered in 280 workshops, this high figure itself testifying to the high artistic value of the Paris leather fancy goods. The jewelry, both for articles of luxury, and for all descriptions of cheap goods, is again one of the specialities of the Paris petty trades; and another well-known specialty is the fabrication of artificial flowers. Finally, we must mention the carriage and saddlery trades, which are carried in the small towns round Paris; the making of fine straw hats; glass cutting, and painting on glass and china; and numerous workshops for fancy buttons, attire in mother-of-pearl, and small goods in horn and bone.

W. Results of the Census of the French Industries in 1896

If we consult the results of the census of 1896, that were published in 1901, in the fourth volume of *Resultats statistiques du recensement des industries et des professions*, preceded by an excellent summary written by M. Lucien March, we find that the general impression about the importance of the small industries in France conveyed in the text is fully confirmed by the numerical data of the census.

It is only since 1896, M. March says in a paper read before the Statistical Society of Paris, that a detailed classification of the workshops and factories according to the number of their operatives became possible;[1] and he gives us in this paper, in a series of very elaborate tables, a most instructive picture of the present state of industry in France.

For the industries proper — including the industries carried on by the State and the Municipalities, but excluding the transport trades — the results of the census can be summed up as follows:

There is, first of all, an important division of "heads of establishments (*patrons*) working alone, independent artisans, and working-men without a permanent employment," which contains 1,530,000 persons. It has a very mixed character, as we find here, in agriculture, the small farmer, who works for himself; and the labourer, who works by the day for occasional farmers; and in industry the head of a small workshop, who works for himself (*patron-ouvrier*); the working-man, who on the day of the census had no regular employment; the dressmaker, who works sometimes in her own room and sometimes in a shop; and so on. It is only in an indirect way that M. March finds out that this division contains, in its industrial part, nearly 483,000 artisans (*patron-ouvrier*s); and independent working-men and women; and about 1,047,000 persons of both sexes, temporarily attached to some industrial establishment.

There are, next, 37,705 industrial establishments, of which the heads employ no hired workmen, but are aided by one or more members of their own families.

We have thus, at least 520,000 workshops belonging to the very small industry.

Next to them come 575,530 workshops and factories, giving occupation to more than 3,000,000 persons. They constitute the bulk of French industry, and their subdivision into small, middle-sized, and great industry is what interests us at this moment.

The most striking point is the immense number of establishments having only from one to ten working-men each. No less than 539,449 such workshops and factories have been tabulated, which makes 94 per cent. of all the establishments in France; and we find in them more than one-third of all workpeople of both sexes engaged in industry — namely, 1,134,700 persons.

Next comes the class, still very numerous (28,626 establishments and 585,000 operatives), where we find only from eleven to fifty workmen per establishment. Nearly two-thirds of these

[1] *Journal de la Societe de Statistique de Paris*, June 1901, pp. 189–192, and "Resultats Generaux," in vol. iv. Of the above-mentioned publication.

small factories (17,342 establishments, 240,000 workmen) are so small that they give occupation to less than twenty persons each. They thus belong still to the small industry.

After that comes a sudden fall in the figures. There are only 3,865 factories having from fifty-one to 100 employees. This glass and the preceding one contain among them 5 per cent. Of all the industrial establishments, and 27 per cent. Of their employees.

The class of factories employing from 101 to 500 workmen contain 3,145 establishments (616,000 workmen and other employees). But that of from 501–1,000 employees per factory has only 295 establishments, and a total of only 195,000 operatives. Taken together, these two classes contain less that 1 per cent. Of all the establishments (six per 1,000), and 26 per cent. of all the workmen.

Finally, the number of factories and works having more than a thousand workmen and employees each is very small. It is only 149. Out of them, 108 have from 1,001 to 2,000 workmen, twenty-one have from 2,001 to 5,000, and ten only have more than 5,000 workmen. These 149 very big factories and works give occupation to 313,000 persons only, out of more than 3,000,000 — that is, only 10 per cent. of all the industrial workers.

It thus appears that more than 99 per cent. of al the industrial establishments in France — that is, 571,940 our of 575,529 — have less than 100 workmen each. They give occupation to 200,000,000 persons, and represent an army of 571,940 employers. More than that. The immense majority of that number (568,075 employers) belong to the category of those who employ less that fifty workmen each. And I do not yet count in their number 520,000 employers and artisans who work for themselves, or with the aid of a member of the family

It is evident that in France, as everywhere, the petty trades represent a very important factor of the industrial life. Economists have been too hasty in celebrating their death. And this conclusion becomes still more apparent when one analyses the different industries separately, taking advantage of the tables given in *Reultats Statistiques*. A very important face appears from this analysis — namely, that there are only three branches of industry in which one can speak of a strong "concentration" — the mines, metallurgy, and the State's industries, to which one may add the textiles and ironmongery, but always remembering that in these two branches immense numbers of small factories continue to prosper by the side of the great ones.

In all other branches the small trades are dominant, to such an extent that more than 95 *per cent. of the employers employ less that fifty workmen each.* In the quarries, in all branches of the alimentation, in the book trade, clothing, leather, wood, metallic goods, and even the brick-works, china and glass works, we hardly find one or two factories out of each hundred employing more than fifty workmen.

The three industries that make an exception to this rule are, we have said, metallurgy, the great works of the State, and the mines. In metallurgy two-thirds of the works have more than fifty men each, and it is here that we find some twenty great works employing each of them more than one thousand men. The works of the State, which include the great shipbuilding yards, are evidently in the same case. They contain thirty-four establishments, having more than 1,000. And finally, in the mines — one hardly would believe that — more than one-half of all establishments employ less that fifty workmen each; but 15 per cent. of them have more than 500 workmen; forty-one mines are worked by a staff of more than 1,000 persons each, and six out of them employ even more than 5,000 miners.

It is only in these three branches that one finds a rather strong "concentration"; and yet, the small industry continues to exist, as we saw it already in England, by the side of the great one, even in mining, and still more so in all branches of metallurgy.

As to the *textile* industries, they have exactly the same character as in England. We find here a certain number of very large establishments (forty establishments having each of them more than 1,000 work-people), and especially we see a great development of the middle-sized factories (1,300 mills having from 100 to 500 workpeople). But on the other side, the small industry is also very numerous.[2]

Quite the same is also seen in the manufacture of all *metallic goods* (iron, steel, brass). Here, also, by the side of a few great works (seventeen works occupy each of them more than 1,000 workpeople and salaried employees; out of them five employ more than 2,000 persons, and one more than 5,000); and by the side of a great number of middle-sized works (440 establishments employing from 100 to 500 persons), we find more than 100,000 artisans who work single-handed, or with the aid of their families; and 72,600 works which have only from three to four workpeople.

In the *India-rubber* works, and those for the manufacture of *paper*, the middle-sized factories are still well represented (13 per cent. of all the establishments have more than fifty workmen each); but the remainder belongs to the small industry. It is the same in the *chemical works*. There is in this branch some ten factories employing more than 500 persons, and 100 which employ from 101 to 500 people; but the remainder is 1,000 of small works employing from ten to fifty people, and 3,800 of the very small works (less than ten workers).

In all other branches it is *the small or the very small industry* which dominates. Thus, in the manufacture of articles of food, there are only eight factories employing more than 500 people each, and 92,000 small establishments having less than ten workpeople each. In the printing industry the immense majority of establishments are very small, and employ from five to ten, or from ten to fifty workpeople.

As to the manufacture of *clothing*, it entirely belongs to the small industry. Only five factories employ more than 200 each; but the remainder represents 630,000 independent artisans, men and women; 9,500 workshops where the work is done by the family; and 132,000 workshops and factories occupying less than ten workpeople each.[3]

The different branches dealing with straw, feathers, hair, leather, gloves, again, belong to the small and the very small industry: 125,000 artisans and 43,000 small establishments employing from three to four persons each.

Shall I speak of the factories dealing with wood, furniture, brushes, and so on? True, there are in these branches two large factories employing nearly 2,000 persons; but there are also 214,260 independent artisans and 105,400 small factories and workshops employing less than ten persons each.

[2] Here is how they are distributed: Workmen working single-handed, 124,544; with their families, but without paid workmen, 8,000; less than 10 workmen, 34,433 factories; from 10 to 100 workpeople, 4,665 factories; from 101 to 200 workpeople, 746 factories; from 201 to 500 workpeople, 554; from 501 to 1,000, 123; from 1,001 to 2,000, 38; more than 2,000, 2 factories.

[3] In an excellent monograph dealing with this branch (*Le developpement de la fabrique et la travail a domicile dans les industries de l'habillement*, by Professor Albert Aftalion, Paris, 1906), the author gives most valuable data as to the proper domains of domestic work and the factory, and shows how, why, and in which domains domestic work successfully competes with the factory.

Needless to say that jewelry, the cutting of precious stones, and stone-cutting for masonry belong entirely to the small industry, no more than ten to twenty works employing more than 100 persons each. Only in ceramics and in brick-making do we find by the side of the very small works (8,930 establishments), and the small ones (1,277 establishments employing from ten to fifty workpeople), 334 middle-sized works (fifty to 200 people), and seven of the very great (more than 1,000 workpeople).[4]

[4] The industrial establishments having more than 1,000 employees each are distributed as follows: Mining, 41; textiles, 40 (123 have from 500 to 1,000); industries of the State and the Communes, 14; metallurgy, 17; working of metals — iron, steel, brass — 17, quarries, 2; alimentation, 3; chemical industries, 2; india-rubber, paper, cardboard, 0 (9 have from 500 to 1,000); books, polygraphy, 0 (22 have from 500 to 1,000); dressing of stuffs, clothing, 2 (9 from 500 to 1000); straw, feathers, hair, 0 (1 from 500 to 1,000); leather, skins, 2; wood, cabinet-making, brushes, etc., 1; fine metals, jewelry, 0; cutting of precious stones, 0; stone-cutting for buildings, 0; earth-works and building, 1; bricks, ceramics, 7; preparation and distribution of food, 0; total, 149 out of 575,531 establishments. To these figures we may add six large establishments in the transports, and five in different branches of trade. We ma note also that, by means of various calculations, M. March comes to the conclusion that 91 per cent. of the workmen and employees in industry and 44 per cent. in commerce are employees — that is, clerks, managers, and so on.

X. The Small Industries in Germany

The literature of the small industries in Germany being very bulky, the chief works upon this subject may be found, either in full or reviewed, in Schmoller's *Jahrbucher*, and in Conrad's *Sammlung national-okonomischer und statistischer Abhandlungen*. For a general review of the subject and rich bibliographical indications, Schonberg's *Volkwirthschaftslehre*, vol. ii., which contains excellent remarks about the proper domain of small industries (p. 401 *seq.*) as well as the above-mentioned publication of K. Bucher (*Untersuchungen uber dies Lage des Handwerks in Deutschland*), will be found most valuable. The work of O. Schwarz, *Die Betriebsformen der modernen Grossindustrie* (in *Zeitschrift fur Staatswissenschaft*, vol. xxv., p. 535), is interesting by its analysis of the respective advantages of both the great and the small industries, which brings the author to formulate the following three factors in favour of the former: (1) economy in the cost of motive power; (2) division of labour and its harmonic organization; and (3) the advantages offered for the sale of the produce. Of these three factors, the first is more and more eliminated every year by the progress achieved in the transmission of power; the second exists in small industries as well, and to the same extent, as in the great ones (watchmakers, toymakers, and so on); so that only the third remains in full force; but this factor, as already mentioned in the text of this book, is a *social* factor which entirely depends upon the degree of development of the spirit of association amongst the producers.

A detailed industrial census having been taken in 1907, in addition to those of 1882 and 1895, most important and quite reliable data showing the importance and the resistance of the small industries were brought to light, and a series of most interesting monographs dealing with this subject have been published. Let me name, therefore, some of them which could be consulted with profit: Dr. Fr. Zahn, *Wirtschaftliche Entwicklung, unter besonderer Berucksichtigung der Volkszahlung*, 1905, *sowie der Berufs und Betriebszahlung*, 1907; *Sonderabdruck aus der Anaalen des Deutschen Reichs*, Munchen, 1910 and 1911; Dr. Josef Grunzel, *System der Industriepolitik*, Leipzig, 1905; and *Der Sieg des Industrialismus*, Leipzig, 1911; W. Sombart, "Verlagssystem (Hausindustrie)", in Conrad, *Handworterbuch der Staatswissenschaften*, 3te Auflage, Bd. VIII.; R. van der Borght, *Beruf, Gesselshaftliche Gliederung und Betrieb im Deutschen Reiche*, in *Vortrage der Gehe-Stiftung*, Bd. II., 1910; and Heinrich Koch, *Die Deutsche Hausindustrie*, M. Gladbach, 1905. Many other works will be found mentioned by these authors.

In all these books the reader will find a further confirmation of the ideas about the small industries that are expressed in chapters vi. and vii. When I developed them in the first edition of this book, it was objected to me that, although the existence of a great number of small industries is out of question, and although their great extension in a country so far advanced in its industrial development as England was not known to economists, still the fact proves nothing. These industries are a mere survival; and if we had data about the different classes of industry *at different periods*, we should see how rapidly the small industries are disappearing.

Now we have such data for Germany, for a period of twenty-five years, in the three censuses of 1882, 1895, and 1907, and, what is till more valuable, these twenty-five years belong to a moment

in the life of Germany when a powerful industry has developed on an immense scale with a great rapidity. Here it is that the dying out of the small industries, their "absorption" by the great concerns, and the supposes "concentration of capital" ought to be seen in full.

But the numerical results, as they appear from the three censuses, and as they have been interpreted by those who have studied them, are pointing out to quite the reverse. The position of the small industries in the life of an industrial country is exactly the same which could have been foreseen twenty-five years ago, and very often it is described in the very same words that I have used.

The German *Statistisches Jahrbuch* gives us the distribution of workmen in the different industries of the German Empire in 1882 and 1895. Leaving aside all the concerns which belong to trade and those for the sale of alcoholic drinks (955,680 establishments, 2,165,638 workpeople), as also 42,321 establishments belonging to horticulture, fishing, and poultry (103,128 workpeople in 1895), there were, in all the industries, including mining, 1,237,000 artisans working single-handed, and over 900,000 establishments in which 6,730,500 persons were employed. Their distribution in establishments of different sizes was as follows:

	Establishments	Employees	Average per establishment
Artisans working single-handed	1,237,000	1,237,000*	–
From 1 to 5 employees	752,572	1,954,125	2.6
From 6 to 50 employees	139,459	1,902,049	13
Over 50 employees	17,941	2,907,329	162
Total	909,972	6,763,503	7.5
with artisans	2,146,972	8,000,503	4

1895

* In reality there are no employees. I give this figure only for the totals.

Twelve years later the industries, as they appeared in the next census, made in 1907, were distributed as follows:

For the sake of comparison, I give also (in round figures) the numbers of establishments obtained by the three censuses:

	Establishments	Employees	Average per establishment
Artisans working single-handed	994,743	994,743*	–
From 1 to 5 employees	875,518	2,205,539	2.5
From 6 to 10 employees	96,849	717,282	7
From 11 to 50 employees	90,225	1,996,906	22
From 51 to 100 employees	15,783	1,103,949	70
From 101 to 500 employees	11,827	2,295,401	194
Over 500 employees	1,423	1,538,577	1,081
Total	1,091,625	9,858,120	9
with artisans	2,086,368	10,852,863	5

1907.

* In reality there are no employees. I give this figure only for the totals.

	1882	1895	1907
Artisans working single-handed	1,430,000	1,237,000	995,000
From 1 to 5 employees	746,000	753,000	875,000
From 6 to 50 employees	85,000	139,000	187,000
Over 50 employees	9,000	18,000	30,000
Total	830,000	910,000	1,092,000
with artisans	2,270,000	2,147,000	2,086,000

What appears quite distinctly from the last census is the rapid decrease in the numbers of artisans who work single-handed, mostly without the aid of machinery. Such an individual mode of production by hand is naturally on the decrease, even many artisans resorting now to some sort of motive power and taking one or two hired aids; but this does not prove that in the least that the small industries carried on with the aid of machinery should be on the wane. The census of 1907 proves quite the contrary, and all those who have studied it are bound to recognise it.

"Of a pronounced decay of the small establishments in which five or less persons are employed, is, of course, no sign," writes Dr. Zahn in the afore-mentioned work. Out of the 14.3 million people who live on industry, full 5.4 million belong to the small industry.

Far from decreasing, this category has considerably increased since 1895 (from 732,572 establishments with 1,954,125 employees in 1895, to 875,518 establishments and 2,205,539 employees in 1907). Moreover, it is not only the very small industry which is on the increase; it is also the

small one which has increased even more than the preceding — namely, by 47,615 establishments and 812,139 employees.

As to the very great industry, a closer analysis of what the German statisticians describe as giant establishments (*Riesenbetriebe*) shows that they belong chiefly to industries working for the State, or created in consequence of State-granted monopolies. Thus, for instance, the Krupp Shareholders Company employ 69,500 persons in their nine different establishments, and everyone knows that the works of Krupp are in reality a dependency of the State.

The opinion of the above-named German authors about the facts revealed by the industrial censuses are very interesting.

In speaking of the small industries in Germany, W. Sombart writes in the article, "Verlagssystem (Hausindustrie)," in Conrad's *Handwortezbuch:* "It results from the census of 1907 that the losses in the small industries are almost exclusively limited to those home industries which are usually described as the *old ones;* while the increases belong to the home industries of modern origin." The statistical data thus confirm that "at the present time a sort of rejuvenation is going on in the home industries; instead of those of them which are dying out, new ones are almost equal in numbers, are growing up" (p.242). Prof. Sombart points out that the same is going on in Switzerland, and refers to some new works on this subject.[1]

Dr. J. Grunzel comes to a similar conclusion: "Life experience shows that the home industries are not a form of industrial organization which has had its time," he writes in his afore-mentioned work. "On the contrary, it proves to be possessed of a great life force in certain branches. It is spread in all branches in which handwork offers advantages above the work of the machine" (p. 46). It is also retained wherever the value of labour exceeds very much the value of the raw produce; and finally, in all the branches devoted to articles which are rapidly changing with the seasons or the vagaries of fashion. And he shows (pp. 46 and 149) how the home industries have been increasing in Germany from 1882 to 1895, and how they are widely spread in Austria, France, Switzerland, Italy, Belgium, and England.

The conclusions of R. van der Borght are quite similar.

"It is true," Dr. van der Borght says, "that the numbers of artisans working single-handed have diminished in numbers in most industries; but they still represent two-fifths of all industries; but they still represent two-fifths of all industrial establishments, and even more than one-half in several industries. At the same time, the small establishments (having from one to five workers) have increased in numbers, and they contain nearly one-half of all the industrial establishments, and even more than that in several groups."

As for Koch's work, *Die Deutsche Hausindustrie*, it deserves special mention for the discussion it contains of the measures advocated, on the one side, for the weeding out of the domestic industries, and, on the other side, for improving the condition of the workers and the industries themselves by the means of co-operation, credit, workshops' inspection, and the like.

[1] *Die Hausindustrie in der Schweiz: Auszug aus der Ergebnissen der Eidgenossischen Betreibszahlung von Aug. 9, 1905;* E. Ryser, *L'industrie horlogere*, Zurich, 1909; J. Beck, *Die Schweizerische Hausindustrie, ihre soziale und wirthschaftliche Lage*, Grutliverein, 1909.

Y. The Domestic Industries in Switzerland

We have most interesting monographs dealing with separate branches of the small industries of Switzerland, but we have not yet such comprehensive statistical data as those which have been mentioned in the text in speaking of Germany and France. It was only in the year 1901 that the first attempt was made to get the exact numbers of workpeople employed in what the Swiss statisticians describe as *Hausindustrie*, or "the domestic industries' extension of the factory industries" (*der hausindustrielle Anhang der Fabrikindustrie*). Up till then these numbers remained "an absolutely unknown quantity." For many it was, therefore, a revelation when a first rough estimate, made by the factory inspectors, gave the figure of 52,291 workpeople belonging to this category, as against 243,200 persons employed in all the factories, large and small, of the same branches. A few years later, Schuler, in *Zeitung für Schweizerische Statistik*, 1904 (reprinted since as a volume), came to the figure of 131,299 persons employed in the domestic industries; and yet this figure, although it is much nearer to reality than the former, is still below the real numbers. Finally, an official census of the industries, made in 1905, gave the figure of 92,162 persons employed in the domestic industries in 70,873 establishments, in the following branches — textiles, watches and jewellery, straw-plaiting, clothing and dress, wood-carving, tobacco. They thus represent more than one-fourth (28.5 per cent.) of the 317,027 operatives employed in Switzerland in these same branches, and 15.7 per cent of all the industrial operatives, who numbered 585,574 in 1905.

Out of the just-mentioned 92,162 workpeople, registered as belonging to the domestic trades, nearly three-quarters (66,061 in 49,168 establishments) belong to the textile industry, chiefly knitting and the silks; then comes the watch-trade (12,871 persons in 9,186 establishments), straw-plaiting, and dress. However, these figures are still incomplete. Not only several smaller branches of the domestic trades were omitted in the census, but also the children under fourteen years of ago employed in the domestic trades, whose numbers are estimated at 32,300, were not counted. Besides, the census having been made in the summer, during the "strangers' season," a considerable number of persons employed in a variety of domestic trades during the winter did not appear in the census.

It must also be noted that the Swiss census includes under the name of *Heimarbeit* (domestic trades) only those "dependencies of the industrial employers" which do not represent separate factories placed under the employer's management; so that those workshops and small factories, the produce of which is sold directly to the consumers, as also the small factories directly managed by small employers, are not included in this category. If all that be taken into consideration, we must agree with the conclusion that the "domestic trades have in Switzerland a much greater extension than in any other country of Europe" (save Russia), which we find in an elaborate recent work, published in connection with the 1910 exhibition of Swiss domestic industries, and edited by Herr Jac. Lorenz (*Die wirtschaflichen und sozialen Verhältnisse in der Schweizerischen Heimarbeit*, Zurich, 1910–1911, p. 27).

A feature of importance which appears from this last work is, that more than one-half of the workers engaged in domestic trades have some other source of income besides these trades. Very many of them carry on agriculture, so that it has been said that in Switzerland "the domestic trades' question is as much *a peasant question* as a labour question."

It would be impossible to sum up in this place the interesting data contained in the first four fascicles published by Herr Lorenz, which deal with the cotton, the silk, and the linen domestic industries, their struggles against the machine, their defeats in some branches and their holding the ground in other branches, and so on. I must therefore refer the reader to this very instructive publication.

Tables

Table 1

Per head of population the exports of British produce appear, in shillings, as follows:

1876	121s
1877	119s
1878	114s
1879	112s
1880	129s
1881	134s
1882	137s
1883	135s
1884	130s
1885	118s
1886	117s
1887	121s
1888	127s
1889	134s
1890	141s
1891	131s
1892	119s
1893	114s
1894	111s
1895	112s
1896	116s
1897	117s
1898	116s
1899	130s
1900	142s
1901	135s
1902	135s
1903	138s
1904	141s
1905	153s
1906	173s
1907	194s
1908	171s
1909	192s
1910	201s

Table 2

The International Federation of the Cotton Industry employers gave, on March 1, 1909, the following numbers of spindles in the different countries of the Old and New Worlds:

United Kingdom	53,472,000	41 per cent.
United States	27,846,000	21 ”
Germany	9,881,000	8 ”
Russia	7,829,000	6 ”
France	6,750,000	5 ”
British India	5,756,000	4 ”
Other nations	19,262,000	15 ”
	130,796,000	100 ”

Table 3

The figures which I take for these calculations are given in *Agricultural Returns of the Board of Agriculture and Agricultural Statistics for* 1911, vol. xlvi., pt. 1. They are as follows for the year 1910:

	Acres
Total area (Great Britain)	56,803,000
Uncultivable area (23,680,000 in 1895)	24,657,070
Cultivable area	32,145,930
Out of it, under the plough	14,668,890
Out of it, under permanent pasture	17,477,040

(During the last ten years, since the census of 1901, the cultivable area decreased by 323,000 acres, while the urban area increased by 166,710 acres, thus reaching now 4,015,700 acres. Since 1901, 942,000 acres were withdrawn from the plough, 661,000 acres in England, 158,000 in Wales, and 123,000 in Scotland.)

The distribution of the area which is actually under the plough between the various crops varies considerably from year to year. Taking 1910 (an average year) we have the following: —

	Acres
Corn crops	7,045,630
Clover and mature grasses	4,157,040
Green crops and orchards	2,994,890
Hops	32,890
Small fruit	84,310
Flax	230
Bare fallow, etc.	354,000
Total under culture (including that part of permanent pasture which gives hay)	14,668,890
In 1901	15,619,890
In 1895	16,166,950

Out of the 7,045,530 acres given to corn crops, 1,808,850 acres were under wheat (nearly 200,000 acres less than in 1899 and 100,000 acres less than in 1911), 1,728,680 acres under barley (only 1,597,930 in 1911), 3,020,970 acres under oats, about 300,000 under beans, and about 62,000 acres under rye and buckwheat. From 640,000 to 670,000 acres were given to potatoes. The area under clover and sown grasses is steadily declining since 1898, when it was 4,911,000 acres.

Table 4

Assuming that 9,000 lb. of dry hay are necessary for keeping one head of horned cattle every year, the following figures (taken from Toubeau's *Répartition métrique de impôts) will* show what we obtain now under usual and under intensive culture:

	Crop per acre. Eng.lb	Equivalent in dry hay. Eng.lb	Number of cattle fed from each100acres.
Pasture	–	1,200	13
Unirrigated meadows	–	2,400	26
Clover, cut twice	–	4,800	54
Swedish turnips	38,5000	10,000	108
Rye-grass	64,000	18,000	180
Beet, high farming	64,000	21,000	210
Indian corn, ensilage	120,000	30,000	330

Table 5

The researches of Tisserand may be summed up as follows:

Year.	Population in millions	Acres under wheat	Average crop in bushels per acre	bushels
1789	27.0	9,884,000	9	87,980,000
1831-41	33.4	13,224,000	15	194,225,000
1882-88	38.2	17,198,000	18	311,619,000

Table 6

In a recent evaluation, M. Augé-Laribé *(L'evolution de la France. agricole*, Paris, 1912) arrives at the following figures: —

Years.	Area under wheat. Acres.
1862	18,430,000
1882	17,740,000
1892	17,690,000
1900	16,960,000
1910	16,190,000

The average crops for each ten years since 1834 are given as follows:

Years	Crops in bushels.
1834–43	190,800,000
1856–65	272,900,000
1876–85	279,800,000
1884–95	294,700,000
1896–1905	317,700,000
1906–09	333,400,000

The wheat crop has thus increased in seventy-five years by 74 per cent., while the population increased only by 20 per cent. For potatoes, the increase is still greater: while 198,800,000 cwt. of potatoes were grown in 1882, the crop of 1909 was already 328,300,000 cwt., the average yield of the acre growing from 148 cwt. in 1882 to 212 cwt. in 1909.

Table 7

These figures, which were found during the census of 1866, have not changed much since, as may be seen from the following table which gives the proportional quantities of the different categories of the active population of both sexes (employers, working men, and clerks) in 1866 and 1896: —

	1866	1896
Agriculture	52 per cent.	47 per cent.
Industry	34 ”	35 ”
Commerce	4 ”	5 ”
Transport and various	3 ”	5 ”
Liberal professions	7 ”	8 ”

As has been remarked by M. S. Fontaine who worked out the results of the last census, “the number of persons employed in industry properly speaking, although it has increased, has nevertheless absorbed a smaller percentage of the loss sustained by the agricultural population than the other categories.” — *Résultats statitisques du recensement des professions,* t. iv., p. 8.

Pëtr Kropotkin
Fields, Factories and Workshops
or Industry Combined with Agriculture and Brain Work with Manual Work
1912

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