Chapter Fifteen: Machinery and Modern Industry

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SECTION 1

THE DEVELOPMENT OF MACHINERY

John Stuart Mill says in his “Principles of Political Economy":

> “It is questionable if all the mechanical inventions yet made have lightened the day’s toil of any human being.” [1]

That is, however, by no means the aim of the capitalistic application of machinery. Like every other increase in the productiveness of labour, machinery is intended to cheapen commodities, and, by shortening that portion of the working-day, in which the labourer works for himself, to lengthen the other

portion that he gives, without an equivalent, to the capitalist. In short, it is a means for producing surplus-value.

In manufacture, the revolution in the mode of production begins with the labour-power, in modern industry it begins with the instruments of labour. Our first inquiry then is, how the instruments of labour are converted from tools into machines, or what is the difference between a machine and the implements of a handicraft? We are only concerned here with striking and general characteristics; for epochs in the history of society are no more separated from each other by hard and fast lines of demarcation, than are geological epochs.

Mathematicians and mechanicians, and in this they are followed by a few English economists, call a tool a simple machine, and a machine a complex tool. They see no essential difference between them, and even give the name of machine to the simple mechanical powers, the lever, the inclined plane, the screw, the wedge, &c. [2] As a matter of fact, every machine is a combination of those simple powers, no matter how they may be disguised. From the economic standpoint this explanation is worth nothing, because the historical element is wanting. Another explanation of the difference between tool and machine is that in the case of a tool, man is the motive power, while the motive power of a machine is something different from man, as, for instance, an animal, water, wind, and so on.[3] According to this, a plough drawn by oxen, which is a contrivance common to the most different epochs, would be a machine, while Claussen's circular loom, which, worked by a single labourer, weaves 96,000 picks per minute, would be a mere tool. Nay, this very loom, though a tool when worked by hand, would, if worked by steam, be a machine. And since the application of animal power is one of man's earliest inventions, production by machinery would have preceded production by handicrafts. When in 1735, John Wyatt brought out his spinning machine, and began the industrial revolution of the 18th century, not a word did he say about an ass driving it instead of a man, and yet this part fell to the ass. He described it as a machine "to spin without fingers." [4]

All fully developed machinery consists of three essentially different parts, the motor mechanism, the transmitting mechanism, and finally the tool or working machine. The motor mechanism is that which puts the whole in motion. It either generates its own motive power, like the steam-engine, the caloric engine, the electromagnetic machine, &c., or it receives its impulse from some already existing natural force, like the water-wheel from a head of water, the wind-mill from wind, &c. The transmitting mechanism, composed of fly-wheels, shafting, toothed wheels, pullies, straps, ropes, bands, pinions, and gearing of the most varied kinds, regulates the motion, changes its form where necessary, as for instance, from linear to circular, and divides and distributes it among the working machines. These two first parts of the whole mechanism are there, solely for putting the working machines in motion, by means of which motion the subject of labour is seized upon and modified as desired. The tool or working machine is that part of the machinery with which the industrial revolution of the 18th century started. And to this day it constantly serves as such a starting-point, whenever a handicraft, or a manufacture, is turned into an industry carried on by machinery.

On a closer examination of the working machine proper, we find in it, as a general rule, though often, no doubt, under very altered forms, the apparatus and tools used by the handicraftsman or manufacturing workman; with this difference, that instead of being human implements, they are the implements of a mechanism, or mechanical implements. Either the entire machine is only a more or less altered mechanical edition of the old handicraft tool, as, for instance, the power-loom,[5] or the working parts fitted in the frame of the machine are old acquaintances, as spindles are in a mule, needles in a stocking-loom, saws in a sawing-machine, and knives in a chopping machine. The distinction between these tools and the body proper of the machine, exists from their very birth; for they continue for the most part to be produced by handicraft, or by manufacture, and are afterwards fitted into the body of the machine, which is the product of machinery. [6] The machine proper is therefore a mechanism that, after being set in motion, performs with its tools the same operations that were formerly done by the workman with similar tools. Whether the motive power is derived from man, or from some other machine, makes no difference in this respect. From the moment that the tool proper is taken from man, and fitted into a mechanism, a machine takes the place of a mere implement. The difference strikes one at once, even in those cases where man himself continues to be the prime mover. The number of implements that he himself can use simultaneously, is limited by the number of his own natural instruments of production, by the number of

his bodily organs. In Germany, they tried at first to make one spinner work two spinning-wheels, that is, to work simultaneously with both hands and both feet. This was too difficult. Later, a treddle spinning-wheel with two spindles was invented, but adepts in spinning, who could spin two threads at once, were almost as scarce as two-headed men. The Jenny, on the other hand, even at its very birth, spun with 12-18 spindles, and the stocking-loom knits with many thousand needles at once. The number of tools that a machine can bring into play simultaneously, is from the very first emancipated from the organic limits that hedge in the tools of a handicraftsman.

In many manual implements the distinction between man as mere motive power, and man as the workman or operator properly so called, is brought into striking contrast. For instance, the foot is merely the prime mover of the spinning-wheel, while the hand, working with the spindle, and drawing and twisting, performs the real operation of spinning. It is this last part of the handicraftsman's implement that is first seized upon by the industrial revolution, leaving to the workman, in addition to his new labour of watching the machine with his eyes and correcting its mistakes with his hands, the merely mechanical part of being the moving power. On the other hand, implements, in regard to which man has always acted as a simple motive power, as, for instance, by turning the crank of a mill, [7] by pumping, by moving up and down the arm of a bellows, by pounding with a mortar, &c., such implements soon call for the application of animals, water [8] and wind as motive powers. Here and there, long before the period of manufacture, and also, to some extent, during that period, these implements pass over into machines, but without creating any revolution in the mode of production. It becomes evident, in the period of modern industry, that these implements, even under their form of manual tools, are already machines. For instance, the pumps with which the Dutch, in 1836-7, emptied the Lake of Harlem, were constructed on the principle of ordinary pumps; the only difference being, that their pistons were driven by cyclopean steam-engines, instead of by men. The common and very imperfect bellows of the blacksmith is, in England, occasionally converted into a blowing-engine, by connecting its arm with a steam-engine. The steam-engine itself, such as it was at its invention, during the manufacturing period at the close of the 17th century, and such as it continued to be down to 1780, [9] did not give rise to any industrial revolution. It was, on the contrary, the invention of machines that made a revolution in the form of steam-engines necessary. As soon as man, instead of working with an implement on the subject of his labour, becomes merely the motive power of an implement-machine, it is a mere accident that motive power takes the disguise of human muscle; and it may equally well take the form of wind, water or steam. Of course, this does not prevent such a change of form from producing great technical alterations in the mechanism that was originally constructed to be driven by man alone. Now-a-days, all machines that have their way to make, such as sewing-machines, bread-making machines, &c., are, unless from their very nature their use on a small scale is excluded, constructed to be driven both by human and by purely mechanical motive power.

The machine, which is the starting-point of the industrial revolution, supersedes the workman, who handles a single tool, by a mechanism operating with a number of similar tools, and set in motion by a single motive power, whatever the form of that power may be. [10] Here we have the machine, but only as an elementary factor of production by machinery.

Increase in the size of the machine, and in the number of its working tools, calls for a more massive mechanism to drive it; and this mechanism requires, in order to overcome its resistance, a mightier moving power than that of man, apart from the fact that man is a very imperfect instrument for producing uniform continued motion. But assuming that he is acting simply as a motor, that a machine has taken the place of his tool, it is evident that he can be replaced by natural forces. Of all the great motors handed down from the manufacturing period, horse-power is the worst, partly because a horse has a head of his own, partly because he is costly, and the extent to which he is applicable in factories is very restricted.[11] Nevertheless the horse was extensively used during the infancy of modern industry. This is proved, as well by the complaints of contemporary agriculturists, as by the term "horse-power," which has survived to this day as an expression for mechanical force.

Wind was too inconstant and uncontrollable, and besides, in England, the birthplace of modern industry, the use of water power preponderated even during the manufacturing period. In the 17th century attempts had already been made to turn two pairs of millstones with a single water-wheel. But the increased size of the gearing was too much for the water power, which had now become insufficient, and

this was one of the circumstances that led to a more accurate investigation of the laws of friction. In the same way the irregularity caused by the motive power in mills that were put in motion by pushing and pulling a lever, led to the theory, and the application, of the fly-wheel, which afterwards plays so important a part in modern industry. [12] In this way, during the manufacturing period, were developed the first scientific and technical elements of Modern Mechanical Industry. Arkwright's throstle spinning mill was from the very first turned by water. But for all that, the use of water, as the predominant motive power, was beset with difficulties. It could not be increased at will, it failed at certain seasons of the year, and, above all, it was essentially local. [13] Not till the invention of Watt's second and so-called double-acting steam-engine, was a prime mover found, that begot its own force by the consumption of coal and water, whose power was entirely under man's control, that was mobile and a means of locomotion, that was urban and not, like the waterwheel, rural, that permitted production to be concentrated in towns instead of, like the water-wheels, being scattered up and down the country, [14] that was of universal technical application, and, relatively speaking, little affected in its choice of residence by local circumstances. The greatness of Watt's genius showed itself in the specification of the patent that he took out in April, 1784. In that specification his steam-engine is described, not as an invention for a specific purpose, but as an agent universally applicable in Mechanical Industry. In it he points out applications, many of which, as for instance, the steam-hammer, were not introduced till half a century later. Nevertheless he doubted the use of steam-engines in navigation. His successors, Boulton and Watt, sent to the exhibition of 1851 steam-engines of colossal size for ocean steamers.

As soon as tools had been converted from being manual implements of man into implements of a mechanical apparatus, of a machine, the motive mechanism also acquired an independent form, entirely emancipated from the restraints of human strength. Thereupon the individual machine, that we have hitherto been considering, sinks into a mere factor in production by machinery. One motive mechanism was now able to drive many machines at once. The motive mechanism grows with the number of the machines that are turned simultaneously, and the transmitting mechanism becomes a wide-spreading apparatus.

We now proceed to distinguish the co-operation of a number of machines of one kind from a complex system of machinery.

In the one case, the product is entirely made by a single machine, which performs all the various operations previously done by one handicraftsman with his tool; as, for instance, by a weaver with his loom; or by several handicraftsman successively, either separately or as members of a system of Manufacture. [15] For example, in the manufacture of envelopes, one man folded the paper with the folder, another laid on the gum, a third turned the flap over, on which the device is impressed, a fourth embossed the device, and so on; and for each of these operations the envelope had to change hands. One single envelope machine now performs all these operations at once, and makes more than 3,000 envelopes in an hour. In the London exhibition of 1862, there was an American machine for making paper cornets. It cut the paper, pasted, folded, and finished 300 in a minute. Here, the whole process, which, when carried on as Manufacture, was split up into, and carried out by, a series of operations, is completed by a single machine, working a combination of various tools. Now, whether such a machine be merely a reproduction of a complicated manual implement, or a combination of various simple implements specialised by Manufacture, in either case, in the factory, *i.e.*, in the workshop in which machinery alone is used, we meet again with simple co-operation; and, leaving the workman out of consideration for the moment, this co-operation presents itself to us, in the first instance, as the conglomeration in one place of similar and simultaneously acting machines. Thus, a weaving factory is constituted of a number of power-looms, working side by side, and a sewing factory of a number of sewing-machines all in the same building. But there is here a technical oneness in the whole system, owing to all the machines receiving their impulse simultaneously, and in an equal degree, from the pulsations of the common prime mover, by the intermediary of the transmitting mechanism; and this mechanism, to a certain extent, is also common to them all, since only particular ramifications of it branch off to each machine. Just as a number of tools, then, form the organs of a machine, so a number of machines of one kind constitute the organs of the motive mechanism.

A real machinery system, however, does not take the place of these independent machines, until the

subject of labour goes through a connected series of detail processes, that are carried out by a chain of machines of various kinds, the one supplementing the other. Here we have again the co-operation by division of labour that characterises Manufacture; only now, it is a combination of detail machines. The special tools of the various detail workmen, such as those of the beaters, cambers, spinners, &c., in the woollen manufacture, are now transformed into the tools of specialised machines, each machine constituting a special organ, with a special function, in the system. In those branches of industry in which the machinery system is first introduced, Manufacture itself furnishes, in a general way, the natural basis for the division, and consequent organisation, of the process of production. [16] Nevertheless an essential difference at once manifests itself. In Manufacture it is the workmen who, with their manual implements, must, either singly or in groups, carry on each particular detail process. If, on the one hand, the workman becomes adapted to the process, on the other, the process was previously made suitable to the workman. This subjective principle of the division of labour no longer exists in production by machinery. Here, the process as a whole is examined objectively, in itself, that is to say, without regard to the question of its execution by human hands, it is analysed into its constituent phases; and the problem, how to execute each detail process, and bind them all into a whole, is solved by the aid of machines, chemistry, &c. [17] But, of course, in this case also, theory must be perfected by accumulated experience on a large scale. Each detail machine supplies raw material to the machine next in order; and since they are all working at the same time, the product is always going through the various stages of its fabrication, and is also constantly in a state of transition, from one phase to another. Just as in Manufacture, the direct co-operation of the detail labourers establishes a numerical proportion between the special groups, so in an organised system of machinery, where one detail machine is constantly kept employed by another, a fixed relation is established between their numbers, their size, and their speed. The collective machine, now an organised system of various kinds of single machines, and of groups of single machines, becomes more and more perfect, the more the process as a whole becomes a continuous one, i.e., the less the raw material is interrupted in its passage from its first phase to its last; in other words, the more its passage from one phase to another is effected, not by the hand of man, but by the machinery itself. In Manufacture the isolation of each detail process is a condition imposed by the nature of division of labour, but in the fully developed factory the continuity of those processes is, on the contrary, imperative.

A system of machinery, whether it reposes on the mere co-operation of similar machines, as in weaving, or on a combination of different machines, as in spinning, constitutes in itself a huge automaton, whenever it is driven by a self-acting prime mover. But although the factory as a whole be driven by its steam-engine, yet either some of the individual machines may require the aid of the workman for some of their movements (such aid was necessary for the running in of the mule carriage, before the invention of the self-acting mule, and is still necessary in fine-spinning mills); or, to enable a machine to do its work, certain parts of it may require to be handled by the workman like a manual tool; this was the case in machine-makers' workshops, before the conversion of the slide rest into a self-actor. As soon as a machine executes, without man's help, all the movements requisite to elaborate the raw material, needing only attendance from him, we have an automatic system of machinery, and one that is susceptible of constant improvement in its details. Such improvements as the apparatus that stops a drawing frame, whenever a sliver breaks, and the self-acting stop, that stops the power-loom so soon as the shuttle bobbin is emptied of weft, are quite modern inventions. As an example, both of continuity of production, and of the carrying out of the automatic principle, we may take a modern paper mill. In the paper industry generally, we may advantageously study in detail not only the distinctions between modes of production based on different means of production, but also the connexion of the social conditions of production with those modes: for the old German paper-making furnishes us with a sample of handicraft production; that of Holland in the 17th and of France in the 18th century with a sample of manufacturing in the strict sense; and that of modern England with a sample of automatic fabrication of this article. Besides these, there still exist, in India and China, two distinct antique Asiatic forms of the same industry.

An organised system of machines, to which motion is communicated by the transmitting mechanism from a central automaton, is the most developed form of production by machinery. Here we have, in the place of the isolated machine, a mechanical monster whose body fills whole factories, and whose demon power, at first veiled under the slow and measured motions of his giant limbs, at length breaks out into the fast and furious whirl of his countless working organs.

There were mules and steam-engines before there were any labourers, whose exclusive occupation it was to make mules and steam-engines; just as men wore clothes before there were such people as tailors. The inventions of Vaucanson, Arkwright, Watt, and others, were, however, practicable, only because those inventors found, ready to hand, a considerable number of skilled mechanical workmen, placed at their disposal by the manufacturing period. Some of these workmen were independent handicraftsman of various trades, others were grouped together in manufactures, in which, as before-mentioned, division of labour was strictly carried out. As inventions increased in number, and the demand for the newly discovered machines grew larger, the machine-making industry split up, more and more, into numerous independent branches, and division of labour in these manufactures was more and more developed. Here, then, we see in Manufacture the immediate technical foundation of modern industry. Manufacture produced the machinery, by means of which modern industry abolished the handicraft and manufacturing systems in those spheres of production that it first seized upon. The factory system was therefore raised, in the natural course of things, on an inadequate foundation. When the system attained to a certain degree of development, it had to root up this ready-made foundation, which in the meantime had been elaborated on the old lines, and to build up for itself a basis that should correspond to its methods of production. Just as the individual machine retains a dwarfish character, so long as it is worked by the power of man alone, and just as no system of machinery could be properly developed before the steam-engine took the place of the earlier motive powers, animals, wind, and even water; so, too, modern industry was crippled in its complete development, so long as its characteristic instrument of production, the machine, owed its existence to personal strength and personal skill, and depended on the muscular development, the keenness of sight, and the cunning of hand, with which the detail workmen in manufactures, and the manual labourers in handicrafts, wielded their dwarfish implements. Thus, apart from the dearness of the machines made in this way, a circumstance that is ever present to the mind of the capitalist, the expansion of industries carried on by means of machinery, and the invasion by machinery of fresh branches of production, were dependent on the growth of a class of workmen, who, owing to the almost artistic nature of their employment, could increase their numbers only gradually, and not by leaps and bounds. But besides this, at a certain stage of its development, modern industry became technologically incompatible with the basis furnished for it by handicraft and Manufacture. The increasing size of the prime movers, of the transmitting mechanism, and of the machines proper, the greater complication, multiformity and regularity of the details of these machines, as they more and more departed from the model of those originally made by manual labour, and acquired a form, untrammelled except by the conditions under which they worked, [18] the perfecting of the automatic system, and the use, every day more unavoidable, of a more refractory material, such as iron instead of wood – the solution of all these problems, which sprang up by the force of circumstances, everywhere met with a stumbling-block in the personal restrictions, which even the collective labourer of Manufacture could not break through, except to a limited extent. Such machines as the modern hydraulic press, the modern power-loom, and the modern carding engine, could never have been furnished by Manufacture.

A radical change in the mode of production in one sphere of industry involves a similar change in other spheres. This happens at first in such branches of industry as are connected together by being separate phases of a process, and yet are isolated by the social division of labour, in such a way, that each of them produces an independent commodity. Thus spinning by machinery made weaving by machinery a necessity, and both together made the mechanical and chemical revolution that took place in bleaching, printing, and dyeing, imperative. So too, on the other hand, the revolution in cotton-spinning called forth the invention of the gin, for separating the seeds from the cotton fibre; it was only by means of this invention, that the production of cotton became possible on the enormous scale at present required. [19] But more especially, the revolution in the modes of production of industry and agriculture made necessary a revolution in the general conditions of the social process of production, i.e., in the means of communication and of transport. In a society whose pivot, to use an expression of Fourier, was agriculture on a small scale, with its subsidiary domestic industries, and the urban handicrafts, the means of communication and transport were so utterly inadequate to the productive requirements of the manufacturing period, with its extended division of social labour, its concentration of the instruments of labour, and of the workmen, and its colonial markets, that they became in fact revolutionised. In the same way the means of communication and transport handed down from the manufacturing period soon became unbearable trammels on modern industry, with its feverish haste of production, its enormous

extent, its constant flinging of capital and labour from one sphere of production into another, and its newly-created connexions with the markets of the whole world. Hence, apart from the radical changes introduced in the construction of sailing vessels, the means of communication and transport became gradually adapted to the modes of production of mechanical industry, by the creation of a system of river steamers, railways, ocean steamers, and telegraphs. But the huge masses of iron that had now to be forged, to be welded, to be cut, to be bored, and to be shaped, demanded, on their part, cyclopean machines, for the construction of which the methods of the manufacturing period were utterly inadequate.

Modern industry had therefore itself to take in hand the machine, its characteristic instrument of production, and to construct machines by machines. It was not till it did this, that it built up for itself a fitting technical foundation, and stood on its own feet. Machinery, simultaneously with the increasing use of it, in the first decades of this century, appropriated, by degrees, the fabrication of machines proper. But it was only during the decade preceding 1866, that the construction of railways and ocean steamers on a stupendous scale called into existence the cyclopean machines now employed in the construction of prime movers.

The most essential condition to the production of machines by machines was a prime mover capable of exerting any amount of force, and yet under perfect control. Such a condition was already supplied by the steam-engine. But at the same time it was necessary to produce the geometrically accurate straight lines, planes, circles, cylinders, cones, and spheres, required in the detail parts of the machines. This problem Henry Maudsley solved in the first decade of this century by the invention of the slide rest, a tool that was soon made automatic, and in a modified form was applied to other constructive machines besides the lathe, for which it was originally intended. This mechanical appliance replaces, not some particular tool, but the hand itself, which produces a given form by holding and guiding the cutting tool along the iron or other material operated upon. Thus it became possible to produce the forms of the individual parts of machinery

> “with a degree of ease, accuracy, and speed, that no accumulated experience of the hand of the most skilled workman could give.” [20]

If we now fix our attention on that portion of the machinery employed in the construction of machines, which constitutes the operating tool, we find the manual implements re-appearing, but on a cyclopean scale. The operating part of the boring machine is an immense drill driven by a steam-engine; without this machine, on the other hand, the cylinders of large steam-engines and of hydraulic presses could not be made. The mechanical lathe is only a cyclopean reproduction of the ordinary foot-lathe; the planing machine, an iron carpenter, that works on iron with the same tools that the human carpenter employs on wood; the instrument that, on the London wharves, cuts the veneers, is a gigantic razor; the tool of the shearing machine, which shears iron as easily as a tailor’s scissors cut cloth, is a monster pair of scissors; and the steam-hammer works with an ordinary hammer head, but of such a weight that not Thor himself could wield it. [21] These steam-hammers are an invention of Nasmyth, and there is one that weighs over 6 tons and strikes with a vertical fall of 7 feet, on an anvil weighing 36 tons. It is mere child’s-play for it to crush a block of granite into powder, yet it is no less capable of driving, with a succession of light taps, a nail into a piece of soft wood. [22]

The implements of labour, in the form of machinery, necessitate the substitution of natural forces for human force, and the conscious application of science, instead of rule of thumb. In Manufacture, the organisation of the social labour-process is purely subjective; it is a combination of detail labourers; in its machinery system, modern industry has a productive organism that is purely objective, in which the labourer becomes a mere appendage to an already existing material condition of production. In simple co-operation, and even in that founded on division of labour, the suppression of the isolated, by the collective, workman still appears to be more or less accidental. Machinery, with a few exceptions to be mentioned later, operates only by means of associated labour, or labour in common. Hence the co-operative character of the labour-process is, in the latter case, a technical necessity dictated by the instrument of labour itself.

SECTION 2

THE VALUE TRANSFERRED BY MACHINERY TO THE PRODUCT

We saw that the productive forces resulting from co-operation and division of labour cost capital nothing. They are natural forces of social labour. So also physical forces, like steam, water, &c., when appropriated to productive processes, cost nothing. But just as a man requires lungs to breathe with, so he requires something that is work of man's hand, in order to consume physical forces productively. A water-wheel is necessary to exploit the force of water, and a steam-engine to exploit the elasticity of steam. Once discovered, the law of the deviation of the magnetic needle in the field of an electric current, or the law of the magnetisation of iron, around which an electric current circulates, cost never a penny. [23] But the exploitation of these laws for the purposes of telegraphy, &c., necessitates a costly and extensive apparatus. The tool, as we have seen, is not exterminated by the machine. From being a dwarf implement of the human organism, it expands and multiplies into the implement of a mechanism created by man. Capital now sets the labourer to work, not with a manual tool, but with a machine which itself handles the tools. Although, therefore, it is clear at the first glance that, by incorporating both stupendous physical forces, and the natural sciences, with the process of production, modern industry raises the productiveness of labour to an extraordinary degree, it is by no means equally clear, that this increased productive force is not, on the other hand, purchased by an increased expenditure of labour. Machinery, like every other component of constant capital, creates no new value, but yields up its own value to the product that it serves to beget. In so far as the machine has value, and, in consequence, parts with value to the product, it forms an element in the value of that product. Instead of being cheapened, the product is made dearer in proportion to the value of the machine. And it is clear as noon-day, that machines and systems of machinery, the characteristic instruments of labour of Modern Industry, are incomparably more loaded with value than the implements used in handicrafts and manufactures.

In the first place, it must be observed that the machinery, while always entering as a whole into the labour-process, enters into the value-begetting process only by bits. It never adds more value than it loses, on an average, by wear and tear. Hence there is a great difference between the value of a machine, and the value transferred in a given time by that machine to the product. The longer the life of the machine in the labour-process, the greater is that difference. It is true, no doubt, as we have already seen, that every instrument of labour enters as a whole into the labour-process, and only piece-meal, proportionally to its average daily loss by wear and tear, into the value-begetting process. But this difference between the instrument as a whole and its daily wear and tear, is much greater in a machine than in a tool, because the machine, being made from more durable material, has a longer life; because its employment, being regulated by strictly scientific laws, allows of greater economy in the wear and tear of its parts, and in the materials it consumes; and lastly, because its field of production is incomparably larger than that of a tool. After making allowance, both in the case of the machine and of the tool, for their average daily cost, that is for the value they transmit to the product by their average daily wear and tear, and for their consumption of auxiliary substance, such as oil, coal, and so on, they each do their work gratuitously, just like the forces furnished by Nature without the help of man. The greater the productive power of the machinery compared with that of the tool, the greater is the extent of its gratuitous service compared with that of the tool. In modern industry man succeeded for the first time in making the product of his past labour work on a large scale gratuitously, like the forces of Nature. [24]

In treating of Co-operation and Manufacture, it was shown that certain general factors of production, such as buildings, are, in comparison with the scattered means of production of the isolated workman, economised by being consumed in common, and that they therefore make the product cheaper. In a system of machinery, not only is the framework of the machine consumed in common by its numerous operating implements, but the prime mover, together with a part of the transmitting mechanism, is consumed in common by the numerous operative machines.

Given the difference between the value of the machinery, and the value transferred by it in a day to the product, the extent to which this latter value makes the product dearer, depends in the first instance, upon the size of the product; so to say, upon its area. Mr. Baynes, of Blackburn, in a lecture published in 1858, estimates that

> "each real mechanical horse-power [25] will drive 450 self-acting mule spindles, with preparation, or 200 throstle spindles, or 15 looms for 40 inch cloth with the appliances for warping, sizing, &c."

In the first case, it is the day's produce of 450 mule spindles, in the second, of 200 throstle spindles, in the third, of 15 power-looms, over which the daily cost of one horse-power, and the wear and tear of the machinery set in motion by that power, are spread; so that only a very minute value is transferred by such wear and tear to a pound of yarn or a yard of cloth. The same is the case with the steam-hammer mentioned above. Since its daily wear and tear, its coal-consumption, &c., are spread over the stupendous masses of iron hammered by it in a day, only a small value is added to a hundred weight of iron; but that value would be very great, if the cyclopean instrument were employed in driving in nails.

Given a machine's capacity for work, that is, the number of its operating tools, or, where it is a question of force, their mass, the amount of its product will depend on the velocity of its working parts, on the speed, for instance, of the spindles, or on the number of blows given by the hammer in a minute. Many of these colossal hammers strike seventy times in a minute, and Ryder's patent machine for forging spindles with small hammers gives as many as 700 strokes per minute.

Given the rate at which machinery transfers its value to the product, the amount of value so transferred depends on the total value of the machinery. [26] The less labour it contains, the less value it imparts to the product. The less value it gives up, so much the more productive it is, and so much the more its services approximate to those of natural forces. But the production of machinery by machinery lessens its value relatively to its extension and efficacy.

An analysis and comparison of the prices of commodities produced by handicrafts or manufactures, and of the prices of the same commodities produced by machinery, shows generally, that, in the product of machinery, the value due to the instruments of labour increases relatively, but decreases absolutely. In other words, its absolute amount decreases, but its amount, relatively to the total value of the product, of a pound of yarn, for instance, increases. [27]

It is evident that whenever it costs as much labour to produce a machine as is saved by the employment of that machine, there is nothing but a transposition of labour; consequently the total labour required to produce a commodity is not lessened or the productiveness of labour is not increased. It is clear, however, that the difference between the labour a machine costs, and the labour it saves, in other words, that the degree of its productiveness does not depend on the difference between its own value and the value of the implement it replaces. As long as the labour spent on a machine, and consequently the portion of its value added to the product, remains smaller than the value added by the workman to the product with his tool, there is always a difference of labour saved in favour of the machine. The productiveness of a machine is therefore measured by the human labour-power it replaces. According to Mr. Baynes, 2 operatives are required for the 450 mule spindles, inclusive of preparation machinery, [28] that are driven by one-horse power; each self-acting mule spindle, working ten hours, produces 13 ounces of yarn (average number of thickness); consequently 2½ operatives spin weekly 365 5/8 lbs. of yarn. Hence, leaving waste on one side, 366 lbs. of cotton absorb, during their conversion into yarn, only 150 hours' labour, or fifteen days' labour of ten hours each. But with a spinning-wheel, supposing the hand-spinner to produce thirteen ounces of yarn in sixty hours, the same weight of cotton would absorb 2,700 days' labour of ten hours each, or 27,000 hours' labour. [29] Where blockprinting, the old method of printing calico by hand, has been superseded by machine printing, a single machine prints, with the aid of one man or boy, as much calico of four colours in one hour, as it formerly took 200 men to do. [30] Before Eli Whitney invented the cotton gin in 1793, the separation of the seed from a pound of cotton cost an average day's labour. By means of his invention one negress was enabled to clean 100 lbs. daily; and since then, the efficacy of the gin has been considerably increased. A pound of cotton wool, previously costing 50 cents to produce, included after that invention more unpaid labour, and was consequently sold with greater profit, at 10 cents. In India they employ for separating the wool from the seed, an instrument, half machine, half tool, called a churka; with this one man and a woman can clean 28 lbs. daily. With the churka invented some years ago by Dr. Forbes, one man and a boy produce 250 lbs. daily. If oxen, steam, or water, be used for driving it, only a few boys and girls as feeders are required. Sixteen of these machines driven by oxen do as much work in a day as formerly 750 people did on an average. [31]

As already stated, a steam-plough does as much work in one hour at a cost of three-pence, as 66 men at a cost of 15 shillings. I return to this example in order to clear up an erroneous notion. The 15 shillings are by no means the expression in money of all the labour expended in one hour by the 66 men. If the ratio of surplus-labour to necessary labour were 100%, these 66 men would produce in one hour a value of 30 shillings, although their wages, 15 shillings, represent only their labour for half an hour. Suppose, then, a machine cost as much as the wages for a year of the 150 men it displaces, say £3,000; this £3,000 is by no means the expression in money of the labour added to the object produced by these 150 men before the introduction of the machine, but only of that portion of their year's labour which was expended for themselves and represented by their wages. On the other hand, the £3,000, the money-value of the machine, expresses all the labour expended on its production, no matter in what proportion this labour constitutes wages for the workman, and surplus-value for the capitalist. Therefore, though a machine cost as much as the labour-power displaced by it costs, yet the labour materialised in it is even then much less than the living labour it replaces. [32]

The use of machinery for the exclusive purpose of cheapening the product, is limited in this way, that less labour must be expended in producing the machinery than is displaced by the employment of that machinery, For the capitalist, however, this use is still more limited. Instead of paying for the labour, he only pays the value of the labour-power employed; therefore, the limit to his using a machine is fixed by the difference between the value of the machine and the value of the labour-power replaced by it. Since the division of the day's work into necessary and surplus-labour differs in different countries, and even in the same country at different periods, or in different branches of industry; and further, since the actual wage of the labourer at one time sinks below the value of his labour-power, at another rises above it, it is possible for the difference between the price of the machinery and the price of the labour-power replaced by that machinery to vary very much, although the difference between the quantity of labour requisite to produce the machine and the total quantity replaced by it, remain constant. [33] But it is the former difference alone that determines the cost, to the capitalist, of producing a commodity, and, through the pressure of competition, influences his action. Hence the invention now-a-days of machines in England that are employed only in North America; just as in the sixteenth and seventeenth centuries, machines were invented in Germany to be used only in Holland, and just as many a French invention of the eighteenth century was exploited in England alone. In the older countries, machinery, when employed in some branches of industry, creates such a redundancy of labour in other branches that in these latter the fall of wages below the value of labour-power impedes the use of machinery, and, from the standpoint of the capitalist, whose profit comes, not from a diminution of the labour employed, but of the labour paid for, renders that use superfluous and often impossible. In some branches of the woollen manufacture in England the employment of children has during recent years been considerably diminished, and in some cases has been entirely abolished. Why? Because the Factory Acts made two sets of children necessary, one working six hours, the other four, or each working five hours. But the parents refused to sell the "half-timers" cheaper than the "full-timers." Hence the substitution of machinery for the "half-timers." [34] Before the labour of women and of children under 10 years of age was forbidden in mines, capitalists considered the employment of naked women and girls, often in company with men, so far sanctioned by their moral code, and especially by their ledgers, that it was only after the passing of the Act that they had recourse to machinery. The Yankees have invented a stone-breaking machine. The English do not make use of it, because the "wretch" [35] who does this work gets paid for such a small portion of his labour, that machinery would increase the cost of production to the capitalist. [36] In England women are still occasionally used instead of horses for hauling canal boats, [37] because the labour required to produce horses and machines is an accurately known quantity, while that required to maintain the women of the surplus-population is below all calculation. Hence nowhere do we find a more shameful squandering of human labour-power for the most despicable purposes than in England, the land of machinery.

SECTION 3

THE PROXIMATE EFFECTS OF MACHINERY ON THE WORKMAN

The starting-point of modern industry is, as we have shown, the revolution in the instruments of labour, and this revolution attains its most highly developed form in the organised system of machinery in a factory. Before we inquire how human material is incorporated with this objective organism, let us consider some general effects of this revolution on the labourer himself.

A. Appropriation of Supplementary Labour-power by Capital. The Employment of Women and Children

In so far as machinery dispenses with muscular power, it becomes a means of employing labourers of slight muscular strength, and those whose bodily development is incomplete, but whose limbs are all the more supple. The labour of women and children was, therefore, the first thing sought for by capitalists who used machinery. That mighty substitute for labour and labourers was forthwith changed into a means for increasing the number of wage-labourers by enrolling, under the direct sway of capital, every member of the workman's family, without distinction of age or sex. Compulsory work for the capitalist usurped the place, not only of the children's play, but also of free labour at home within moderate limits for the support of the family. [38]

The value of labour-power was determined, not only by the labour-time necessary to maintain the individual adult labourer, but also by that necessary to maintain his family. Machinery, by throwing every member of that family on to the labour-market, spreads the value of the man's labour-power over his whole family. It thus depreciates his labour-power. To purchase the labour-power of a family of four workers may, perhaps, cost more than it formerly did to purchase the labour-power of the head of the family, but, in return, four days' labour takes the place of one, and their price falls in proportion to the excess of the surplus-labour of four over the surplus-labour of one. In order that the family may live, four people must now, not only labour, but expend surplus-labour for the capitalist. Thus we see, that machinery, while augmenting the human material that forms the principal object of capital's exploiting power, [39] at the same time raises the degree of exploitation.

Machinery also revolutionises out and out the contract between the labourer and the capitalist, which formally fixes their mutual relations. Taking the exchange of commodities as our basis, our first assumption was that capitalist and labourer met as free persons, as independent owners of commodities; the one possessing money and means of production, the other labour-power. But now the capitalist buys children and young persons under age. Previously, the workman sold his own labour-power, which he disposed of nominally as a free agent. Now he sells wife and child. He has become a slave-dealer. [40] The demand for children's labour often resembles in form the inquiries for negro slaves, such as were formerly to be read among the advertisements in American journals.

> "My attention," says an English factory inspector, "was drawn to an advertisement in the local paper of one of the most important manufacturing towns of my district, of which the following is a copy: Wanted, 12 to 20 young persons, not younger than what can pass for 13 years. Wages, 4 shillings a week. Apply &c." [41]

The phrase "what can pass for 13 years," has reference to the fact, that by the Factory Act, children under 13 years may work only 6 hours. A surgeon officially appointed must certify their age. The manufacturer, therefore, asks for children who look as if they were already 13 years old. The decrease, often by leaps and bounds in the number of children under 13 years employed in factories, a decrease that is shown in an astonishing manner by the English statistics of the last 20 years, was for the most part, according to the evidence of the factory inspectors themselves, the work of the certifying surgeons, who overstated the age of the children, agreeably to the capitalist's greed for exploitation, and the sordid trafficking needs of the parents. In the notorious district of Bethnal Green, a public market is held every Monday and Tuesday morning, where children of both sexes from 9 years of age upwards, hire themselves out to the silk manufacturers. "The usual terms are 1s. 8d. a week (this belongs to the parents) and '2d. for myself and

tea.' The contract is binding only for the week. The scene and language while this market is going on are quite disgraceful." [42] It has also occurred in England, that women have taken "children from the workhouse and let any one have them out for 2s. 6d. a week." [43] In spite of legislation, the number of boys sold in Great Britain by their parents to act as live chimney-sweeping machines (although there exist plenty of machines to replace them) exceeds 2,000. [44] The revolution effected by machinery in the juridical relations between the buyer and the seller of labour-power, causing the transaction as a whole to lose the appearance of a contract between free persons, afforded the English Parliament an excuse, founded on juridical principles, for the interference of the state with factories. Whenever the law limits the labour of children to 6 hours in industries not before interfered with, the complaints of the manufacturers are always renewed. They allege that numbers of the parents withdraw their children from the industry brought under the Act, in order to sell them where "freedom of labour" still rules, i.e., where children under 13 years are compelled to work like grown-up people, and therefore can be got rid of at a higher price. But since capital is by nature a leveller, since it exacts in every sphere of production equality in the conditions of the exploitation of labour, the limitation by law of children's labour, in one branch of industry, becomes the cause of its limitation in others.

We have already alluded to the physical deterioration as well of the children and young-persons as of the women, whom machinery, first directly in the factories that shoot up on its basis, and then indirectly in all the remaining branches of industry, subjects to the exploitation of capital. In this place, therefore, we dwell only on one point, the enormous mortality, during the first few years of their life, of the children of the operatives. In sixteen of the registration districts into which England is divided, there are, for every 100,000 children alive under the age of one year, only 9,000 deaths in a year on an average (in one district only 7,047); in 24 districts the deaths are over 10,000, but under 11,000; in 39 districts, over 11,000, but under 12,000; in 48 districts over 12,000, but under 13,000; in 22 districts over 20,000; in 25 districts over 21,000; in 17 over 22,000; in 11 over 23,000; in Hoo, Wolverhampton, Ashton-under-Lyne, and Preston, over 24,000; in Nottingham, Stockport, and Bradford, over 25,000; in Wisbeach, 16,000; and in Manchester, 26,125. [45] As was shown by an official medical inquiry in the year 1861, the high death-rates are, apart from local causes, principally due to the employment of the mothers away from their homes, and to the neglect and maltreatment, consequent on her absence, such as, amongst others, insufficient nourishment, unsuitable food, and dosing with opiates; besides this, there arises an unnatural estrangement between mother and child, and as a consequence intentional starving and poisoning of the children. [46] In those agricultural districts, "where a minimum in the employment of women exists, the death-rate is on the other hand very low." [47] The Inquiry Commission of 1861 led, however, to the unexpected result, that in some purely agricultural districts bordering on the North Sea, the death-rate of children under one year old almost equalled that of the worst factory districts. Dr. Julian Hunter was therefore commissioned to investigate this phenomenon on the spot. His report is incorporated with the "Sixth Report on Public Health." [48] Up to that time it was supposed, that the children were decimated by malaria, and other diseases peculiar to low-lying and marshy districts. But the inquiry showed the very opposite, namely, that the same cause which drove away malaria, the conversion of the land, from a morass in winter and a scanty pasture in summer, into fruitful corn land, created the exceptional death-rate of the infants. [49] The 70 medical men, whom Dr. Hunter examined in that district, were "wonderfully in accord" on this point. In fact, the revolution in the mode of cultivation had led to the introduction of the industrial system.

> Married women, who work in gangs along with boys and girls, are, for a stipulated sum of money, placed at the disposal of the farmer, by a man called the "undertaker," who contracts for the whole gang. "These gangs will sometimes travel many miles from their own village; they are to be met morning and evening on the roads, dressed in short petticoats, with suitable coats and boots, and sometimes trousers, looking wonderfully strong and healthy, but tainted with a customary immorality and heedless of the fatal results which their love of this busy and independent life is bringing on their unfortunate offspring who are pining at home." [50]

Every phenomenon of the factory districts is here reproduced, including, but to a greater extent, ill-disguised infanticide, and dosing children with opiates. [51]

"My knowledge of such evils," says Dr. Simon, the medical officer of the Privy Council and editor in chief of

the Reports on Public Health, "may excuse the profound misgiving with which I regard any large industrial employment of adult women." [52]

"Happy indeed," exclaims Mr. Baker, the factory inspector, in his official report, "happy indeed will it be for the manufacturing districts of England, when every married woman having a family is prohibited from working in any textile works at all." [53]

The moral degradation caused by the capitalistic exploitation of women and children has been so exhaustively depicted by F. Engels in his "Lage der Arbeitenden Klasse Englands," and other writers, that I need only mention the subject in this place. But the intellectual desolation artificially produced by converting immature human beings into mere machines for the fabrication of surplus-value, a state of mind clearly distinguishable from that natural ignorance which keeps the mind fallow without destroying its capacity for development, its natural fertility, this desolation finally compelled even the English Parliament to make elementary education a compulsory condition to the "productive" employment of children under 14 years, in every industry subject to the Factory Acts. The spirit of capitalist production stands out clearly in the ludicrous wording of the so-called education clauses in the Factory Acts, in the absence of an administrative machinery, an absence that again makes the compulsion illusory, in the opposition of the manufacturers themselves to these education clauses, and in the tricks and dodges they put in practice for evading them.

> "For this the legislature is alone to blame, by having passed a delusive law, which, while it would seem to provide that the children employed in factories shall be *educated,* contains no enactment by which that professed end can be secured. It provides nothing more than that the children shall on certain days of the week, and for a certain number of hours (three) in each day, be inclosed within the four walls of a place called a school, and that the employer of the child shall receive weekly a certificate to that effect signed by a person designated by the subscriber as a schoolmaster or schoolmistress." [54]

Previous to the passing of the amended Factory Act, 1844, it happened, not unfrequently, that the certificates of attendance at school were signed by the schoolmaster or schoolmistress with a cross, as they themselves were unable to write.

> "On one occasion, on visiting a place called a school, from which certificates of school attendance, had issued, I was so struck with the ignorance of the master, that I said to him: 'Pray, sir, can you read?' His reply was: 'Aye, summat!' and as a justification of his right to grant certificates, he added: 'At any rate, I am before my scholars.'"

The inspectors, when the Bill of 1844 was in preparation, did not fail to represent the disgraceful state of the places called schools, certificates from which they were obliged to admit as a compliance with the laws, but they were successful only in obtaining thus much, that since the passing of the Act of 1845,

> the figures in the school certificate must be filled up in the handwriting of the schoolmaster, who must also sign his Christian and surname in full." [55]

Sir John Kincaid, factory inspector for Scotland, relates experiences of the same kind.

> "The first school we visited was kept by a Mrs. Ann Killin. Upon asking her to spell her name, she straightway made a mistake, by beginning with the letter C, but correcting herself immediately, she said her name began with a K. On looking at her signature, however, in the school certificate books, I noticed that she spelt it in various ways, while her handwriting left no doubt as to her unfitness to teach. She herself also acknowledged that she could not keep the register ... In a second school I found the schoolroom 15 feet long, and 10 feet wide, and counted in this space 75 children, who were gabbling something unintelligible" [56] But it is not only in the miserable places above referred to that the children obtain certificates of school attendance without having received instruction of any value, for in many schools where there is a competent teacher, his efforts are of little avail from the distracting crowd of children of all ages, from infants of 3 years old and upwards; his livelihood, miserable at the best, depending on the pence received from the greatest number of children whom it is possible to cram into the space. To this is to be added scanty school furniture, deficiency of books, and other materials for teaching, and the depressing effect upon the poor children themselves of a close, noisome atmosphere. I have been in many such schools, where I have seen rows of children doing absolutely nothing; and this is certified as school attendance, and, in statistical returns, such children are set down as being educated." [57]

In Scotland the manufacturers try all they can to do without the children that are obliged to attend school.

> "It requires no further argument to prove that the educational clauses of the Factory Act, being held in such disfavour among mill-owners, tend in a great measure to exclude that class of children alike from the employment and the benefit of education contemplated by this Act." [58]

Horribly grotesque does this appear in print works, which are regulated by a special Act. By that Act,

> "every child, before being employed in a print work must have attended school for at least 30 days, and not less than 150 hours, during the six months immediately preceding such first day of employment, and during the continuance of its employment in the print works, it must attend for a like period of 30 days, and 150 hours during every successive period of six months.... The attendance at school must be between 8 a.m. and 6 p.m. No attendance of less than 2½ hours, nor more than 5 hours on any one day, shall be reckoned as part of the 150 hours. Under ordinary circumstances the children attend school morning and afternoon for 30 days, for at least 5 hours each day, and upon the expiration of the 30 days, the statutory total of 150 hours having been attained, having, in their language, made up their book, they return to the print work, where they continue until the six months have expired, when another instalment of school attendance becomes due, and they again seek the school until the book is again made up.... Many boys having attended school for the required number of hours, when they return to school after the expiration of their six months' work in the print work, are in the same condition as when they first attended school as print-work boys, that they have lost all they gained by their previous school attendance.... In other print works the children's attendance at school is made to depend altogether upon the exigencies of the work in the establishment. The requisite number of hours is made up each six months, by instalments consisting of from 3 to 5 hours at a time, spreading over, perhaps, the whole six months.... For instance, the attendance on one day might be from 8 to 11 a.m., on another day from I p.m. to 4 p.m., and the child might not appear at school again for several days, when it would attend from 3 p.m. to 6 p.m.; then it might attend for 3 or 4 days consecutively, or for a week, then it would not appear in school for 3 weeks or a month, after that upon some odd days at some odd hours when the operative who employed it chose to spare it; and thus the child was, as it were, buffeted from school to work, from work to school, until the tale of 150 hours was told." [59]

By the excessive addition of women and children to the ranks of the workers, machinery at last breaks down the resistance which the male operatives in the manufacturing period continued to oppose to the despotism of capital. [60]

B. Prolongation of the Working-Day

If machinery be the most powerful means for increasing the productiveness of labour — i.e., for shortening the working-time required in the production of a commodity, it becomes in the hands of capital the most powerful means, in those industries first invaded by it, for lengthening the working-day beyond all bounds set by human nature. It creates, on the one hand, new conditions by which capital is enabled to give free scope to this its constant tendency, and on the other hand, new motives with which to whet capital's appetite for the labour of others.

In the first place, in the form of machinery, the implements of labour become automatic, things moving and working independent of the workman. They are thenceforth an industrial *perpetuum mobile*, that would go on producing forever, did it not meet with certain natural obstructions in the weak bodies and the strong wills of its human attendants. The automaton, as capital, and because it is capital, is endowed, in the person of the capitalist, with intelligence and will; it is therefore animated by the longing to reduce to a minimum the resistance offered by that repellent yet elastic natural barrier, man. [61] This resistance is moreover lessened by the apparent lightness of machine work, and by the more pliant and docile character of the women and children employed on it. [62]

The productiveness of machinery is, as we saw, inversely proportional to the value transferred by it to the product. The longer the life of the machine, the greater is the mass of the products over which the value transmitted by the machine is spread, and the less is the portion of that value added to each single commodity. The active lifetime of a machine is, however, clearly dependent on the length of the working-day, or on the duration of the daily labour-process multiplied by the number of days for which the process is carried on.

The wear and tear of a machine is not exactly proportional to its working-time. And even if it were so, a machine working 16 hours daily for 7½ years, covers as long a working period as, and transmits to the

total product no more value than, the same machine would if it worked only 8 hours daily for 15 years. But in the first case the value of the machine would be reproduced twice as quickly as in the latter, and the capitalist would, by this use of the machine, absorb in 7½ years as much surplus-value as in the second case he would in 15.

The material wear and tear of a machine is of two kinds. The one arises from use, as coins wear away by circulating, the other from non-use, as a sword rusts when left in its scabbard. The latter kind is due to the elements. The former is more or less directly proportional, the latter to a certain extent inversely proportional, to the use of the machine. [63]

But in addition to the material wear and tear, a machine also undergoes, what we may call a moral depreciation. It loses exchange-value, either by machines of the same sort being produced cheaper than it, or by better machines entering into competition with it. [64] In both cases, be the machine ever so young and full of life, its value is no longer determined by the labour actually materialised in it, but by the labour-time requisite to reproduce either it or the better machine. It has, therefore, lost value more or less. The shorter the period taken to reproduce its total value, the less is the danger of moral depreciation; and the longer the working-day, the shorter is that period. When machinery is first introduced into an industry, new methods of reproducing it more cheaply follow blow upon blow, [65] and so do improvements, that not only affect individual parts and details of the machine, but its entire build. It is, therefore, in the early days of the life of machinery that this special incentive to the prolongation of the working-day makes itself felt most acutely. [66]

Given the length of the working-day, all other circumstances remaining the same, the exploitation of double the number of workmen demands, not only a doubling of that part of constant capital which is invested in machinery and buildings, but also of that part which is laid out in raw material and auxiliary substances. The lengthening of the working-day, on the other hand, allows of production on an extended scale without any alteration in the amount of capital laid out on machinery and buildings. [67] Not only is there, therefore, an increase of surplus-value, but the outlay necessary to obtain it diminishes. It is true that this takes place, more or less, with every lengthening of the working-day; but in the case under consideration, the change is more marked, because the capital converted into the instruments of labour preponderates to a greater degree. [68] The development of the factory system fixes a constantly increasing portion of the capital in a form, in which, on the one hand, its value is capable of continual self-expansion, and in which, on the other hand, it loses both use-value and exchange-value whenever it loses contact with living labour. “When a labourer,” said Mr. Ashworth, a cotton magnate, to Professor Nassau W. Senior, “lays down his spade, he renders useless, for that period, a capital worth eighteen-pence. When one of our people leaves the mill, he renders useless a capital that has cost £100,000.” [69] Only fancy! making “useless” for a single moment, a capital that has cost £100,000! It is, in truth, monstrous, that a single one of our people should ever leave the factory! The increased use of machinery, as Senior after the instruction he received from Ashworth clearly perceives, makes a constantly increasing lengthening of the working-day “desirable.” [70]

Machinery produces relative surplus-value; not only by directly depreciating the value of labour-power, and by indirectly cheapening the same through cheapening the commodities that enter into its reproduction, but also, when it is first introduced sporadically into an industry, by converting the labour employed by the owner of that machinery, into labour of a higher degree and greater efficacy, by raising the social value of the article produced above its individual value, and thus enabling the capitalist to replace the value of a day’s labour-power by a smaller portion of the value of a day’s product. During this transition period, when the use of machinery is a sort of monopoly, the profits are therefore exceptional, and the capitalist endeavours to exploit thoroughly “the sunny time of this his first love,” by prolonging the working-day as much as possible. The magnitude of the profit whets his appetite for more profit.

As the use of machinery becomes more general in a particular industry, the social value of the product sinks down to its individual value, and the law that surplus-value does not arise from the labour-power that has been replaced by the machinery, but from the labour-power actually employed in working with the machinery, asserts itself. Surplus-value arises from variable capital alone, and we saw that the amount of surplus-value depends on two factors, viz., the rate of surplus-value and the number of the workmen

simultaneously employed. Given the length of the working-day, the rate of surplus-value is determined by the relative duration of the necessary labour and of the surplus-labour in a day. The number of the labourers simultaneously employed depends, on its side, on the ratio of the variable to the constant capital. Now, however much the use of machinery may increase the surplus-labour at the expense of the necessary labour by heightening the productiveness of labour, it is clear that it attains this result, only by diminishing the number of workmen employed by a given amount of capital. It converts what was formerly variable capital, invested in labour-power, into machinery which, being constant capital, does not produce surplus-value. It is impossible, for instance, to squeeze as much surplus-value out of 2 as out of 24 labourers. If each of these 24 men gives only one hour of surplus-labour in 12, the 24 men give together 24 hours of surplus-labour, while 24 hours is the total labour of the two men. Hence, the application of machinery to the production of surplus-value implies a contradiction which is immanent in it, since of the two factors of the surplus-value created by a given amount of capital, one, the rate of surplus-value, cannot be increased, except by diminishing the other, the number of workmen. This contradiction comes to light, as soon as by the general employment of machinery in a given industry, the value of the machine-produced commodity regulates the value of all commodities of the same sort; and it is this contradiction, that in its turn, drives the capitalist, without his being conscious of the fact, [71] to excessive lengthening of the working-day, in order that he may compensate the decrease in the relative number of labourers exploited, by an increase not only of the relative, but of the absolute surplus-labour.

If, then, the capitalistic employment of machinery, on the one hand, supplies new and powerful motives to an excessive lengthening of the working-day, and radically changes, as well the methods of labour, as also the character of the social working organism, in such a manner as to break down all opposition to this tendency, on the other hand it produces, partly by opening out to the capitalist new strata of the working-class, previously inaccessible to him, partly by setting free the labourers it supplants, a surplus working population, [72] which is compelled to submit to the dictation of capital. Hence that remarkable phenomenon in the history of modern industry, that machinery sweeps away every moral and natural restriction on the length of the working-day. Hence, too, the economic paradox, that the most powerful instrument for shortening labour-time, becomes the most unfailing means for placing every moment of the labourer's time and that of his family, at the disposal of the capitalist for the purpose of expanding the value of his capital. "If," dreamed Aristotle, the greatest thinker of antiquity, "if every tool, when summoned, or even of its own accord, could do the work that befits it, just as the creations of Daedalus moved of themselves, or the tripods of Hephaestos went of their own accord to their sacred work, if the weavers' shuttles were to weave of themselves, then there would be no need either of apprentices for the master workers, or of slaves for the lords." [73] And Antipatros, a Greek poet of the time of Cicero, hailed the invention of the water-wheel for grinding corn, an invention that is the elementary form of all machinery, as the giver of freedom to female slaves, and the bringer back of the golden age. [74] Oh! those heathens! They understood, as the learned Bastiat, and before him the still wiser MacCulloch have discovered, nothing of Political Economy and Christianity. They did not, for example, comprehend that machinery is the surest means of lengthening the working-day. They perhaps excused the slavery of one on the ground that it was a means to the full development of another. But to preach slavery of the masses, in order that a few crude and half-educated parvenus, might become "eminent spinners," "extensive sausage-makers," and "influential shoe-black dealers," to do this, they lacked the bump of Christianity.

C. Intensification of Labour

The immoderate lengthening of the working-day, produced by machinery in the hands of capital, leads to a reaction on the part of society, the very sources of whose life are menaced; and, thence, to a normal working-day whose length is fixed by law. Thenceforth a phenomenon that we have already met with, namely, the intensification of labour, develops into great importance. Our analysis of absolute surplus-value had reference primarily to the extension or duration of the labour, its intensity being assumed as given. We now proceed to consider the substitution of a more intensified labour for labour of more extensive duration, and the degree of the former.

It is self-evident, that in proportion as the use of machinery spreads, and the experience of a special

class of workmen habituated to machinery accumulates, the rapidity and intensity of labour increase as a natural consequence. Thus in England, during half a century, lengthening of the working-day went hand in hand with increasing intensity of factory labour. Nevertheless the reader will clearly see, that where we have labour, not carried on by fits and starts, but repeated day after day with unvarying uniformity, a point must inevitably be reached, where extension of the working-day and intensity of the labour mutually exclude one another, in such a way that lengthening of the working-day becomes compatible only with a lower degree of intensity, and a higher degree of intensity, only with a shortening of the working-day. So soon as the gradually surging revolt of the working-class compelled Parliament to shorten compulsorily the hours of labour, and to begin by imposing a normal working-day on factories proper, so soon consequently as an increased production of surplus-value by the prolongation of the working-day was once for all put a stop to, from that moment capital threw itself with all its might into the production of relative surplus-value, by hastening on the further improvement of machinery. At the same time a change took place in the nature of relative surplus-value. Generally speaking, the mode of producing relative surplus-value consists in raising the productive power of the workman, so as to enable him to produce more in a given time with the same expenditure of labour. Labour-time continues to transmit as before the same value to the total product, but this unchanged amount of exchange-value is spread over more use-value; hence the value of each single commodity sinks. Otherwise, however, so soon as the compulsory shortening of the hours of labour takes place. The immense impetus it gives the development of productive power, and to economy in the means of production, imposes on the workman increased expenditure of labour in a given time, heightened tension of labour-power, and closer filling up of the pores of the working-day, or condensation of labour to a degree that is attainable only within the limits of the shortened working-day. This condensation of a greater mass of labour into a given period thenceforward counts for what it really is, a greater quantity of labour. In addition to a measure of its extension, i.e., duration, labour now acquires a measure of its intensity or of the degree of its condensation or density. [75] The denser hour of the ten hours' working-day contains more labour, i.e., expended labour-power than the more porous hour of the twelve hours' working-day. The product therefore of one of the former hours has as much or more value than has the product of 1 1/5 of the latter hours. Apart from the increased yield of relative surplus-value through the heightened productiveness of labour, the same mass of value is now produced for the capitalist say by 3 1/3 hours of surplus-labour, and 6 2/3 hours of necessary labour, as was previously produced by four hours of surplus-labour and eight hours of necessary labour.

We now come to the question: How is the labour intensified?

The first effect of shortening the working-day results from the self-evident law, that the efficiency of labour-power is in an inverse ratio to the duration of its expenditure. Hence, within certain limits what is lost by shortening the duration is gained by the increasing tension of labour-power. That the workman moreover really does expend more labour-power, is ensured by the mode in which the capitalist pays him. [76] In those industries, such as potteries, where machinery plays little or no part, the introduction of the Factory Acts has strikingly shown that the mere shortening of the working-day increases to a wonderful degree the regularity, uniformity, order, continuity, and energy of the labour. [77] It seemed, however, doubtful whether this effect was produced in the factory proper, where the dependence of the workman on the continuous and uniform motion of the machinery had already created the strictest discipline. Hence, when in 1844 the reduction of the working-day to less than twelve hours was being debated, the masters almost unanimously declared

> "that their overlookers in the different rooms took good care that the hands lost no time," that "the extent of vigilance and attention on the part of the workmen was hardly capable of being increased," and, therefore, that the speed of the machinery and other conditions remaining unaltered, "to expect in a well-managed factory any important result from increased attention of the workmen was an absurdity." [78]

This assertion was contradicted by experiments. Mr. Robert Gardner reduced the hours of labour in his two large factories at Preston, on and after the 20th April, 1844, from twelve to eleven hours a day. The result of about a year's working was that "the same amount of product for the same cost was received, and the workpeople as a whole earned in eleven hours as much wages as they did before in twelve." [79] I pass over the experiments made in the spinning and carding rooms, because they were accompanied by an increase of 2% in the speed of the machines. But in the weaving department, where, moreover, many sorts of figured fancy articles were woven, there was not the slightest alteration in the conditions of the work.

The result was: “From 6th January to 20th April, 1844, with a twelve hours’ day, average weekly wages of each hand 10s. 1½d., from 20th April to 29th June, 1844, with day of eleven hours, average weekly wages 10s. 3½d.” [80] Here we have more produced in eleven hours than previously in twelve, and entirely in consequence of more steady application and economy of time by the workpeople. While they got the same wages and gained one hour of spare time, the capitalist got the same amount produced and saved the cost of coal, gas, and other such items, for one hour. Similar experiments, and with the like success, were carried out in the mills of Messrs. Horrocks and Jacson. [81]

The shortening of the hours of labour creates, to begin with, the subjective conditions for the condensation of labour, by enabling the workman to exert more strength in a given time. So soon as that shortening becomes compulsory, machinery becomes in the hands of capital the objective means, systematically employed for squeezing out more labour in a given time. This is effected in two ways: by increasing the speed of the machinery, and by giving the workman more machinery to tent. Improved construction of the machinery is necessary, partly because without it greater pressure cannot be put on the workman, and partly because the shortened hours of labour force the capitalist to exercise the strictest watch over the cost of production. The improvements in the steam-engine have increased the piston speed, and at the same time have made it possible, by means of a greater economy of power, to drive with the same or even a smaller consumption of coal more machinery with the same engine. The improvements in the transmitting mechanism have lessened friction, and, what so strikingly distinguishes modern from the older machinery, have reduced the diameter and weight of the shafting to a constantly decreasing minimum. Finally, the improvements in the operative machines have, while reducing their size, increased their speed and efficiency, as in the modern power-loom; or, while increasing the size of their framework, have also increased the extent and number of their working parts, as in spinning-mules, or have added to the speed of these working parts by imperceptible alterations of detail, such as those which ten years ago increased the speed of the spindles in self-acting mules by one-fifth.

The reduction of the working-day to 12 hours dates in England from 1832. In 1836 a manufacturer stated:

> “The labour now undergone in the factories is much greater than it used to be ... compared with thirty or forty years ago ... owing to the greater attention and activity required by the greatly increased speed which is given to the machinery.” [82]

In the year 1844, Lord Ashley, now Lord Shaftesbury, made in the House of Commons the following statements, supported by documentary evidence:

> “The labour performed by those engaged in the processes of manufacture, is three times as great as in the beginning of such operations. Machinery has executed, no doubt, the work that would demand the sinews of millions of men; but it has also prodigiously multiplied the labour of those who are governed by its fearful movements.... In 1815, the labour of following a pair of mules spinning cotton of No. 40 — reckoning 12 hours to the working-day — involved a necessity of walking 8 miles. In 1832, the distance travelled in following a pair of mules, spinning cotton yarn of the same number, was 20 miles, and frequently more. In 1835” (query — 1815 or 1825?) “the spinner put up daily, on each of these mules, 820 stretches, making a total of 1,640 stretches in the course of the day. In 1832, the spinner put up on each mule 2,200 stretches, making a total of 4,400. In 1844, 2,400 stretches, making a total of 4,800; and in some cases the amount of labour required is even still greater.... I have another document sent to me in 1842, stating that the labour is progressively increasing – increasing not only because the distance to be travelled is greater, but because the quantity of goods produced is multiplied, while the hands are fewer in proportion than before; and, moreover, because an inferior species of cotton is now often spun, which it is more difficult to work.... In the carding-room there has also been a great increase of labour. One person there does the work formerly divided between two. In the weaving-room, where a vast number of persons are employed, and principally females ... the labour has increased within the last few years fully 10 per cent., owing to the increased speed of the machinery in spinning. In 1838, the number of hanks spun per week was 18,000, in 1843 it amounted to 21,000. In 1819, the number of picks in power-loom-weaving per minute was 60 — in 1842 it was 140, showing a vast increase of labour.” [83]

In the face of this remarkable intensity of labour which had already been reached in 1844 under the Twelve Hours’ Act, there appeared to be a justification for the assertion made at that time by the English manufacturers, that any further progress in that direction was impossible, and therefore that every further reduction of the hours of labour meant a lessened production. The apparent correctness of their reasons

will be best shown by the following contemporary statement by Leonard Horner, the factory inspector, their ever watchful censor.

> "Now, as the quantity produced must, in the main, be regulated by the speed of the machinery, it must be the interest of the mill-owner to drive it at the utmost rate of speed consistent with these following conditions, viz., the preservation of the machinery from too rapid deterioration; the preservation of the quality of the article manufactured; and the capability of the workman to follow the motion without a greater exertion than he can sustain for a constancy. One of the most important problems, therefore, which the owner of a factory has to solve is to find out the maximum speed at which he can run, with a due regard to the above conditions. It frequently happens that he finds he has gone too fast, that breakages and bad work more than counterbalance the increased speed, and that he is obliged to slacken his pace. I therefore concluded, that as an active and intelligent mill-owner would find out the safe maximum, it would not be possible to produce as much in eleven hours as in twelve. I further assumed that the operative paid by piecework, would exert himself to the utmost consistent with the power of continuing at the same rate." [84]
>
> Horner, therefore, came to the conclusion that a reduction of the working hours below twelve would necessarily diminish production. [85] He himself, ten years later, cites his opinion of 1845 in proof of how much he under-estimated in that year the elasticity of machinery, and of man's labour-power, both of which are simultaneously stretched to an extreme by the compulsory shortening of the working-day.

We now come to the period that follows the introduction of the Ten Hours' Act in 1847 into the English cotton, woollen, silk, and flax mills.

> "The speed of the spindles has increased upon throstles 500, and upon mules 1,000 revolutions a minute, i.e., the speed of the throstle spindle, which in 1839 was 4,500 times a minute, is now (1862) 5,000; and of the mule spindle, that was 5,000, is now 6,000 times a minute, amounting in the former case to one-tenth, and in the second case to one-fifth additional increase." [86]

James Nasmyth, the eminent civil engineer of Patricroft, near Manchester, explained in a letter to Leonard Horner, written in 1852, the nature of the improvements in the steam-engine that had been made between the years 1848 and 1852. After remarking that the horse-power of steam-engines, being always estimated in the official returns according to the power of similar engines in 1828, [87] is only nominal, and can serve only as an index of their real power, he goes on to say:

> "I am confident that from the same weight of steam-engine machinery, we are now obtaining at least 50 per cent. more duty or work performed on the average, and that in many cases the identical steam-engines which in the days of the restricted speed of 220 feet per minute, yielded 50 horsepower, are now yielding upwards of 100..." "The modern steam-engine of 100 horse-power is capable of being driven at a much greater force than formerly, arising from improvements in its construction, the capacity and construction of the boilers, &c...." "Although the same number of hands are employed in proportion to the horse-power as at former periods, there are fewer hands employed in proportion to the machinery." [88] "In the year 1850, the factories of the United Kingdom employed 134,217 nominal horse-power to give motion to 25,638,716 spindles and 301,445 looms. The number of spindles and looms in 1856 was respectively 33,503,580 of the former, and 369,205 of the latter, which, reckoning the force of the nominal horse-power required to be the same as in 1850, would require a force equal to 175,000 horses, but the actual power given in the return for 1856 is 161,435, less by above 10,000 horses than, calculating upon the basis of the return of 1850, the factories ought to have required in 1856." [89] "The facts thus brought out by the Return (of 1856) appear to be that the factory system is increasing rapidly; that although the same number of hands are employed in proportion to the horse-power as at former periods, there are fewer hands employed in proportion to the machinery; that the steam-engine is enabled to drive an increased weight of machinery by economy of force and other methods, and that an increased quantity of work can be turned off by improvements in machinery, and in methods of manufacture, by increase of speed of the machinery, and by a variety of other causes." [90]
>
> "The great improvements made in machines of every kind have raised their productive power very much. Without any doubt, the shortening of the hours of labour... gave the impulse to these improvements. The latter, combined with the more intense strain on the workman, have had the effect, that at least as much is produced in the shortened (by two hours or one-sixth) working-day as was previously produced during the longer one." [91]

One fact is sufficient to show how greatly the wealth of the manufacturers increased along with the more intense exploitation of labour-power. From 1838 to 1850, the average proportional increase in English cotton and other factories was 32%, while from 1850 to 1856 it amounted to 86%.

But however great the progress of English industry had been during the 8 years from 1848 to 1856 under the influence of a working-day of 10 hours, it way far surpassed during the next period of 6 years from 1856 to 1862. In silk factories, for instance, there were in 1856, spindles 1,093,799; in 1862, 1,388,544; in 1856, looms 9,260; in 1862, 10,709. But the number of operatives was, in 1856, 56,131; in 1862, 52,429. The increase in the spindles was therefore 26.9% and in the looms 15.6%, while the number of the operatives decreased 7%. In the year 1850 there were employed in worsted mills 875,830 spindles; in 1856, 1,324,549 (increase 51.2%), and in 1862, 1,289,172 (decrease 2.7%). But if we deduct the doubling spindles that figure in the numbers for 1856, but not in those for 1862, it will be found that after 1856 the number of spindles remained nearly stationary. On the other hand, after 1850, the speed of the spindles and looms was in many cases doubled. The number of power-looms in worsted mills was, in 1850, 32,617; in 1856, 38,956; in 1862, 43,048. The number of the operatives was, in 1850, 79,737; in 1856, 87,794; in 1862, 86,063; included in these, however, the children under 14 years of age were, in 1850, 9,956; in 1856, 11,228; in 1862, 13,178. In spite, therefore, of the greatly increased number of looms in 1862, compared with 1856, the total number of the workpeople employed decreased, and that of the children exploited increased. [92]

On the 27th April, 1863, Mr. Ferrand said in the House of Commons:

> “I have been informed by delegates from 16 districts of Lancashire and Cheshire, in whose behalf I speak, that the work in the factories is, in consequence of the improvements in machinery, constantly on the increase. Instead of as formerly one person with two helps tenting two looms, one person now tents three looms without helps, and it is no uncommon thing for one person to tent four. Twelve hours’ work, as is evident from the facts adduced, is now compressed into less than 10 hours. It is therefore self-evident, to what an enormous extent the toil of the factory operative has increased during the last 10 years.” [93]

Although, therefore, the Factory Inspectors unceasingly and with justice, commend the results of the Acts of 1844 and 1850, yet they admit that the shortening of the hours of labour has already called forth such an intensification of the labour as is injurious to the health of the workman and to his capacity for work.

> “In most of the cotton, worsted, and silk mills, an exhausting state of excitement necessary to enable the workers satisfactorily to mind the machinery, the motion of which has been greatly accelerated within the last few years, seems to me not unlikely to be one of the causes of that excess of mortality from lung disease, which Dr. Greenhow has pointed out in his recent report on this subject.” [94]

There cannot be the slightest doubt that the tendency that urges capital, so soon as a prolongation of the hours of labour is once for all forbidden, to compensate itself, by a systematic heightening of the intensity of labour, and to convert every improvement in machinery into a more perfect means of exhausting the workman, must soon lead to a state of things in which a reduction of the hours of labour will again be inevitable. [95] On the other hand, the rapid advance of English industry between 1848 and the present time, under the influence of a day of 10 hours, surpasses the advance made between 1833 and 1847, when the day was 12 hours long, by far more than the latter surpasses the advance made during the half century after the first introduction of the factory system, when the working-day was without limits. [96]

SECTION 4

THE FACTORY

At the commencement of this chapter we considered that which we may call the body of the factory, i.e., machinery organised into a system. We there saw how machinery, by annexing the labour of women and children, augments the number of human beings who form the material for capitalistic exploitation, how it confiscates the whole of the workman’s disposable time, by immoderate extension of the hours of labour, and how finally its progress, which allows of enormous increase of production in shorter and shorter periods, serves as a means of systematically getting more work done in a shorter time, or of exploiting

labour-power more intensely. We now turn to the factory as a whole, and that in its most perfect form.

Dr. Ure, the Pindar of the automatic factory, describes it, on the one hand, as

> "Combined co-operation of many orders of workpeople, adult and young, in tending with assiduous skill, a system of productive machines, continuously impelled by a central power" (the prime mover); on the other hand, as "a vast automaton, composed of various mechanical and intellectual organs, acting in uninterrupted concert for the production of a common object, all of them being subordinate to a self-regulated moving force."

These two descriptions are far from being identical. In one, the collective labourer, or social body of labour, appears as the dominant subject, and the mechanical automaton as the object; in the other, the automaton itself is the subject, and the workmen are merely conscious organs, co-ordinate with the unconscious organs of the automaton, and together with them, subordinated to the central moving-power. The first description is applicable to every possible employment of machinery on a large scale, the second is characteristic of its use by capital, and therefore of the modern factory system. Ure prefers therefore, to describe the central machine, from which the motion comes, not only as an automaton, but as an autocrat. "In these spacious halls the benignant power of steam summons around him his myriads of willing menials." [97]

Along with the tool, the skill of the workman in handling it passes over to the machine. The capabilities of the tool are emancipated from the restraints that are inseparable from human labour-power. Thereby the technical foundation on which is based the division of labour in Manufacture, is swept away. Hence, in the place of the hierarchy of specialised workmen that characterises manufacture, there steps, in the automatic factory, a tendency to equalise and reduce to one and the same level every kind of work that has to be done by the minders of the machines; [98] in the place of the artificially produced differentiations of the detail workmen, step the natural differences of age and sex.

So far as division of labour re-appears in the factory, it is primarily a distribution of the workmen among the specialised machines; and of masses of workmen, not however organised into groups, among the various departments of the factory, in each of which they work at a number of similar machines placed together; their co-operation, therefore, is only simple. The organised group, peculiar to manufacture, is replaced by the connexion between the head workman and his few assistants. The essential division is, into workmen who are actually employed on the machines (among whom are included a few who look after the engine), and into mere attendants (almost exclusively children) of these workmen. Among the attendants are reckoned more or less all "Feeders" who supply the machines with the material to be worked. In addition to these two principal classes, there is a numerically unimportant class of persons, whose occupation it is to look after the whole of the machinery and repair it from time to time; such as engineers, mechanics, joiners, &c. This is a superior class of workmen, some of them scientifically educated, others brought up to a trade; it is distinct from the factory operative class, and merely aggregated to it. [99] This division of labour is purely technical.

To work at a machine, the workman should be taught from childhood, in order that he may learn to adapt his own movements to the uniform and unceasing motion of an automaton. When the machinery, as a whole, forms a system of manifold machines, working simultaneously and in concert, the co-operation based upon it, requires the distribution of various groups of workmen among the different kinds of machines. But the employment of machinery does away with the necessity of crystallising this distribution after the manner of Manufacture, by the constant annexation of a particular man to a particular function. [100] Since the motion of the whole system does not proceed from the workman, but from the machinery, a change of persons can take place at any time without an interruption of the work. The most striking proof of this is afforded by the *relays system*, put into operation by the manufacturers during their revolt from 1848-1850. Lastly, the quickness with which machine work is learnt by young people, does away with the necessity of bringing up for exclusive employment by machinery, a special class of operatives. [101] With regard to the work of the mere attendants, it can, to some extent, be replaced in the mill by machines, [102] and owing to its extreme simplicity, it allows of a rapid and constant change of the individuals burdened with this drudgery.

Although then, technically speaking, the old system of division of labour is thrown overboard by machinery, it hangs on in the factory, as a traditional habit handed down from Manufacture, and is

afterwards systematically re-moulded and established in a more hideous form by capital, as a means of exploiting labour-power. The life-long speciality of handling one and the same tool, now becomes the life-long speciality of serving one and the same machine. Machinery is put to a wrong use, with the object of transforming the workman, from his very childhood, into a part of a detail-machine. [103] In this way, not only are the expenses of his reproduction considerably lessened, but at the same time his helpless dependence upon the factory as a whole, and therefore upon the capitalist, is rendered complete. Here as everywhere else, we must distinguish between the increased productiveness due to the development of the social process of production, and that due to the capitalist exploitation of that process. In handicrafts and manufacture, the workman makes use of a tool, in the factory, the machine makes use of him. There the movements of the instrument of labour proceed from him, here it is the movements of the machine that he must follow. In manufacture the workmen are parts of a living mechanism. In the factory we have a lifeless mechanism independent of the workman, who becomes its mere living appendage.

> "The miserable routine of endless drudgery and toil in which the same mechanical process is gone through over and over again, is like the labour of Sisyphus. The burden of labour, like the rock, keeps ever falling back on the worn-out labourer." [104]

At the same time that factory work exhausts the nervous system to the uttermost, it does away with the many-sided play of the muscles, and confiscates every atom of freedom, both in bodily and intellectual activity. [105] The lightening of the labour, even, becomes a sort of torture, since the machine does not free the labourer from work, but deprives the work of all interest. Every kind of capitalist production, in so far as it is not only a labour-process, but also a process of creating surplus-value, has this in common, that it is not the workman that employs the instruments of labour, but the instruments of labour that employ the workman. But it is only in the factory system that this inversion for the first time acquires technical and palpable reality. By means of its conversion into an automaton, the instrument of labour confronts the labourer, during the labour-process, in the shape of capital, of dead labour, that dominates, and pumps dry, living labour-power. The separation of the intellectual powers of production from the manual labour, and the conversion of those powers into the might of capital over labour, is, as we have already shown, finally completed by modern industry erected on the foundation of machinery. The special skill of each individual insignificant factory operative vanishes as an infinitesimal quantity before the science, the gigantic physical forces, and the mass of labour that are embodied in the factory mechanism and, together with that mechanism, constitute the power of the "master." This "master," therefore, in whose brain the machinery and his monopoly of it are inseparably united, whenever he falls out with his "hands," contemptuously tells them:

> "The factory operatives should keep in wholesome remembrance the fact that theirs is really a low species of skilled labour; and that there is none which is more easily acquired, or of its quality more amply remunerated, or which by a short training of the least expert can be more quickly, as well as abundantly, acquired.... The master's machinery really plays a far more important part in the business of production than the labour and the skill of the operative, which six months' education can teach, and a common labourer can learn." [106]

The technical subordination of the workman to the uniform motion of the instruments of labour, and the peculiar composition of the body of workpeople, consisting as it does of individuals of both sexes and of all ages, give rise to a barrack discipline, which is elaborated into a complete system in the factory, and which fully develops the before mentioned labour of overlooking, thereby dividing the workpeople into operatives and overlookers, into private soldiers and sergeants of an industrial army. "The main difficulty [in the automatic factory] ... lay ... above all in training human beings to renounce their desultory habits of work, and to identify themselves with the unvarying regularity of the complex automaton. To devise and administer a successful code of factory discipline, suited to the necessities of factory diligence, was the Herculean enterprise, the noble achievement of Arkwright! Even at the present day, when the system is perfectly organised and its labour lightened to the utmost, it is found nearly impossible to convert persons past the age of puberty, into useful factory hands." [107] The factory code in which capital formulates, like a private legislator, and at his own good will, his autocracy over his workpeople, unaccompanied by that division of responsibility, in other matters so much approved of by the bourgeoisie, and unaccompanied by the still more approved representative system, this code is but the capitalistic caricature of that social regulation of the labour-process which becomes requisite in co-operation on a great scale, and in the

employment in common, of instruments of labour and especially of machinery. The place of the slave-driver's lash is taken by the overlooker's book of penalties. All punishments naturally resolve themselves into fines and deductions from wages, and the law-giving talent of the factory Lycurgus so arranges matters, that a violation of his laws is, if possible, more profitable to him than the keeping of them. [108] We shall here merely allude to the material conditions under which factory labour is carried on. Every organ of sense is injured in an equal degree by artificial elevation of the temperature, by the dust-laden atmosphere, by the deafening noise, not to mention danger to life and limb among the thickly crowded machinery, which, with the regularity of the seasons, issues its list of the killed and wounded in the industrial battle. [109] Economy of the social means of production, matured and forced as in a hothouse by the factory system, is turned, in the hands of capital, into systematic robbery of what is necessary for the life of the workman while he is at work, robbery of space, light, air, and of protection to his person against the dangerous and unwholesome accompaniments of the productive process, not to mention the robbery of appliances for the comfort of the workman. [110] Is Fourier wrong when he calls factories "tempered bagnos"? [111]

SECTION 5

THE STRIFE BETWEEN WORKMAN AND MACHINE

The contest between the capitalist and the wage-labourer dates back to the very origin of capital. It raged on throughout the whole manufacturing period. [112] But only since the introduction of machinery has the workman fought against the instrument of labour itself, the material embodiment of capital. He revolts against this particular form of the means of production, as being the material basis of the capitalist mode of production.

In the 17th century nearly all Europe experienced revolts of the workpeople against the ribbon-loom, a machine for weaving ribbons and trimmings, called in Germany Bandmühle, Schnurmühle, and Mühlenstuhl. These machines were invented in Germany. Abbé Lancellotti, in a work that appeared in Venice in 1636, but which was written in 1579, says as follows:

> "Anthony Müller of Danzig saw about 50 years ago in that town, a very ingenious machine, which weaves 4 to 6 pieces at once. But the Mayor being apprehensive that this invention might throw a large number of workmen on the streets, caused the inventor to be secretly strangled or drowned."

In Leyden, this machine was not used till 1629; there the riots of the ribbon-weavers at length compelled the Town Council to prohibit it.

> "In hac urbe," says Boxhorn (Inst. Pol., 1663), referring to the introduction of this machine into Leyden, "ante hos viginti circiter annos instrumentum quidam invenerunt textorium, quo solus plus panni et facilius conficere poterat, quan plures aequali tempore. Hinc turbae ortae et querulae textorum, tandemque usus hujus instrumenti a magistratu prohibitus est."
> [In this town, about twenty years ago certain people invented an instrument for weaving, with which a single person could weave more cloth, and more easily, than many others in the same length of time. As a result there arose disturbances and complaints from the weavers, until the Town Council finally prohibited the use of this instrument.]

After making various decrees more or less prohibitive against this loom in 1632, 1639, &c., the States General of Holland at length permitted it to be used, under certain conditions, by the decree of the 15th December, 1661. It was also prohibited in Cologne in 1676, at the same time that its introduction into England was causing disturbances among the workpeople. By an imperial Edict of 19th Feb., 1685, its use was forbidden throughout all Germany. In Hamburg it was burnt in public by order of the Senate. The Emperor Charles VI., on 9th Feb., 1719, renewed the edict of 1685, and not till 1765 was its use openly allowed in the Electorate of Saxony. This machine, which shook Europe to its foundations, was in fact the precursor of the mule and the power-loom, and of the industrial revolution of the 18th century. It enabled

a totally inexperienced boy, to set the whole loom with all its shuttles in motion, by simply moving a rod backwards and forwards, and in its improved form produced from 40 to 50 pieces at once.

About 1630, a wind-sawmill, erected near London by a Dutchman, succumbed to the excesses of the populace. Even as late as the beginning of the 18th century, sawmills driven by water overcame the opposition of the people, supported as it was by Parliament, only with great difficulty. No sooner had Everet in 1758 erected the first wool-shearing machine that was driven by water-power, than it was set on fire by 100,000 people who had been thrown out of work. Fifty thousand workpeople, who had previously lived by carding wool, petitioned Parliament against Arkwright's scribbling mills and carding engines. The enormous destruction of machinery that occurred in the English manufacturing districts during the first 15 years of this century, chiefly caused by the employment of the power-loom, and known as the Luddite movement, gave the anti-Jacobin governments of a Sidmouth, a Castlereagh, and the like, a pretext for the most reactionary and forcible measures. It took both time and experience before the workpeople learnt to distinguish between machinery and its employment by capital, and to direct their attacks, not against the material instruments of production, but against the mode in which they are used. [113]

The contests about wages in Manufacture, pre-suppose manufacture, and are in no sense directed against its existence. The opposition against the establishment of new manufactures, proceeds from the guilds and privileged towns, not from the workpeople. Hence the writers of the manufacturing period treat the division of labour chiefly as a means of virtually supplying a deficiency of labourers, and not as a means of actually displacing those in work. This distinction is self-evident. If it be said that 100 millions of people would be required in England to spin with the old spinning-wheel the cotton that is now spun with mules by 500,000 people, this does not mean that the mules took the place of those millions who never existed. It means only this, that many millions of workpeople would be required to replace the spinning machinery. If, on the other hand, we say, that in England the power-loom threw 800,000 weavers on the streets, we do not refer to existing machinery, that would have to be replaced by a definite number of workpeople, but to a number of weavers in existence who were actually replaced or displaced by the looms. During the manufacturing period, handicraft labour, altered though it was by division of labour, was yet the basis. The demands of the new colonial markets could not be satisfied owing to the relatively small number of town operatives handed down from the middle ages, and the manufactures proper opened out new fields of production to the rural population, driven from the land by the dissolution of the feudal system. At that time, therefore, division of labour and co-operation in the workshops, were viewed more from the positive aspect, that they made the workpeople more productive. [114] Long before the period of modern industry, co-operation and the concentration of the instruments of labour in the hands of a few, gave rise, in numerous countries where these methods were applied in agriculture, to great, sudden and forcible revolutions in the modes of production, and consequentially, in the conditions of existence, and the means of employment of the rural populations. But this contest at first takes place more between the large and the small landed proprietors, than between capital and wage labour; on the other hand, when the labourers are displaced by the instruments of labour, by sheep, horses, &c., in this case force is directly resorted to in the first instance as the prelude to the industrial revolution. The labourers are first driven from the land, and then come the sheep. Land grabbing on a great scale, such as was perpetrated in England, is the first step in creating a field for the establishment of agriculture on a great scale. [115] Hence this subversion of agriculture puts on, at first, more the appearance of a political revolution.

The instrument of labour, when it takes the form of a machine, immediately becomes a competitor of the workman himself. [116] The self-expansion of capital by means of machinery is thenceforward directly proportional to the number of the workpeople, whose means of livelihood have been destroyed by that machinery. The whole system of capitalist production is based on the fact that the workman sells his labour-power as a commodity. Division of labour specialises this labour-power, by reducing it to skill in handling a particular tool. So soon as the handling of this tool becomes the work of a machine, then, with the use-value, the exchange-value too, of the workman's labour-power vanishes; the workman becomes unsaleable, like paper money thrown out of currency by legal enactment. That portion of the working-class, thus by machinery rendered superfluous, i.e., no longer immediately necessary for the self-expansion of capital, either goes to the wall in the unequal contest of the old handicrafts and manufactures with machinery, or else floods all the more easily accessible branches of industry, swamps the labour-market, and sinks the price of labour-power below its value. It is impressed upon the workpeople, as a great

consolation, first, that their sufferings are only temporary (“a temporary inconvenience"), secondly, that machinery acquires the mastery over the whole of a given field of production, only by degrees, so that the extent and intensity of its destructive effect is diminished. The first consolation neutralises the second. When machinery seizes on an industry by degrees, it produces chronic misery among the operatives who compete with it. Where the transition is rapid, the effect is acute and felt by great masses. History discloses no tragedy more horrible than the gradual extinction of the English hand-loom weavers, an extinction that was spread over several decades, and finally sealed in 1838. Many of them died of starvation, many with families vegetated for a long time on 2½ d. a day. [117] On the other hand, the English cotton machinery produced an acute effect in India. The Governor General reported 1834-35:

> “The misery hardly finds a parallel in the history of commerce. The bones of the cotton-weavers are bleaching the plains of India.”

No doubt, in turning them out of this “temporal” world, the machinery caused them no more than “a temporary inconvenience.” For the rest, since machinery is continually seizing upon new fields of production, its temporary effect is really permanent. Hence, the character of independence and estrangement which the capitalist mode of production as a whole gives to the instruments of labour and to the product, as against the workman, is developed by means of machinery into a thorough antagonism. [118] Therefore, it is with the advent of machinery, that the workman for the first time brutally revolts against the instruments of labour.

The instrument of labour strikes down the labourer. This direct antagonism between the two comes out most strongly, whenever newly introduced machinery competes with handicrafts or manufactures, handed down from former times. But even in modern industry the continual improvement of machinery, and the development of the automatic system, has an analogous effect.

> “The object of improved machinery is to diminish manual labour, to provide for the performance of a process or the completion of a link in a manufacture by the aid of an iron instead of the human apparatus.” [119] “The adaptation of power to machinery heretofore moved by hand, is almost of daily occurrence ... the minor improvements in machinery having for their object economy of power, the production of better work, the turning off more work in the same time, or in supplying the place of a child, a female, or a man, are constant, and although sometimes apparently of no great moment, have somewhat important results.” [120] “Whenever a process requires peculiar dexterity and steadiness of hand, it is withdrawn, as soon as possible, from the cunning workman, who is prone to irregularities of many kinds, and it is placed in charge of a peculiar mechanism, so self-regulating that a child can superintend it.” [121] “On the automatic plan skilled labour gets progressively superseded.” [122] “The effect of improvements in machinery, not merely in superseding the necessity for the employment of the same quantity of adult labour as before, in order to produce a given result, but in substituting one description of human labour for another, the less skilled for the more skilled, juvenile for adult, female for male, causes a fresh disturbance in the rate of wages.” [123] “The effect of substituting the self-acting mule for the common mule, is to discharge the greater part of the men spinners, and to retain adolescents and children.” [124]

The extraordinary power of expansion of the factory system owing to accumulated practical experience, to the mechanical means at hand, and to constant technical progress, was proved to us by the giant strides of that system under the pressure of a shortened working-day. But who, in 1860, the Zenith year of the English cotton industry, would have dreamt of the galloping improvements in machinery, and the corresponding displacement of working people, called into being during the following 3 years, under the stimulus of the American Civil War? A couple of examples from the Reports of the Inspectors of Factories will suffice on this point. A Manchester manufacturer states:

> “We formerly had 75 carding engines, now we have 12, doing the same quantity of work.... We are doing with fewer hands by 14, at a saving in wages of £10 a-week. Our estimated saving in waste is about 10% in the quantity of cotton consumed.” “In another fine-spinning mill in Manchester, I was informed that through increased speed and the adoption of some self-acting processes, a reduction had been made, in number, of a fourth in one department, and of above half in another, and that the introduction of the combing machine in place of the second carding, had considerably reduced, the number of hands formerly employed in the carding-room.”

Another spinning-mill is estimated to effect a saving of labour of 10%. The Messrs. Gilmour, spinners at Manchester, state: “In our blowing-room department we consider our expense with new machinery is fully

one-third less in wages and hands ... in the jack-frame and drawing-frame room, about one-third less in expense, and likewise one-third less in hands; in the spinning room about one-third less in expenses. But this is not all; when our yarn goes to the manufacturers, it is so much better by the application of our new machinery, that they will produce a greater quantity of cloth, and cheaper than from the yarn produced by old machinery." [125] Mr. Redgrave further remarks in the same Report:

> "The reduction of hands against increased production is, in fact, constantly taking place, in woollen mills the reduction commenced some time since, and is continuing; a few days since, the master of a school in the neighbourhood of Rochdale said to me, that the great falling off in the girls' school is not only caused by the distress, but by the changes of machinery in the woollen mills, in consequence of which a reduction of 70 short-timers had taken place." [126]

The following table shows the total result of the mechanical improvements in the English cotton industry due to the American Civil War.

Number of Factories	**1857**	**1861**	**1868**
England and Wales	2,046	2,715	2,405
Scotland	152	163	131
Ireland	12	9	13
United Kingdom	2,210	2,887	2,549
Number of Power Looms	**1857**	**1861**	**1868**
England and Wales	275,590	368,125	344,719
Scotland	21,624	30,110	31,864
Ireland	1,633	1,757	2,746
United Kingdom	298,847	399,992	379,329
Number of Spindles	**1857**	**1861**	**1868**
England and Wales	25,818,576	28,352,125	30,478,228
Scotland	2,041,129	1,915,398	1,397,546
Ireland	150,512	119,944	124,240
United Kingdom	28,010,217	30,387,467	32,000,014
Number of Persons Employed	**1857**	**1861**	**1868**
England and Wales	341,170	407,598	357,052
Scotland	34,698	41,237	39,809
Ireland	3,345	2,734	4,203
United Kingdom	379,213	452,569	401,064

Hence, between 1861 and 1868, 338 cotton factories disappeared, in other words more productive machinery on a larger scale was concentrated in the hands of a smaller number of capitalists. The number of power-looms decreased by 20,663; but since their product increased in the same period, an improved loom must have yielded more than an old one. Lastly the number of spindles increased by 1,612,541, while the number of operatives decreased by 50,505. The "temporary" misery inflicted on the workpeople by the cotton-crisis, was heightened, and from being temporary made permanent, by the rapid and persistent progress of machinery.

But machinery not only acts as a competitor who gets the better of the workman, and is constantly on the point of making him superfluous. It is also a power inimical to him, and as such capital proclaims it from the roof tops and as such makes use of it. It is the most powerful weapon for repressing strikes, those periodical revolts of the working-class against the autocracy of capital.[127] According to Gaskell, the steam-engine was from the very first an antagonist of human power, an antagonist that enabled the capitalist to tread under foot the growing claims of the workmen, who threatened the newly born factory system with a crisis.[128] It would be possible to write quite a history of the inventions, made since 1830, for the sole purpose of supplying capital with weapons against the revolts of the working-class. At the head

of these in importance, stands the self-acting mule, because it opened up a new epoch in the automatic system.[129]

Nasmyth, the inventor of the steam-hammer, gives the following evidence before the Trades' Union Commission, with regard to the improvements made by him in machinery and introduced in consequence of the wide-spread and long strikes of the engineers in 1851.

> "The characteristic feature of our modern mechanical improvements, is the introduction of self-acting tool machinery. What every mechanical workman has now to do, and what every boy can do, is not to work himself but to superintend the beautiful labour of the machine. The whole class of workmen that depend exclusively on their skill, is now done away with. Formerly, I employed four boys to every mechanic. Thanks to these new mechanical combinations, I have reduced the number of grown-up men from 1,500 to 750. The result was a considerable increase in my profits."

Ure says of a machine used in calico printing:

> "At length capitalists sought deliverance from this intolerable bondage" [namely the, in their eyes, burdensome terms of their contracts with the workmen] "in the resources of science, and were speedily re-instated in their legitimate rule, that of the head over the inferior members."

Speaking of an invention for dressing warps:

> "Then the combined malcontents, who fancied themselves impregnably entrenched behind the old lines of division of labour, found their flanks turned and their defences rendered useless by the new mechanical tactics, and were obliged to surrender at discretion."

With regard to the invention of the self-acting mule, he says:

> "A creation destined to restore order among the industrious classes.... This invention confirms the great doctrine already propounded, that when capital enlists science into her service, the refractory hand of labour will always be taught docility."[130]

Although Ure's work appeared 30 years ago, at a time when the factory system was comparatively but little developed, it still perfectly expresses the spirit of the factory, not only by its undisguised cynicism, but also by the naïveté with which it blurts out the stupid contradictions of the capitalist brain. For instance, after propounding the "doctrine" stated above, that capital, with the aid of science taken into its pay, always reduces the refractory hand of labour to docility, he grows indignant because

> "it (physico-mechanical science) has been accused of lending itself to the rich capitalist as an instrument for harassing the poor."

After preaching a long sermon to show how advantageous the rapid development of machinery is to the working-classes, he warns them, that by their obstinacy and their strikes they hasten that development.

> "Violent revulsions of this nature," he says, "display short-sighted man in the contemptible character of a self-tormentor."

A few pages before he states the contrary.

> "Had it not been for the violent collisions and interruptions resulting from erroneous views among the factory operatives, the factory system would have been developed still more rapidly and beneficially for all concerned." Then he exclaims again: "Fortunately for the state of society in the cotton districts of Great Britain, the improvements in machinery are gradual." "It" (improvement in machinery) "is said to lower the rate of earnings of adults by displacing a portion of them, and thus rendering their number superabundant as compared with the demand for their labour. It certainly augments the demand for the labour of children and increases the rate of *their* wages."

On the other hand, this same dispenser of consolation defends the lowness of the children's wages on the ground that it prevents parents from sending their children at too early an age into the factory. The whole of his book is a vindication of a working-day of unrestricted length; that Parliament should forbid children of 13 years to be exhausted by working 12 hours a day, reminds his liberal soul of the darkest days of the Middle Ages. This does not prevent him from calling upon the factory operatives to thank Providence, who by means of machinery has given them the leisure to think of their "immortal interests." [131]

SECTION 6.

THE THEORY OF COMPENSATION AS REGARDS THE WORKPEOPLE DISPLACED BY MACHINERY

James Mill, MacCulloch, Torrens, Senior, John Stuart Mill, and a whole series besides, of bourgeois political economists, insist that all machinery that displaces workmen, simultaneously and necessarily sets free an amount of capital adequate to employ the same identical workmen. [132]

Suppose a capitalist to employ 100 workmen, at £30 a year each, in a carpet factory. The variable capital annually laid out amounts, therefore, to £3,000. Suppose, also, that he discharges 50 of his workmen, and employs the remaining 50 with machinery that costs him £1,500. To simplify matters, we take no account of buildings, coal, &c. Further suppose that the raw material annually consumed costs £3,000, both before and after the change. [133] Is any capital set free by this metamorphosis? Before the change, the total sum of £6,000 consisted half of constant, and half of variable capital. After the change it consists of £4,500 constant (£3,000 raw material and £1,500 machinery), and £1,500 variable capital. The variable capital, instead of being one half, is only one quarter, of the total capital. Instead of being set free, a part of the capital is here locked up in such a way as to cease to be exchanged against labour-power: variable has been changed into constant capital. Other things remaining unchanged, the capital of £6,000, can, in future, employ no more than 50 men. With each improvement in the machinery, it will employ fewer. If the newly introduced machinery had cost less than did the labour-power and implements displaced by it, if, for instance, instead of costing £1,500, it had cost only £1,000, a variable capital of £1,000 would have been converted into constant capital, and locked up; and a capital of £500 would have been set free. The latter sum, supposing wages unchanged, would form a fund sufficient to employ about 16 out of the 50 men discharged; nay, less than 16, for, in order to be employed as capital, a part of this £500 must now become constant capital, thus leaving only the remainder to be laid out in labour-power.

But, suppose, besides, that the making of the new machinery affords employment to a greater number of mechanics, can that be called compensation to the carpet-makers, thrown on the streets? At the best, its construction employs fewer men than its employment displaces. The sum of £1,500 that formerly represented the wages of the discharged carpet-makers, now represents in the shape of machinery: (1) the value of the means of production used in the construction of that machinery, (2) the wages of the mechanics employed in its construction, and (3) the surplus-value falling to the share of their “master.” Further, the machinery need not be renewed till it is worn out. Hence, in order to keep the increased number of mechanics in constant employment, one carpet manufacturer after another must displace workmen by machines.

As a matter of fact the apologists do not mean this sort of setting free.

They have in their minds the means of subsistence of the liberated work-people. It cannot be denied, in the above instance, that the machinery not only liberates 50 men, thus placing them at others’ disposal, but, at the same time, it withdraws from their consumption, and sets free, means of subsistence to the value of £1,500. The simple fact, by no means a new one, that machinery cuts off the workmen from their means of subsistence is, therefore, in economic parlance tantamount to this, that machinery liberates means of subsistence for the workman, or converts those means into capital for his employment. The mode of expression, you see, is everything. Nominibus mollire licet mala.

This theory implies that the £1,500 worth of means of subsistence was capital that was being expanded by the labour of the 50 men discharged. That, consequently, this capital falls out of employment so soon as they commence their forced holidays, and never rests till it has found a fresh investment, where it can again be productively consumed by these same 50 men. That sooner or later, therefore, the capital and the workmen must come together again, and that, then, the compensation is complete. That the sufferings of the workmen displaced by machinery are therefore as transient as are the riches of this world.

In relation to the discharged workmen, the £1,500 worth of means of subsistence never was capital. What really confronted them as capital, was the sum of £1,500, afterwards laid out in machinery. On looking closer it will be seen that this sum represented part of the carpets produced in a year by the 50 discharged men, which part they received as wages from their employer in money instead of in kind. With

the carpets in the form of money, they bought means of subsistence to the value of £1,500. These means, therefore, were to them, not capital, but commodities, and they, as regards these commodities, were not wage-labourers, but buyers. The circumstance that they were "freed" by the machinery, from the means of purchase, changed them from buyers into non-buyers. Hence a lessened demand for those commodities — voilà tout. If this diminution be not compensated by an increase from some other quarter, the market price of the commodities falls. If this state of things lasts for some time, and extends, there follows a discharge of workmen employed in the production of these commodities. Some of the capital that was previously devoted to production of necessary means of subsistence, has to become reproduced in another form. While prices fall, and capital is being displaced, the labourers employed in the production of necessary means of subsistence are in their turn "freed" from a part of their wages. Instead, therefore, of proving that, when machinery frees the workman from his means of subsistence, it simultaneously converts those means into capital for his further employment, our apologists, with their cut-and-dried law of supply and demand, prove, on the contrary, that machinery throws workmen on the streets, not only in that branch of production in which it is introduced, but also in those branches in which it is not introduced.

The real facts, which are travestied by the optimism of economists, are as follows: The labourers, when driven out of the workshop by the machinery, are thrown upon the labour market, and there add to the number of workmen at the disposal of the capitalists. In Part VII of this book it will be seen that this effect of machinery, which, as we have seen, is represented to be a compensation to the working class, is on the contrary a most frightful scourge. For the present I will only say this: The labourers that are thrown out of work in any branch of industry, can no doubt seek for employment in some other branch. If they find it, and thus renew the bond between them and the means of subsistence, this takes place only by the intermediary of a new and additional capital that is seeking investment; not at all by the intermediary of the capital that formerly employed them and was afterwards converted into machinery. And even should they find employment, what a poor look-out is theirs! Crippled as they are by division of labour, these poor devils are worth so little outside their old trade, that they cannot find admission into any industries, except a few of inferior kind, that are over-supplied with underpaid workmen. [134] Further, every branch of industry attracts each year a new stream of men, who furnish a contingent from which to fill up vacancies, and to draw a supply for expansion. So soon as machinery sets free a part of the workmen employed in a given branch of industry, the reserve men are also diverted into new channels of employment, and become absorbed in other branches; meanwhile the original victims, during the period of transition, for the most part starve and perish.

It is an undoubted fact that machinery, as such, is not responsible for "setting free" the workman from the means of subsistence. It cheapens and increases production in that branch which it seizes on, and at first makes no change in the mass of the means of subsistence produced in other branches. Hence, after its introduction, the society possesses as much, if not more, of the necessaries of life than before, for the labourers thrown out of work; and that quite apart from the enormous share of the annual produce wasted by the non-workers. And this is the point relied on by our apologists! The contradictions and antagonisms inseparable from the capitalist employment of machinery, do not exist, they say, since they do not arise out of machinery, as such, but out of its capitalist employment! Since therefore machinery, considered alone, shortens the hours of labour, but, when in the service of capital, lengthens them; since in itself it lightens labour, but when employed by capital, heightens the intensity of labour; since in itself it is a victory of man over the forces of Nature, but in the hands of capital, makes man the slave of those forces; since in itself it increases the wealth of the producers, but in the hands of capital, makes them paupers – for all these reasons and others besides, says the bourgeois economist without more ado, it is clear as noon-day that all these contradictions are a mere semblance of the reality, and that, as a matter of fact, they have neither an actual nor a theoretical existence. Thus he saves himself from all further puzzling of the brain, and what is more, implicitly declares his opponent to be stupid enough to contend against, not the capitalistic employment of machinery, but machinery itself.

No doubt he is far from denying that temporary inconvenience may result from the capitalist use of machinery. But where is the medal without its reverse! Any employment of machinery, except by capital, is to him an impossibility. Exploitation of the workman by the machine is therefore, with him, identical with exploitation of the machine by the workman. Whoever, therefore, exposes the real state of things in the capitalistic employment of machinery, is against its employment in any way, and is an enemy of social

progress! [135] Exactly the reasoning of the celebrated Bill Sykes. “Gentlemen of the jury, no doubt the throat of this commercial traveller has been cut. But that is not my fault, it is the fault of the knife. Must we, for such a temporary inconvenience, abolish the use of the knife? Only consider! where would agriculture and trade be without the knife? Is it not as salutary in surgery, as it is knowing in anatomy? And in addition a willing help at the festive board? If you abolish the knife — you hurl us back into the depths of barbarism.” [136]

Although machinery necessarily throws men out of work in those industries into which it is introduced, yet it may, notwithstanding this, bring about an increase of employment in other industries. This effect, however, has nothing in common with the so-called theory of compensation. Since every article produced by a machine is cheaper than a similar article produced by hand, we deduce the following infallible law: If the total quantity of the article produced by machinery, be equal to the total quantity of the article previously produced by a handicraft or by manufacture, and now made by machinery, then the total labour expended is diminished. The new labour spent on the instruments of labour, on the machinery, on the coal, and so on, must necessarily be less than the labour displaced by the use of the machinery; otherwise the product of the machine would be as dear, or dearer, than the product of the manual labour. But, as a matter of fact, the total quantity of the article produced by machinery with a diminished number of workmen, instead of remaining equal to, by far exceeds the total quantity of the hand-made article that has been displaced. Suppose that 400,000 yards of cloth have been produced on power-looms by fewer weavers than could weave 100,000 yards by hand. In the quadrupled product there lies four times as much raw material. Hence the production of raw material must be quadrupled. But as regards the instruments of labour, such as buildings, coal, machinery, and so on, it is different; the limit up to which the additional labour required for their production can increase, varies with the difference between the quantity of the machine-made article, and the quantity of the same article that the same number of workmen could make by hand.

Hence, as the use of machinery extends in a given industry, the immediate effect is to increase production in the other industries that furnish the first with means of production. How far employment is thereby found for an increased number of men, depends, given the length of the working-day and the intensity of labour, on the composition of the capital employed, i.e., on the ratio of its constant to its variable component. This ratio, in its turn, varies considerably with the extent to which machinery has already seized on, or is then seizing on, those trades. The number of the men condemned to work in coal and metal mines increased enormously owing to the progress of the English factory system; but during the last few decades this increase of number has been less rapid, owing to the use of new machinery in mining. [137] A new type of workman springs into life along with the machine, namely, its maker. We have already learnt that machinery has possessed itself even of this branch of production on a scale that grows greater every day. [138] As to raw material, [139] there is not the least doubt that the rapid strides of cotton spinning, not only pushed on with tropical luxuriance the growth of cotton in the United States, and with it the African slave trade, but also made the breeding of slaves the chief business of the border slave-states. When, in 1790, the first census of slaves was taken in the United States, their number was 697,000; in 1861 it had nearly reached four millions. On the other hand, it is no less certain that the rise of the English woollen factories, together with the gradual conversion of arable land into sheep pasture, brought, about the superfluity of agricultural labourers that led to their being driven in masses into the towns. Ireland, having during the last twenty years reduced its population by nearly one half, is at this moment undergoing the process of still further reducing the number of its inhabitants, so as exactly to suit the requirements of its landlords and of the English woollen manufacturers.

When machinery is applied to any of the preliminary or intermediate stages through which the subject of labour has to pass on its way to completion, there is an increased yield of material in those stages, and simultaneously an increased demand for labour in the handicrafts or manufactures supplied by the produce of the machines. Spinning by machinery, for example, supplied yarn so cheaply and so abundantly that the hand-loom weavers were, at first, able to work full time without increased outlay. Their earnings accordingly rose. [140] Hence a flow of people into the cotton-weaving trade, till at length the 800,000 weavers, called into existence by the Jenny, the throstle and the mule, were overwhelmed by the power-loom. So also, owing to the abundance of clothing materials produced by machinery, the number of tailors,

seamstresses and needlewomen, went on increasing until the appearance of the sewing-machine.

In proportion as machinery, with the aid of a relatively small number of workpeople, increases the mass of raw materials, intermediate products, instruments of labour, &c., the working-up of these raw materials and intermediate products becomes split up into numberless branches; social production increases in diversity. The factory system carries the social division of labour immeasurably further than does manufacture, for it increases the productiveness of the industries it seizes upon, in a far higher degree.

The immediate result of machinery is to augment surplus-value and the mass of products in which surplus-value is embodied. And, as the substances consumed by the capitalists and their dependents become more plentiful, so too do these orders of society. Their growing wealth, and the relatively diminished number of workmen required to produce the necessaries of life beget, simultaneously with the rise of new and luxurious wants, the means of satisfying those wants. A larger portion of the produce of society is changed into surplus-produce, and a larger part of the surplus-produce is supplied for consumption in a multiplicity of refined shapes. In other words, the production of luxuries increases. [141] The refined and varied forms of the products are also due to new relations with the markets of the world, relations that are created by modern industry. Not only are greater quantities of foreign articles of luxury exchanged for home products, but a greater mass of foreign raw materials, ingredients, and intermediate products, are used as means of production in the home industries. Owing to these relations with the markets of the world, the demand for labour increases in the carrying trades, which split up into numerous varieties. [142]

The increase of the means of production and subsistence, accompanied by a relative diminution in the number of labourers, causes an increased demand for labour in making canals, docks, tunnels, bridges, and so on, works that can only bear fruit in the far future. Entirely new branches of production, creating new fields of labour, are also formed, as the direct result either of machinery or of the general industrial changes brought about by it. But the place occupied by these branches in the general production is, even in the most developed countries, far from important. The number of labourers that find employment in them is directly proportional to the demand, created by those industries, for the crudest form of manual labour. The chief industries of this kind are, at present, gas-works, telegraphs, photography, steam navigation, and railways. According to the census of 1861 for England and Wales, we find in the gas industry (gas-works, production of mechanical apparatus, servants of the gas companies, &c), 15,211 persons; in telegraphy, 2,399; in photography, 2,366; steam navigation, 3,570; and in railways, 70,599, of whom the unskilled “navvies,” more or less permanently employed, and the whole administrative and commercial staff, make up about 28,000. The total number of persons, therefore, employed in these five new industries amounts to 94,145.

Lastly, the extraordinary productiveness of modern industry, accompanied as it is by both a more extensive and a more intense exploitation of labour-power in all other spheres of production, allows of the unproductive employment of a larger and larger part of the working-class, and the consequent reproduction, on a constantly extending scale, of the ancient domestic slaves under the name of a servant class, including men-servants, women-servants, lackeys, &c. According to the census of 1861, the population of England and Wales was 20,066,244; of these, 9,776,259 males, and 10,289,965 females. If we deduct from this population all who are too old or too young for work, all unproductive women, young persons and children, the “ideological” classes, such as government officials, priests, lawyers, soldiers, &c.; further, all who have no occupation but to consume the labour of others in the form of rent, interest, &c.; and, lastly, paupers, vagabonds, and criminals, there remain in round numbers eight millions of the two sexes of every age, including in that number every capitalist who is in any way engaged in industry, commerce, or finance. Among these 8 millions are:

	PERSONS
Agricultural labourers (including shepherds, farm servants, and maidservants living in the houses of farmers)	1,098,261
All who are employed in cotton, woollen, worsted, flax, hemp, silk, and jute factories, in stocking making and lace making by machinery [143]	642,607

All who are employed in coal mines and metal mines		565,835
All who are employed in metal works (blastfurnaces, rolling mills, &c.), and metal manufactures of every kind	[144]	396,998
The servant class	[145]	1,208,648

All the persons employed in textile factories and in mines, taken together, number 1,208,442; those employed in textile factories and metal industries, taken together, number 1,039,605; in both cases less than the number of modern domestic slaves. What a splendid result of the capitalist exploitation of machinery!

SECTION 7

REPULSION AND ATTRACTION OF WORKPEOPLE BY THE FACTORY SYSTEM. CRISES IN THE COTTON TRADE

All political economists of any standing admit that the introduction of new machinery has a baneful effect on the workmen in the old handicrafts and manufactures with which this machinery at first competes. Almost all of them bemoan the slavery of the factory operative. And what is the great trump-card that they play? That machinery, after the horrors of the period of introduction and development have subsided, instead of diminishing, in the long run increases the number of the slaves of labour! Yes, Political Economy revels in the hideous theory, hideous to every "philanthropist" who believes in the eternal Nature-ordained necessity for capitalist production, that after a period of growth and transition, even its crowning success, the factory system based on machinery, grinds down more workpeople than on its first introduction it throws on the streets. [146]

It is true that in some cases, as we saw from instances of English worsted and silk factories, an extraordinary extension of the factory system may, at a certain stage of its development, be accompanied not only by a relative, but by an absolute decrease in the number of operatives employed. In the year 1860, when a special census of all the factories in the United Kingdom was taken by order of Parliament, the factories in those parts of Lancashire, Cheshire, and Yorkshire, included in the district of Mr. Baker, the factory inspector, numbered 652; 570 of these contained 85,622 power-looms, 6,819,146 spindles (exclusive of doubling spindles), employed 27,439 horse-power (steam), and 1,390 (water), and 94,119 persons. In the year 1865, the same factories contained, looms 95,163, spindles 7,025,031, had a steam-power of 28,925 horses, and a water-power of 1,445 horses, and employed 88,913 persons. Between 1860 and 1865, therefore, the increase in looms was 11%, in spindles 3%, and in engine-power 3%, while the number of persons employed decreased 5½%. [147] Between 1852 and 1862, considerable extension of the English woollen manufacture took place, while the number of hands employed in it remained almost stationary,

> "showing how greatly the introduction of new machines had superseded the labour of preceding periods." [148]

In certain cases, the increase in the number of hands employed is only apparent; that is, it is not due to the extension of the factories already established, but to the gradual annexation of connected trades; for instance, the increase in power-looms, and in the hands employed by them between 1838 and 1856, was, in the cotton trade, simply owing to the extension of this branch of industry; but in the other trades to the application of steam-power to the carpet-loom, to the ribbon-loom, and to the linen-loom, which previously had been worked by the power of men. [149] Hence the increase of the hands in these latter trades was merely a symptom of a diminution in the total number employed. Finally, we have considered this question entirely apart from the fact, that everywhere, except in the metal industries, young persons

(under 18), and women and children form the preponderating element in the class of factory hands.

Nevertheless, in spite of the mass of hands actually displaced and virtually replaced by machinery, we can understand how the factory operatives, through the building of more mills and the extension of old ones in a given industry, may become more numerous than the manufacturing workmen and handicraftsman that have been displaced. Suppose, for example, that in the old mode of production, a capital of £500 is employed weekly, two-fifths being constant and three-fifths variable capital, *i.e.*, £200 being laid out in means of production, and £300, say £1 per man, in labour-power. On the introduction of machinery the composition of this capital becomes altered. We will suppose it to consist of four-fifths constant and one-fifth variable, which means that only £100 is now laid out in labour-power. Consequently, two-thirds of the workmen are discharged. If now the business extends, and the total capital employed grows to £1,500 under unchanged conditions, the number of operatives employed will increase to 300, just as many as before the introduction of the machinery. If the capital further grows to £2,000, 400 men will be employed, or one-third more than under the old system. Their numbers have, in point of fact, increased by 100, but relatively, i.e., in proportion to the total capital advanced, they have diminished by 800, for the £2,000 capital would, in the old state of things, have employed 1,200 instead of 400 men. Hence, a relative decrease in the number of hands is consistent with an actual increase. We assumed above that while the total capital increases, its composition remains the same, because the conditions of production remain constant. But we have already seen that, with every advance in the use of machinery, the constant component of capital, that part which consists of machinery, raw material, &c., increases, while the variable component, the part laid out in labour-power, decreases. We also know that in no other system of production is improvement so continuous, and the composition of the capital employed so constantly changing as in the factory system. These changes are, however, continually interrupted by periods of rest, during which there is a mere quantitative extension of the factories on the existing technical basis. During such periods the operatives increase in number. Thus, in 1835, the total number of operatives in the cotton, woollen, worsted, flax, and silk factories of the United Kingdom was only 354,684; while in 1861 the number of the power-loom weavers alone (of both sexes and of all ages, from eight years upwards), amounted to 230,654. Certainly, this growth appears less important when we consider that in 1838 the hand-loom weavers with their families still numbered 800,000, [150] not to mention those thrown out of work in Asia, and on the Continent of Europe.

In the few remarks I have still to make on this point, I shall refer to some actually existing relations, the existence of which our theoretical investigation has not yet disclosed.

So long as, in a given branch of industry, the factory system extends itself at the expense of the old handicrafts or of manufacture, the result is as sure as is the result of an encounter between an army furnished with breach-loaders, and one armed with bows and arrows. This first period, during which machinery conquers its field of action, is of decisive importance owing to the extraordinary profits that it helps to produce. These profits not only form a source of accelerated accumulation, but also attract into the favoured sphere of production a large part of the additional social capital that is being constantly created, and is ever on the look-out for new investments. The special advantages of this first period of fast and furious activity are felt in every branch of production that machinery invades. So soon, however, as the factory system has gained a certain breadth of footing and a definite degree of maturity, and, especially, so soon as its technical basis, machinery, is itself produced by machinery; so soon as coal mining and iron mining, the metal industries, and the means of transport have been revolutionised; so soon, in short, as the general conditions requisite for production by the modern industrial system have been established, this mode of production acquires an elasticity, a capacity for sudden extension by leaps and bounds that finds no hindrance except in the supply of raw material and in the disposal of the produce. On the one hand, the immediate effect of machinery is to increase the supply of raw material in the same way, for example, as the cotton gin augmented the production of cotton. [151] On the other hand, the cheapness of the articles produced by machinery, and the improved means of transport and communication furnish the weapons for conquering foreign markets. By ruining handicraft production in other countries, machinery forcibly converts them into fields for the supply of its raw material. In this way East India was compelled to produce cotton, wool, hemp, jute, and indigo for Great Britain. [152] By constantly making a part of the hands “supernumerary,” modern industry, in all countries where it has taken root, gives a spur to emigration and to the colonisation of foreign lands, which are thereby converted into settlements for

growing the raw material of the mother country; just as Australia, for example, was converted into a colony for growing wool. [153] A new and international division of labour, a division suited to the requirements of the chief centres of modern industry springs up, and converts one part of the globe into a chiefly agricultural field of production, for supplying the other part which remains a chiefly industrial field. This revolution hangs together with radical changes in agriculture which we need not here further inquire into. [154]

On the motion of Mr. Gladstone, the House of Commons ordered, on the 17th February, 1867, a return of the total quantities of grain, corn, and flour, of all sorts, imported into, and exported from, the United Kingdom, between the years 1831 and 1866. I give below a summary of the result. The flour is given in quarters of corn. (See the Table on p. 426.)

QUINQUENNIAL PERIODS AND THE YEAR 1866								
ANNUAL AVERAGE	**1831-1835**	**1836-1840**	**1841-1845**	**1846-1850**	**1851-1855**	**1856-1860**	**1861-1865**	**1866**
Import	1,096,373	2,389,729	2,843,865	8,776,552	8,345,237	10,913,612	15,009,871	16,457,340
Export	225,263	251,770	139,056	155,461	307,491	341,150	302,754	216,218
Excess of import over export	871,110	2,137,959	2,704,809	8,621,091	8,037,746	10,572,462	14,707,117	16,241,122
POPULATION								
Yearly average in each period	24,621,107	25,929,507	27,262,569	27,797,598	27,572,923	28,391,544	29,381,460	29,935,404
Average quantity of corn etc,. in qrs., consumed annually per head over and above the home produce consumed	0.036	0.082	0.099	0.310	0.291	0.372	0.501	0.543

The enormous power, inherent in the factory system, of expanding by jumps, and the dependence of that system on the markets of the world, necessarily beget feverish production, followed by over-filling of the markets, whereupon contraction of the markets brings on crippling of production. The life of modern industry becomes a series of periods of moderate activity, prosperity, over-production, crisis and stagnation. The uncertainty and instability to which machinery subjects the employment, and consequently the conditions of existence, of the operatives become normal, owing to these periodic changes of the industrial cycle. Except in the periods of prosperity, there rages between the capitalists the most furious combat for the share of each in the markets. This share is directly proportional to the cheapness of the product. Besides the rivalry that this struggle begets in the application of improved machinery for replacing labour-power, and of new methods of production, there also comes a time in every industrial cycle, when a forcible reduction of wages beneath the value of labour-power, is attempted for the purpose of cheapening commodities. [156]

A necessary condition, therefore, to the growth of the number of factory hands, is a proportionally much more rapid growth of the amount of capital invested in mills. This growth, however, is conditioned by the ebb and flow of the industrial cycle. It is, besides, constantly interrupted by the technical progress that at

one time virtually supplies the place of new workmen, at another, actually displaces old ones. This qualitative change in mechanical industry continually discharges hands from the factory, or shuts its doors against the fresh stream of recruits, while the purely quantitative extension of the factories absorbs not only the men thrown out of work, but also fresh contingents. The workpeople are thus continually both repelled and attracted, hustled from pillar to post, while, at the same time, constant changes take place in the sex, age, and skill of the levies.

The lot of the factory operatives will be best depicted by taking a rapid survey of the course of the English cotton industry.

From 1770 to 1815 this trade was depressed or stagnant for 5 years only. During this period of 45 years the English manufacturers had a monopoly of machinery and of the markets of the world. From 1815 to 1821 depression; 1822 and 1823 prosperity; 1824 abolition of the laws against Trades' Unions, great extension of factories everywhere; 1825 crisis; 1826 great misery and riots among the factory operatives; 1827 slight improvement; 1828 great increase in power-looms, and in exports; 1829 exports, especially to India, surpass all former years; 1830 glutted markets, great distress; 1831 to 1833 continued depression, the monopoly of the trade with India and China withdrawn from the East India Company; 1834 great increase of factories and machinery, shortness of hands. The new poor law furthers the migration of agricultural labourers into the factory districts. The country districts swept of children. White slave trade; 1835 great prosperity, contemporaneous starvation of the hand-loom weavers; 1836 great prosperity; 1837 and 1838 depression and crisis; 1839 revival; 1840 great depression, riots, calling out of the military; 1841 and 1842 frightful suffering among the factory operatives; 1842 the manufacturers lock the hands out of the factories in order to enforce the repeal of the Corn Laws. The operatives stream in thousands into the towns of Lancashire and Yorkshire, are driven back by the military, and their leaders brought to trial at Lancaster; 1843 great misery; 1844 revival; 1845 great prosperity; 1846 continued improvement at first, then reaction. Repeal of the Corn Laws; 1847 crisis, general reduction of wages by 10 and more per cent. in honour of the "big loaf"; 1848 continued depression; Manchester under military protection; 1849 revival; 1850 prosperity; 1851 falling prices, low wages, frequent strikes; 1852 improvement begins, strikes continue, the manufacturers threaten to import foreign hands; 1853 increasing exports. Strike for 8 months, and great misery at Preston; 1854 prosperity, glutted markets; 1855 news of failures stream in from the United States, Canada, and the Eastern markets; 1856 great prosperity; 1857 crisis; 1858 improvement; 1859 great prosperity, increase in factories; 1860 Zenith of the English cotton trade, the Indian, Australian, and other markets so glutted with goods that even in 1863 they had not absorbed the whole lot; the French Treaty of Commerce, enormous growth of factories and machinery; 1861 prosperity continues for a time, reaction, the American Civil War, cotton famine: 1862 to 1863 complete collapse.

The history of the cotton famine is too characteristic to dispense with dwelling upon it for a moment. From the indications as to the condition of the markets of the world in 1860 and 1861, we see that the cotton famine came in the nick of time for the manufacturers, and was to some extent advantageous to them, a fact that was acknowledged in the reports of the Manchester Chamber of Commerce, proclaimed in Parliament by Palmerston and Derby, and confirmed by events. [157] No doubt, among the 2,887 cotton mills in the United Kingdom in 1861, there were many of small size. According to the report of Mr. A. Redgrave, out of the 2,109 mills included in his district, 392, or 19% employed less than ten horse-power each; 345, or 16% employed 10 H. P., and less than 20 H. P.; while 1,372 employed upwards of 20 H. P. [158] The majority of the small mills were weaving sheds, built during the period of prosperity after 1858, for the most part by speculators, of whom one supplied the yarn, another the machinery, a third the buildings, and were worked by men who had been overlookers, or by other persons of small means. These small manufacturers mostly went to the wall. The same fate would have overtaken them in the commercial crisis that was staved off only by the cotton famine. Although they formed one-third of the total number of manufacturers, yet their mills absorbed a much smaller part of the capital invested in the cotton trade. As to the extent of the stoppage, it appears from authentic estimates, that in October 1862, 60.3% of the spindles, and 58% of the looms were standing. This refers to the cotton trade as a whole, and, of course, requires considerable modification for individual districts. Only very few mills worked full time (60 hours a week), the remainder worked at intervals. Even in those few cases where full time was worked, and at the customary rate of piece-wage, the weekly wages of the operatives necessarily shrank, owing to good cotton being replaced by bad, Sea Island by Egyptian (in fine spinning mills), American and Egyptian by Surat,

and pure cotton by mixings of waste and Surat. The shorter fibre of the Surat cotton and its dirty condition, the greater fragility of the thread, the substitution of all sorts of heavy ingredients for flour in sizing the warps, all these lessened the speed of the machinery, or the number of the looms that could be superintended by one weaver, increased the labour caused by defects in the machinery, and reduced the piece-wage by reducing the mass of the product turned off. Where Surat cotton was used, the loss to the operatives when on full time, amounted to 20, 30, and more per cent. But besides this, the majority of the manufacturers reduced the rate of piece-wage by 5, 7½, and 10 per cent. We can therefore conceive the situation of those hands who were employed for only 3, 3½ or 4 days a week, or for only 6 hours a day. Even in 1863, after a comparative improvement had set in, the weekly wages of spinners and of weavers were 3s. 4d., 3s. 10d., 4s. 6d. and 5s. 1d. [159] Even in this miserable state of things, however, the inventive spirit of the master never stood still, but was exercised in making deductions from wages. These were to some extent inflicted as a penalty for defects in the finished article that were really due to his bad cotton and to his unsuitable machinery. Moreover, where the manufacturer owned the cottages of the workpeople, he paid himself his rents by deducting the amount from these miserable wages. Mr. Redgrave tells us of self-acting minders (operatives who manage a pair of self-acting mules)

> "earning at the end of a fortnight's full work 8s. 11d., and that from this sum was deducted the rent of the house, the manufacturer, however, returning half the rent as a gift. The minders took away the sum of 6s. 11d. In many places the self-acting minders ranged from 5s. to 9s. per week, and the weavers from 2s. to 6s. per week, during the latter part of 1862." [160]

Even when working short time the rent was frequently deducted from the wages of the operatives. [161] No wonder that in some parts of Lancashire a kind of famine fever broke out. But more characteristic than all this, was, the revolution that took place in the process of production at the expense of the workpeople. Experimenta in corpore vili, like those of anatomists on frogs, were formally made.

> "Although," says Mr. Redgrave, "I have given the actual earnings of the operatives in the several mills, it does not follow that they earn the same amount week by week. The operatives are subject to great fluctuation from the constant experimentalising of the manufacturers ... the earnings of the operatives rise and fall with the quality of the cotton mixings; sometimes they have been within 15 per cent. of former earnings, and then, in a week or two, they have fallen off from 50 to 60 per cent." [162]

These experiments were not made solely at the expense of the workman's means of subsistence. His five senses also had to pay the penalty.

> "The people who are employed in making up Surat cotton complain very much. They inform me, on opening the bales of cotton there is an intolerable smell, which causes sickness.... In the mixing, scribbling and carding rooms, the dust and dirt which are disengaged, irritate the air passages, and give rise to cough and difficulty of breathing. A disease of the skin, no doubt from the irritation of the dirt contained in the Surat cotton, also prevails.... The fibre being so short, a great amount of size, both animal and vegetable, is used.... Bronchitis is more prevalent owing to the dust. Inflammatory sore throat is common, from the same cause. Sickness and dyspepsia are produced by the frequent breaking of the weft, when the weaver sucks the weft through the eye of the shuttle." On the other hand, the substitutes for flour were a Fortunatus' purse to the manufacturers, by increasing the weight of the yarn. They caused "15 lbs. of raw material to weigh 26 lbs. after it was woven." [163]

In the Report of Inspectors of Factories for 30th April, 1864, we read as follows:

> "The trade is availing itself of this resource at present to an extent which is even discreditable. I have heard on good authority of a cloth weighing 8 lbs. which was made of 5 1/4 lbs. cotton and 2 3/4 lbs. size; and of another cloth weighing 5 1/4 lbs., of which 2 lbs. was size. These were ordinary export shirtings. In cloths of other descriptions, as much as 50 per cent. size is sometimes added; so that a manufacturer may, and does truly boast, that he is getting rich by selling cloth for less money per pound than he paid for the mere yarn of which they are composed." [164]

But the workpeople had to suffer, not only from the experiments of the manufacturers inside the mills, and of the municipalities outside, not only from reduced wages and absence of work, from want and from charity, and from the eulogistic speeches of lords and commons.

> "Unfortunate females who, in consequence of the cotton famine, were at its commencement thrown out of employment, and have thereby become outcasts of society; and now, though trade has revived, and work is plentiful, continue members of that unfortunate class, and are likely to continue so. There are also in the

borough more youthful prostitutes than I have known for the last 25 years." [165]

We find then, in the first 45 years of the English cotton trade, from 1770 to 1815, only 5 years of crisis and stagnation; but this was the period of monopoly. The second period from 1815 to 1863 counts, during its 48 years, only 20 years of revival and prosperity against 28 of depression and stagnation. Between 1815 and 1830 the competition with the continent of Europe and with the United States sets in. After 1833, the extension of the Asiatic markets is enforced by "destruction of the human race" (the wholesale extinction of Indian hand-loom weavers). After the repeal of the Corn Laws, from 1846 to 1863, there are 8 years of moderate activity and prosperity against 9 years of depression and stagnation. The condition of the adult male operatives, even during the years of prosperity, may be judged from the note subjoined. [166]

SECTION 8

REVOLUTION EFFECTED IN MANUFACTURE, HANDICRAFTS, AND DOMESTIC INDUSTRY BY MODERN INDUSTRY

A. Overthrow of Co-operation Based on Handicraft, and on the Division of Labour

We have seen how machinery does away with co-operation based on handicrafts, and with manufacture based on the division of handicraft labour. An example of the first sort is the mowing-machine; it replaces co-operation between mowers. A striking example of the second kind, is the needle-making machine. According to Adam Smith, 10 men, in his day, made in co-operation, over 48,000 needles a-day. On the other hand, a single needle-machine makes 145,000 in a working-day of 11 hours. One woman or one girl superintends four such machines, and so produces near upon 600,000 needles in a day, and upwards of 3,000,000 in a week. [167] A single machine, when it takes the place of co-operation or of manufacture, may itself serve as the basis of an industry of a handicraft character. Still, such a return to handicrafts is but a transition to the factory system, which, as a rule, makes its appearance so soon as the human muscles are replaced, for the purpose of driving the machines, by a mechanical motive power, such as steam or water. Here and there, but in any case only for a time, an industry may be carried on, on a small scale, by means of mechanical power. This is effected by hiring steam-power, as is done in some of the Birmingham trades, or by the use of small caloric-engines, as in some branches of weaving. [168] In the Coventry silk weaving industry the experiment of "cottage factories" was tried. In the centre of a square surrounded by rows of cottages, an engine-house was built and the engine connected by shafts with the looms in the cottages. In all cases the power was hired at so much per loom. The rent was payable weekly, whether the looms worked or not. Each cottage held from 2 to 6 looms; some belonged to the weaver, some were bought on credit, some were hired. The struggle between these cottage factories and the factory proper, lasted over 12 years. It ended with the complete ruin of the 300 cottage factories. [169] Wherever the nature of the process did not involve production on a large scale, the new industries that have sprung up in the last few decades, such as envelope making, steel-pen making, &c., have, as a general rule, first passed through the handicraft stage, and then the manufacturing stage, as short phases of transition to the factory stage. The transition is very difficult in those cases where the production of the article by manufacture consists, not of a series of graduated processes, but of a great number of disconnected ones. This circumstance formed a great hindrance to the establishment of steel-pen factories. Nevertheless, about 15 years ago, a machine was invented that automatically performed 6 separate operations at once. The first steel-pens were supplied by the handicraft system, in the year 1820, at £7 4s. the gross; in 1830 they-were supplied by manufacture at 8s., and today the factory system supplies them to the trade at from 2 to 6d. the gross. [170]

B. Reaction of the Factory System on Manufacture and Domestic Industries

Along with the development of the factory system and of the revolution in agriculture that accompanies it, production in all the other branches of industry not only extends, but alters its character. The principle, carried out in the factory system, of analysing the process of production into its constituent phases, and of solving the problems thus proposed by the application of mechanics, of chemistry, and of the whole range of the natural sciences, becomes the determining principle everywhere. Hence, machinery squeezes itself into the manufacturing industries first for one detail process, then for another. Thus the solid crystal of their organisation, based on the old division of labour, becomes dissolved, and makes way for constant changes. Independently of this, a radical change takes place in the composition of the collective labourer, a change of the persons working in combination. In contrast with the manufacturing period, the division of labour is thenceforth based, wherever possible, on the employment of women, of children of all ages, and of unskilled labourers, in one word, on cheap labour, as it is characteristically called in England. This is the case not only with all production on a large scale, whether employing machinery or not, but also with the so-called domestic industry, whether carried on in the houses of the workpeople or in small workshops. This modern so-called domestic industry has nothing, except the name, in common with the old-fashioned domestic industry, the existence of which pre-supposes independent urban handicrafts, independent peasant farming, and above all, a dwelling-house for the labourer and his family. That old-fashioned industry has now been converted into an outside department of the factory, the manufactory, or the warehouse. Besides the factory operatives, the manufacturing workmen and the handicraftsman, whom it concentrates in large masses at one spot, and directly commands, capital also sets in motion, by means, of invisible threads, another army; that of the workers in the domestic industries, who dwell in the large towns and are also scattered over the face of the country. An example: The shirt factory of Messrs. Tillie at Londonderry, which employs 1,000 operatives in the factory itself, and 9,000 people spread up and down the country and working in their own houses. [171]

The exploitation of cheap and immature labour-power is carried out in a more shameless manner in modern Manufacture than in the factory proper. This is because the technical foundation of the factory system, namely, the substitution of machines for muscular power, and the light character of the labour, is almost entirely absent in Manufacture, and at the same time women and over-young children are subjected, in a most unconscionable way, to the influence of poisonous or injurious substances. This exploitation is more shameless in the so-called domestic industry than in manufactures, and that because the power of resistance in the labourers decreases with their dissemination; because a whole series of plundering parasites insinuate themselves between the employer and the workman; because a domestic industry has always to compete either with the factory system, or with manufacturing in the same branch of production; because poverty robs the workman of the conditions most essential to his labour, of space, light and ventilation; because employment becomes more and more irregular; and, finally, because in these the last resorts of the masses made “redundant” by modern industry and Agriculture, competition for work attains its maximum. Economy in the means of production, first systematically carried out in the factory system, and there, from the very beginning, coincident with the most reckless squandering of labour-power, and robbery of the conditions normally requisite for labour — this economy now shows its antagonistic and murderous side more and more in a given branch of industry, the less the social productive power of labour and the technical basis for a combination of processes are developed in that branch.

C. Modern Manufacture

I now proceed, by a few examples, to illustrate the principles laid down above. As a matter of fact, the reader is already familiar with numerous instances given in the chapter on the working-day. In the hardware manufactures of Birmingham and the neighbourhood, there are employed, mostly in very heavy work, 30,000 children and young persons, besides 10,000 women. There they are to be seen in the unwholesome brass-foundries, button factories, enamelling, galvanising, and lackering works. [172] Owing to the excessive labour of their workpeople, both adult and non-adult, certain London houses where

newspapers and books are printed, have got the ill-omened name of "slaughterhouses." [173] Similar excesses are practised in book-binding, where the victims are chiefly women, girls, and children; young persons have to do heavy work in rope-walks and night-work in salt mines, candle manufactories, and chemical works; young people are worked to death at turning the looms in silk weaving, when it is not carried on by machinery. [174] One of the most shameful, the most dirty, and the worst paid kinds of labour, and one on which women and young girls are by preference employed, is the sorting of rags. It is well known that Great Britain, apart from its own immense store of rags, is the emporium for the rag trade of the whole world. They flow in from Japan, from the most remote States of South America, and from the Canary Islands. But the chief sources of their supply are Germany, France, Russia, Italy, Egypt, Turkey, Belgium, and Holland. They are used for manure, for making bedflocks, for shoddy, and they serve as the raw material of paper. The rag-sorters are the medium for the spread of small-pox and other infectious diseases, and they themselves are the first victims. [175] A classical example of over-work, of hard and inappropriate labour, and of its brutalising effects on the workman from his childhood upwards, is afforded not only by coal-mining and miners generally, but also by tile and brick making, in which industry the recently invented machinery is, in England, used only here and there. Between May and September the work lasts from 5 in the morning till 8 in the evening, and where the drying is done in the open air, it often lasts from 4 in the morning till 9 in the evening. Work from 5 in the morning till 7 in the evening is considered "reduced" and "moderate." Both boys and girls of 6 and even of 4 years of age are employed. They work for the same number of hours, often longer, than the adults. The work is hard and the summer heat increases the exhaustion. In a certain tile-field at Mosley, e.g., a young woman, 24 years of age, was in the habit of making 2,000 tiles a day, with the assistance of 2 little girls, who carried the clay for her, and stacked the tiles. These girls carried daily 10 tons up the slippery sides of the clay pits, from a depth of 30 feet, and then for a distance of 210 feet.

> "It is impossible for a child to pass through the purgatory of a tile-field without great moral degradation... the low language, which they are accustomed to hear from their tenderest years, the filthy, indecent, and shameless habits, amidst which, unknowing, and half wild, they grow up, make them in after-life lawless, abandoned, dissolute.... A frightful source of demoralisation is the mode of living. Each moulder, who is always a skilled labourer, and the chief of a group, supplies his 7 subordinates with board and lodging in his cottage. Whether members of his family or not, the men, boys, and girls all sleep in the cottage, which contains generally two, exceptionally 3 rooms, all on the ground floor, and badly ventilated. These people are so exhausted after the day's hard work, that neither the rules of health, of cleanliness, nor of decency are in the least observed. Many of these cottages are models of untidiness, dirt, and dust.... The greatest evil of the system that employs young girls on this sort of work, consists in this, that, as a rule, it chains them fast from childhood for the whole of their after-life to the most abandoned rabble. They become rough, foul-mouthed boys, before Nature has taught them that they are women. Clothed in a few dirty rags, the legs naked far above the knees, hair and face besmeared with dirt, they learn to treat all feelings of decency and of shame with contempt. During meal-times they lie at full length in the fields, or watch the boys bathing in a neighbouring canal. Their heavy day's work at length completed, they put on better clothes, and accompany the men to the public houses."

That excessive insobriety is prevalent from childhood upwards among the whole of this class, is only natural.

> "The worst is that the brickmakers despair of themselves. You might as well, said one of the better kind to a chaplain of Southallfield, try to raise and improve the devil as a brickie, sir!" [176]

As to the manner, in which capital effects an economy in the requisites of labour, in modern Manufacture (in which I include all workshops of larger size, except factories proper), official and most ample material bearing on it is to be found in the Public Health Reports IV. (1863) and VI. (1864). The description of the workshops, more especially those of the London printers and tailors, surpasses the most loathsome phantasies of our romance writers. The effect on the health of the workpeople is self-evident. Dr. Simon, the chief medical officer of the Privy Council and the official editor of the "Public Health Reports," says:

> "In my fourth Report (1863) I showed, how it is practically impossible for the workpeople to insist upon that which is their first sanitary right, viz., the right that, no matter what the work for which their employer brings them together, the labour, so far as it depends upon him, should be freed from all avoidably unwholesome conditions. I pointed out, that while the workpeople are practically incapable of doing

themselves this sanitary justice, they are unable to obtain any effective support from the paid administrations of the sanitary police.... The life of myriads of workmen and workwomen is now uselessly tortured and shortened by the never-ending physical suffering that their mere occupation begets." [177]

In illustration of the way in which the workrooms influence the state of health Dr. Simon gives the following table of mortality. [178]

Number of persons of all ages employed in the respective industries.	Industries compared as regards health.	Death-rate per 100,000 men in the respective industries between the stated ages		
		Age 25-35.	Age 35- 45.	Age 45-55.
958,265	Agriculture in England & Wales	743	805	1,145
22,301 men 12,379 women	London tailors	958	1,262	2,093
13,803	London printers	894	1,747	2,367

D. Modern Domestic Industry

I now come to the so-called domestic industry. In order to get an idea of the horrors of this sphere, in which capital conducts its exploitation in the background of modern mechanical industry, one must go to the apparently quite idyllic trade of nail-making, [179] carried on in a few remote villages of England. In this place, however, it will be enough to give a few examples from those branches of the lace-making and straw-plaiting industries that are not yet carried on by the aid of machinery, and that as yet do not compete with branches carried on in factories or in manufactories.

Of the 150,000 persons employed in England in the production of lace, about 10,000 fall under the authority of the Factory Act, 1861. Almost the whole of the remaining 140,000 are women, young persons, and children of both sexes, the male sex, however, being weakly represented. The state of health of this cheap material for exploitation will be seen from the following table, computed by Dr. Trueman, physician to the Nottingham General Dispensary. Out of 686 female patients who were lace-makers, most of them between the ages of 17 and 24, the number of consumptive ones were:

1852. — 1 in 45. **1857**. — 1 in 13.
1853. — 1 in 28. **1858**. — 1 in 15.
1854. — 1 in 17. **1859**. — 1 in 9.
1856. — 1 in 15. **1861**. — 1 in 8. [180]

This progress in the rate of consumption ought to suffice for the most optimist of progressists, and for the biggest hawker of lies among the Free-trade bagmen of Germany.

The Factory Act of 1861 regulates the actual making of the lace, so far as it is done by machinery, and this is the rule in England. The branches that we are now about to examine, solely with regard to those of the workpeople who work at home, and not those who work in manufactories or warehouses, fall into two divisions, viz. (1), finishing; (2), mending. The former gives the finishing touches to the machine-made lace, and includes numerous sub-divisions.

The lace finishing is done either in what are called "mistresses' houses," or by women in their own houses, with or without the help of their children. The women who keep the "mistresses' houses" are themselves poor. The workroom is in a private house. The mistresses take orders from manufacturers, or from warehousemen, and employ as many women, girls, and young children as the size of their rooms and the fluctuating demand of the business will allow. The number of the workwomen employed in these workrooms varies from 20 to 40 in some, and from 10 to 20 in others. The average age at which the children commence work is six years, but in many cases it is below five. The usual working-hours are from 8 in the morning till eight in the evening, with 1½ hours for meals, which are taken at irregular intervals, and often in the foul workrooms. When business is brisk, the labour frequently lasts from 8 or even 6

o'clock in the morning till 10, 11, or 12 o'clock at night. In English barracks the regulation space allotted to each soldier is 500-600 cubic feet, and in the military hospitals 1,200 cubic feet. But in those finishing sties there are but 67 to 100 cubic feet to each person. At the same time the oxygen of the air is consumed by gas-lights. In order to keep the lace clean, and although the floor is tiled or gagged, the children are often compelled, even in winter, to pull off their shoes.

> "It is not at all uncommon in Nottingham to find 14 to 20 children huddled together in a small room, of, perhaps, not more than 12 feet square, and employed for 15 hours out of the 24, at work that of itself is exhausting, from its weariness and monotony, and is besides carried on under every possible unwholesome condition.... Even the very youngest children work with a strained attention and a rapidity that is astonishing, hardly ever giving their fingers rest or glowering their motion. If a question be asked them, they never raise their eyes from their work from fear of losing a single moment."

The "long stick" is used by the mistresses as a stimulant more and more as the working hours are prolonged.

> "The children gradually tire and become as restless as birds towards the end of their long detention at an occupation that is monotonous, eye-straining, and exhausting from the uniformity in the posture of the body. Their work is like slavery." [181]

When women and their children work at home, which now-a-days means in a hired room, often in a garret, the state of things is, if possible, still worse. This sort of work is given out within a circle of 80 miles radius from Nottingham. On leaving the warehouses at 9 or 10 o'clock at night, the children are often given a bundle of lace to take home with them and finish. The Pharisee of a capitalist represented by one of his servants, accompanies this action, of course, with the unctuous phrase: "That's for mother," yet he knows well enough that the poor children must sit up and help. [182]

Pillow lace-making is chiefly carried on in England in two agricultural districts; one, the Honiton lace district, extending from 20 to 30 miles along the south coast of Devonshire, and including a few places in North Devon; the other comprising a great part of the counties of Buckingham, Bedford, and Northampton, and also the adjoining portions of Oxfordshire and Huntingdonshire. The cottages of the agricultural labourers are the places where the work is usually carried on. Many manufacturers employ upwards of 3,000 of these lace-makers, who are chiefly children and young persons of the female sex exclusively. The state of things described as incidental to lace finishing is here repeated, save that instead of the "mistresses' houses," we find what are called "lace-schools," kept by poor women in their cottages. From their fifth year and often earlier, until their twelfth or fifteenth year, the children work in these schools; during the first year the very young ones work from four to eight hours, and later on, from six in the morning till eight and ten o'clock at night.

> "The rooms are generally the ordinary living rooms of small cottages, the chimney stopped up to keep out draughts, the inmates kept warm by their own animal heat alone, and this frequently in winter. In other cases, these so-called school-rooms are like small store-rooms without fire-places.... The over-crowding in these dens and the consequent vitiation of the air are often extreme. Added to this is the injurious effect of drains, privies, decomposing substances, and other filth usual in the purlieus of the smaller cottages." With regard to space: "In one lace-school 18 girls and a mistress, 35 cubic feet to each person; in another, where the smell was unbearable, 18 persons and 24½ cubic feet per head. In this industry are to be found employed children of 2 and 2½ years." [183]

Where lace-making ends in the counties of Buckingham and Bedford, straw-plaiting begins, and extends over a large part of Hertfordshire and the westerly and northerly parts of Essex. In 1861, there were 40,043 persons employed in straw-plaiting and straw-hat making; of these 3,815 were males of all ages, the rest females, of whom 14,913, including about 7,000 children, were under 20 years of age. In the place of the lace-schools we find here the "straw-plait schools." The children commence their instruction in straw-plaiting generally in their 4th, often between their 3rd and 4th year. Education, of course, they get none. The children themselves call the elementary schools, "natural schools," to distinguish them from these blood-sucking institutions, in which they are kept at work simply to get through the task, generally 30 yards daily, prescribed by their half-starved mothers. These same mothers often make them work at home, after school is over, till 10, 11, and 12 o'clock at night. The straw cuts their mouths, with which they constantly moisten it, and their fingers. Dr. Ballard gives it as the general opinion of the whole body of medical officers in London, that 300 cubic feet is the minimum space proper for each person in a bedroom or workroom. But in the straw-plait schools space is more sparingly allotted than in the lace-schools, "12

2/3, 17, 18½ and below 22 cubic feet for each person."

> "The smaller of these numbers, says one of the commissioners, Mr. White, represents less space than the half of what a child would occupy if packed in a box measuring 3 feet in each direction."

Thus do the children enjoy life till the age of 12 or 14. The wretched half-starved parents think of nothing but getting as much as possible out of their children. The latter, as soon as they are grown up, do not care a farthing, and naturally so, for their parents, and leave them.

> "It is no wonder that ignorance and vice abound in a population so brought up.... Their morality is at the lowest ebb,... a great number of the women have illegitimate children, and that at such an immature age that even those most conversant with criminal statistics are astounded." [184]

And the native land of these model families is the pattern Christian country for Europe; so says at least Count Montalembert, certainly a competent authority on Christianity!

Wages in the above industries, miserable as they are (the maximum wages of a child in the straw-plait schools rising in rare cases to 3 shillings), are reduced far below their nominal amount by the prevalence of the truck system everywhere, but especially in the lace districts. [185]

E. Passage of Modern Manufacture, an Domestic Industry into Modern Mechanical Industry. The Hastening of This Revolution by the Application of the Factory Acts to those Industries

The cheapening of labour-power, by sheer abuse of the labour of women and children, by sheer robbery of every normal condition requisite for working and living, and by the sheer brutality of overwork and night-work, meets at last with natural obstacles that cannot be overstepped. So also, when based on these methods, do the cheapening of commodities and capitalist exploitation in general. So soon as this point is at last reached — and it takes many years — the hour has struck for the introduction of machinery, and for the thenceforth rapid conversion of the scattered domestic industries and also of manufactures into factory industries.

An example, on the most colossal scale, of this movement is afforded by the production of wearing apparel. This industry, according to the classification of the Children's Employment Commission, comprises straw-hat makers, ladies'-hat makers, cap-makers, tailors, milliners and dressmakers, shirt-makers, corset-makers, glove-makers, shoemakers, besides many minor branches, such as the making of neck-ties, collars, &c. In 1861, the number of females employed in these industries, in England and Wales, amounted to 586,299, of these 115,242 at the least were under 20, and 16,650. under 15 years of age. The number of these workwomen in the United Kingdom in 1861, was 750,334. The number of males employed in England and Wales, in hat-making, shoemaking, glove-making and tailoring was 437,969; of these 14,964 under 15 years, 89,285 between 15 and 20, and 333,117 over 20 years. Many of the smaller branches are not included in these figures. But take the figures as they stand; we then have for England and Wales alone, according to the census of 1861, a total of 1,024,277 persons, about as many as are absorbed by agriculture and cattle breeding. We begin to understand what becomes of the immense quantities of goods conjured up by the magic of machinery, and of the enormous masses of workpeople, which that machinery sets free.

The production of wearing apparel is carried on partly in manufactories in whose workrooms there is but a reproduction of that division of labour, the membra disjecta of which were found ready to hand; partly by small master-handicraftsmen; these, however, do not, as formerly, work for individual consumers, but for manufactories and warehouses, and to such an extent that often whole towns and stretches of country carry on certain branches, such as shoemaking, as a speciality; finally, on a very great scale by the so-called domestic workers, who form an external department of the manufactories, warehouses, and even of the workshops of the smaller masters. [186]

The raw material, &c., is supplied by mechanical industry, the mass of cheap human material (taillable à merci et miséricorde) is composed of the individuals "liberated" by mechanical industry and improved agriculture. The manufactures of this class owed their origin chiefly to the capitalist's need of having at hand an army ready equipped to meet any increase of demand. [187] These manufactures, nevertheless,

allowed the scattered handicrafts and domestic industries to continue to exist as a broad foundation. The great production of surplus-value in these branches of labour, and the progressive cheapening of their articles, were and are chiefly due to the minimum wages paid, no more than requisite for a miserable vegetation, and to the extension of working-time up to the maximum endurable by the human organism. It was in fact by the cheapness of the human sweat and the human blood, which were converted into commodities, that the markets were constantly being extended, and continue daily to be extended; more especially was this the case with England's colonial markets, where, besides, English tastes and habits prevail. At last the critical point was reached. The basis of the old method, sheer brutality in the exploitation of the workpeople, accompanied more or less by a systematic division of labour, no longer sufficed for the extending markets and for the still more rapidly extending competition of the capitalists. The hour struck for the advent of machinery. The decisively revolutionary machine, the machine which attacks in an equal degree the whole of the numberless branches of this sphere of production, dressmaking, tailoring, shoemaking, sewing, hat-making, and many others, is the sewing-machine.

Its immediate effect on the workpeople is like that of all machinery, which, since the rise of modern industry, has seized upon new branches of trade. Children of too tender an age are sent adrift. The wage of the machine hands rises compared with that of the house-workers, many of whom belong to the poorest of the poor. That of the better situated handicraftsman, with whom the machine competes, sinks. The new machine hands are exclusively girls and young women. With the help of mechanical force, they destroy the monopoly that male labour had of the heavier work, and they drive off from the lighter work numbers of old women and very young children. The overpowering competition crushes the weakest of the manual labourers. The fearful increase in death from starvation during the last 10 years in London runs parallel with the extension of machine sewing. [188] The new workwomen turn the machines by hand and foot, or by hand alone, sometimes sitting, sometimes standing, according to the weight, size, and special make of the machine, and expend a great deal of labour-power. Their occupation is unwholesome, owing to the long hours, although in most cases they are not so long as under the old system. Wherever the sewing-machine locates itself in narrow and already over-crowded workrooms, it adds to the unwholesome influences.

> "The effect," says Mr. Lord, "on entering low-ceiled workrooms in which 30 to 40 machine hands are working is unbearable.... The heat, partly due to the gas stoves used for warming the irons, is horrible.... Even when moderate hours of work, i.e., from 8 in the morning till 6 in the evening, prevail in such places, yet 3 or 4 persons fall into a swoon regularly every day." [189]

The revolution in the industrial methods which is the necessary result of the revolution in the instruments of production, is effected by a medley of transition forms. These forms vary according to the extent to which the sewing-machine has become prevalent in one branch, of industry or the other, to the time during which it has been in operation, to the previous condition of the workpeople, to the preponderance of manufacture, of handicrafts or of domestic industry, to the rent of the workrooms, [190] &c. In dressmaking, for instance, where the labour for the most part was already organised, chiefly by simple co-operation, the sewing-machine at first formed merely a new factor in that manufacturing industry. In tailoring, shirtmaking, shoemaking, &c., all the forms are intermingled. Here the factory system proper. There middlemen receive the raw material from the capitalist *en chef*, and group around their sewing-machines, in "chambers" and "garrets," from 10 to 50 or more workwomen. Finally, as is always the case with machinery when not organised into a system, and when it can also be used in dwarfish proportions, handicraftsman and domestic workers, along with their families, or with a little extra labour from without, make use of their own sewing-machines. [191] The system actually prevalent in England is, that the capitalist concentrates a large number of machines on his premises, and then distributes the produce of those machines for further manipulation amongst the domestic workers. [192] The variety of the transition forms, however, does not conceal the tendency to conversion into the factory system proper. This tendency is nurtured by the very nature of the sewing-machine, the manifold uses of which push on the concentration, under one roof, and one management, of previously separated branches of a trade. It is also favoured by the circumstance that preparatory needlework, and certain other operations, are most conveniently done on the premises where the machine is at work; as well as by the inevitable expropriation of the hand sewers, and of the domestic workers who work with their own machines. This fate has already in part overtaken them. The constantly increasing amount of capital

invested in sewing-machines, [193] gives the spur to the production of, and gluts the markets with, machine-made articles, thereby giving the signal to the domestic workers for the sale of their machines. The overproduction of sewing-machines themselves, causes their producers, in bad want of a sale, to let them out for so much a week, thus crushing by their deadly competition the small owners of machines. [194] Constant changes in the construction of the machines, and their ever-increasing cheapness, depreciate day by day the older makes, and allow of their being sold in great numbers, at absurd prices, to large capitalists, who alone can thus employ them at a profit. Finally, the substitution of the steam-engine for man gives in this, as in all similar revolutions, the finishing blow. At first, the use of steam power meets with mere technical difficulties, such as unsteadiness in the machines, difficulty in controlling their speed, rapid wear and tear of the lighter machines, &c., all of which are soon overcome by experience. [195] If, on the one hand, the concentration of many machines in large manufactories leads to the use of steam power, on the other hand, the competition of steam with human muscles hastens on the concentration of workpeople and machines in large factories. Thus England is at present experiencing, not only in the colossal industry of making wearing apparel, but in most of the other trades mentioned above, the conversion of manufacture, of handicrafts, and of domestic work into the factory system, after each of those forms of production, totally changed and disorganised under the influence of modern industry, has long ago reproduced, and even overdone, all the horrors of the factory system, without participating in any of the elements of social progress it contains. [196]

This industrial revolution which takes place spontaneously, is artificially helped on by the extension of the Factory Acts to all industries in which women, young persons and children are employed. The compulsory regulation of the working-day as regards its length, pauses, beginning and end, the system of relays of children, the exclusion of all children under a certain age, &c., necessitate on the one hand more machinery [197] and the substitution of steam as a motive power in the place of muscles. [198] On the other hand, in order to make up for the loss of time, an expansion occurs of the means of production used in common, of the furnaces, buildings, &c., in one word, greater concentration of the means of production and a correspondingly greater concourse of workpeople. The chief objection, repeatedly and passionately urged on behalf of each manufacture threatened with the Factory Act, is in fact this, that in order to continue the business on the old scale a greater outlay of capital will be necessary. But as regards labour in the so-called domestic industries and the intermediate forms between them and Manufacture, so soon as limits are put to the working-day and to the employment of children, those industries go to the wall. Unlimited exploitation of cheap labour-power is the sole foundation of their power to compete.

One of the essential conditions for the existence of the factory system, especially when the length of the working-day is fixed, is certainty in the result, i.e., the production in a given time of a given quantity of commodities, or of a given useful effect. The statutory pauses in the working-day, moreover, imply the assumption that periodical and sudden cessation of the work does no harm to the article undergoing the process of production. This certainty in the result, and this possibility of interrupting the work are, of course, easier to be attained in the purely mechanical industries than in those in which chemical and physical processes play a part; as, for instance, in the earthenware trade, in bleaching, dyeing, baking, and in most of the metal industries. Wherever there is a workingday without restriction as to length, wherever there is night-work and unrestricted waste of human life, there the slightest obstacle presented by the nature of the work to a change for the better is soon looked upon as an everlasting barrier erected by Nature. No poison kills vermin with more certainty than the Factory Act removes such everlasting barriers. No one made a greater outcry over “impossibilities” than our friends the earthenware manufacturers. In 1864, however, they were brought under the Act, and within sixteen months every “impossibility” had vanished.

> “The improved method,” called forth by the Act, “of making slip by pressure instead of by evaporation, the newly-constructed stoves for drying the ware in its green state, &c., are each events of great importance in the pottery art, and mark an advance which the preceding century could not rival.... It has even considerably reduced the temperature of the stoves themselves with a considerable saving of fuel, and with a readier effect on the ware.” [199]

In spite of every prophecy, the cost-price of earthenware did not rise, but the quantity produced did, and to such an extent that the export for the twelve months, ending December, 1865, exceeded in value by

£138,628 the average of the preceding three years. In the manufacture of matches it was thought to be an indispensable requirement, that boys, even while bolting their dinner, should go on dipping the matches in melted phosphorus, the poisonous vapour from which rose into their faces. The Factory Act (1864) made the saving of time a necessity, and so forced into existence a dipping machine, the vapour from which could not come in contact with the workers. [200] So, at the present time, in those branches of the lace manufacture not yet subject to the Factory Act, it is maintained that the meal-times cannot be regular owing to the different periods required by the various kinds of lace for drying, which periods vary from three minutes up to an hour and more. To this the Children's Employment Commissioners answer:

> "The circumstances of this case are precisely analogous to that of the paper-stainers, dealt with in our first report. Some of the principal manufacturers in the trade urged that in consequence of the nature of the materials used, and their various processes, they would be unable, without serious loss, to stop for meal-times at any given moment. But it was seen from the evidence that, by due care and previous arrangement, the apprehended difficulty would be got over; and accordingly, by clause 6 of section 6 of the Factory Acts Extension Act, passed during this Session of Parliament, an interval of eighteen months is given to them from the passing of the Act before they are required to conform to the meal hours, specified by the Factory Acts." [201]

Hardly had the Act been passed when our friends the manufacturers found out:

> "The inconveniences we expected to arise from the introduction of the Factory Acts into our branch of manufacture, I am happy to say, have not arisen. We do not find the production at all interfered with; in short, we produce more in the same time." [202]

It is evident that the English legislature, which certainly no one will venture to reproach with being overdosed with genius, has been led by experience to the conclusion that a simple compulsory law is sufficient to enact away all the so-called impediments, opposed by the nature of the process, to the restriction and regulation of the working-day. Hence, on the introduction of the Factory Act into a given industry, a period varying from six to eighteen months is fixed within which it is incumbent on the manufacturers to remove all technical impediments to the working of the Act. Mirabeau's "Impossible! ne me dites jamais ce bête de mot!" is particularly applicable to modern technology. But though the Factory Acts thus artificially ripen the material elements necessary for the conversion of the manufacturing system into the factory system, yet at the same time, owing to the necessity they impose for greater outlay of capital, they hasten on the decline of the small masters, and the concentration of capital. [203]

Besides the purely technical impediments that are removable by technical means, the irregular habits of the workpeople themselves obstruct the regulation of the hours of labour. This is especially the case where piece-wage predominates, and where loss of time in one part of the day or week can be made good by subsequent over-time, or by night-work, a process which brutalises the adult workman, and ruins his wife and children. [204] Although this absence of regularity in the expenditure of labour-power is a natural and rude reaction against the tedium of monotonous drudgery, it originates, also, to a much greater degree from anarchy in production, anarchy that in its turn pre-supposes unbridled exploitation of labour-power by the capitalist. Besides the general periodic changes of the industrial cycle, and the special fluctuations in the markets to which each industry is subject, we may also reckon what is called "the season," dependent either on the periodicity of favourable seasons of the year for navigation; or on fashion, and the sudden placing of large orders that have to be executed in the shortest possible time. The habit of giving such orders becomes more frequent with the extension of railways and telegraphs.

> "The extension of the railway system throughout the country has tended very much to encourage giving short notice. Purchasers now come up from Glasgow, Manchester, and Edinburgh once every fortnight or so to the wholesale city warehouses which we supply, and give small orders requiring immediate execution, instead of buying from stock as they used to do. Years ago we were always able to work in the slack times, so as to meet demand of the next season, but now no one can say beforehand what will be the demand then." [205]

In those factories and manufactories that are not yet subject to the Factory Acts, the most fearful over-work prevails periodically during what is called the season, in consequence of sudden orders. In the outside department of the factory, of the manufactory, and of the warehouse, the so-called domestic workers, whose employment is at the best irregular, are entirely dependent for their raw material and their orders on the caprice of the capitalist, who, in this industry, is not hampered by any regard for

depreciation of his buildings and machinery, and risks nothing by a stoppage of work, but the skin of the worker himself. Here then he sets himself systematically to work to form an industrial reserve force that shall be ready at a moment's notice; during one part of the year he decimates this force by the most inhuman toil, during the other part, he lets it starve for want of work.

> "The employers avail themselves of the habitual irregularity in the homework, when any extra work is wanted at a push, so that the work goes on till 11, and 12 p.m. or 2 a.m., or as the usual phrase is, "all hours," and that in localities where "the stench is enough to knock you down, you go to the door, perhaps, and open it, but shudder to go further." [206] "They are curious men," said one of the witnesses, a shoemaker, speaking of the masters, "they think it does a boy no harm to work too hard for half the year, if he is nearly idle for the other half." [207]

In the same way as technical impediments, so, too, those "usages which have grown with the growth of trade" were and still are proclaimed by interested capitalists as obstacles due to the nature of the work. This was a favourite cry of the cotton lords at the time they were first threatened with the Factory Acts. Although their industry more than any other depends on navigation, yet experience has given them the lie. Since then, every pretended obstruction to business has been treated by the Factory inspectors as a mere sham. [208] The thoroughly conscientious investigations of the Children's Employment Commission prove that the effect of the regulation of the hours of work, in some industries, was to spread the mass of labour previously employed more evenly over the whole year [208a] that this regulation was the first rational bridle on the murderous, meaningless caprices of fashion, [208b] caprices that consort so badly with the system of modern industry; that the development of ocean navigation and of the means of communication generally, has swept away the technical basis on which season-work was really supported, [209] and that all other so-called unconquerable difficulties vanish before larger buildings, additional machinery, increase in the number of workpeople employed, [210] and the alterations caused by all these in the mode of conducting the wholesale trade. [211] But for all that, capital never becomes reconciled to such changes — and this is admitted over and over again by its own representatives — except "under the pressure of a General Act of Parliament" [212] for the compulsory regulation of the hours of labour.

SECTION 9

THE FACTORY ACTS. SANITARY AND EDUCATIONAL CLAUSES OF THE SAME. THEIR GENERAL EXTENSION IN ENGLAND

Factory legislation, that first conscious and methodical reaction of society against the spontaneously developed form of the process of production, is, as we have seen, just as much the necessary product of modern industry as cotton yarn, self-actors, and the electric telegraph. Before passing to the consideration of the extension of that legislation in England, we shall shortly notice certain clauses contained in the Factory Acts, and not relating to the hours of work.

Apart from their wording, which makes it easy for the capitalist to evade them, the sanitary clauses are extremely meagre, and, in fact, limited to provisions for whitewashing the walls, for insuring cleanliness in some other matters, for ventilation, and for protection against dangerous machinery. In the third book we shall return again to the fanatical opposition of the masters to those clauses which imposed upon them a slight expenditure on appliances for protecting the limbs of their workpeople, an opposition that throws a fresh and glaring light on the Free-trade dogma, according to which, in a society with conflicting interests, each individual necessarily furthers the common weal by seeking nothing but his own personal advantage! One example is enough. The reader knows that during the last 20 years, the flax industry has very much extended, and that, with that extension, the number of scutching mills in Ireland has increased. In 1864 there were in that country 1,800 of these mills. Regularly in autumn and winter women and "young

persons," the wives, sons, and daughters of the neighbouring small farmers, a class of people totally unaccustomed to machinery, are taken from field labour to feed the rollers of the scutching mills with flax. The accidents, both as regards number and kind, are wholly unexampled in the history of machinery. In one scutching mill, at Kildinan, near Cork, there occurred between 1852 and 1856, six fatal accidents and sixty mutilations; every one of which might have been prevented by the simplest appliances, at the cost of a few shillings. Dr. W. White, the certifying surgeon for factories at Downpatrick, states in his official report, dated the 15th December, 1865:

> "The serious accidents at the scutching mills are of the most fearful nature. In many cases a quarter of the body is torn from the trunk, and either involves death, or a future of wretched incapacity and suffering. The increase of mills in the country will, of course, extend these dreadful results, and it will be a great boon if they are brought under the legislature. I am convinced that by proper supervision of scutching mills a vast sacrifice of life and limb would be averted." [213]

What could possibly show better the character of the capitalist mode of production, than the necessity that exists for forcing upon it, by Acts of Parliament, the simplest appliances for maintaining cleanliness and health? In the potteries the Factory Act of 1864 "has whitewashed and cleansed upwards of 200 workshops, after a period of abstinence from any such cleaning, in many cases of 20 years, and in some, entirely," (this is the "abstinence" of the capitalist!) "in which were employed 27,800 artisans, hitherto breathing through protracted days and often nights of labour, a mephitic atmosphere, and which rendered an otherwise comparatively innocuous occupation, pregnant with disease and death. The Act has improved the ventilation very much." [214]

At the same time, this portion of the Act strikingly shows that the capitalist mode of production, owing to its very nature, excludes all rational improvement beyond a certain point. It has been stated over and over again that the English doctors are unanimous in declaring that where the work is continuous, 500 cubic feet is the very least space that should be allowed for each person. Now, if the Factory Acts, owing to their compulsory provisions, indirectly hasten on the conversion of small workshops into factories, thus indirectly attacking the proprietary rights of the smaller capitalists, and assuring a monopoly to the great ones, so, if it were made obligatory to provide the proper space for each workman in every workshop, thousands of small employers would, at one full swoop, be expropriated directly! The very root of the capitalist mode of production, i.e., the self-expansion of all capital, large or small, by means of the "free" purchase and consumption of labour-power, would be attacked. Factory legislation is therefore brought to a deadlock before these 500 cubic feet of breathing space. The sanitary officers, the industrial inquiry commissioners, the factory inspectors, all harp, over and over again, upon the necessity for those 500 cubic feet, and upon the impossibility of wringing them out of capital. They thus, in fact, declare that consumption and other lung diseases among the workpeople are necessary conditions to the existence of capital. [215]

Paltry as the education clauses of the Act appear on the whole, yet they proclaim elementary education to be an indispensable condition to the employment of children. [216] The success of those clauses proved for the first time the possibility of combining education and gymnastics [217] with manual labour, and, consequently, of combining manual labour with education and gymnastics. The factory inspectors soon found out by questioning the schoolmasters, that the factory children, although receiving only one half the education of the regular day scholars, yet learnt quite as much and often more.

> "This can be accounted for by the simple fact that, with only being at school for one half of the day, they are always fresh, and nearly always ready and willing to receive instruction. The system on which they work, half manual labour, and half school, renders each employment a rest and a relief to the other; consequently, both are far more congenial to the child, than would be the case were he kept constantly at one. It is quite clear that a boy who has been at school all the morning, cannot (in hot weather particularly) cope with one who comes fresh and bright from his work." [218]

Further information on this point will be found in Senior's speech at the Social Science Congress at Edinburgh in 1863. He there shows, amongst other things, how the monotonous and uselessly long school hours of the children of the upper and middle classes, uselessly add to the labour of the teacher, "while he not only fruitlessly but absolutely injuriously, wastes the time, health, and energy of the children." [219] From the Factory system budded, as Robert Owen has shown us in detail, the germ of the education of the

future, an education that will, in the case of every child over a given age, combine productive labour with instruction and gymnastics, not only as one of the methods of adding to the efficiency of production, but as the only method of producing fully developed human beings.

Modern industry, as we have seen, sweeps away by technical means the manufacturing division of labour, under which each man is bound hand and foot for life to a single detail-operation. At the same time, the capitalistic form of that industry reproduces this same division of labour in a still more monstrous shape; in the factory proper, by converting the workman into a living appendage of the machine; and everywhere outside the Factory, partly by the sporadic use of machinery and machine workers, [220] partly by re-establishing the division of labour on a fresh basis by the general introduction of the labour of women and children, and of cheap unskilled labour.

The antagonism between the manufacturing division of labour and the methods of modern industry makes itself forcibly felt. It manifests itself, amongst other ways, in the frightful fact that a great part of the children employed in modern factories and manufactures, are from their earliest years riveted to the most simple manipulations, and exploited for years, without being taught a single sort of work that would afterwards make them of use, even in the same manufactory or factory. In the English letter-press printing trade, for example, there existed formerly a system, corresponding to that in the old manufactures and handicrafts, of advancing the apprentices from easy to more and more difficult work. They went through a course of teaching till they were finished printers. To be able to read and write was for every one of them a requirement of their trade. All this was changed by the printing machine. It employs two sorts of labourers, one grown up, renters, the other, boys mostly from 11 to 17 years of age whose sole business is either to spread the sheets of paper under the machine, or to take from it the printed sheets. They perform this weary task, in London especially, for 14, 15, and 16 hours at a stretch, during several days in the week, and frequently for 36 hours, with only 2 hours' rest for meals and sleep. [221] A great part of them cannot read, and they are, as a rule, utter savages and very extraordinary creatures.

> "To qualify them for the work which they have to do, they require no intellectual training; there is little room in it for skill, and less for judgment; their wages, though rather high for boys, do not increase proportionately as they grow up, and the majority of them cannot look for advancement to the better paid and more responsible post of machine minder, because while each machine has but one minder, it has at least two, and often four boys attached to it." [222]

As soon as they get too old for such child's work, that is about 17 at the latest, they are discharged from the printing establishments. They become recruits of crime. Several attempts to procure them employment elsewhere, were rendered of no avail by their ignorance and brutality, and by their mental and bodily degradation.

As with the division of labour in the interior of the manufacturing workshops, so it is with the division of labour in the interior of society. So long as handicraft and manufacture form the general groundwork of social production, the subjection of the producer to one branch exclusively, the breaking up of the multifariousness of his employment, [223] is a necessary step in the development. On that groundwork each separate branch of production acquires empirically the form that is technically suited to it, slowly perfects it, and, so soon as a given degree of maturity has been reached, rapidly crystallises that form. The only thing, that here and there causes a change, besides new raw material supplied by commerce, is the gradual alteration of the instruments of labour. But their form, too, once definitely settled by experience, petrifies, as is proved by their being in many cases handed down in the same form by one generation to another during thousands of years. A characteristic feature is, that, even down into the eighteenth century, the different trades were called "mysteries" (mystères); [224] into their secrets none but those duly initiated could penetrate. modern industry rent the veil that concealed from men their own social process of production, and that turned the various, spontaneously divided branches of production into so many riddles, not only to outsiders, but even to the initiated. The principle which it pursued, of resolving each process into its constituent movements, without any regard to their possible execution by the hand of man, created the new modern science of technology. The varied, apparently unconnected, and petrified forms of the industrial processes now resolved themselves into so many conscious and systematic applications of natural science to the attainment of given useful effects. Technology also discovered the few main fundamental forms of motion, which, despite the diversity of the instruments used, are necessarily taken

by every productive action of the human body; just as the science of mechanics sees in the most complicated machinery nothing but the continual repetition of the simple mechanical powers.

Modern industry never looks upon and treats the existing form of a process as final. The technical basis of that industry is therefore revolutionary, while all earlier modes of production were essentially conservative. [225] By means of machinery, chemical processes and other methods, it is continually causing changes not only in the technical basis of production, but also in the functions of the labourer, and in the social combinations of the labour-process. At the same time, it thereby also revolutionises the division of labour within the society, and incessantly launches masses of capital and of workpeople from one branch of production to another. But if modern industry, by its very nature, therefore necessitates variation of labour, fluency of function, universal mobility of the labourer, on the other hand, in its capitalistic form, it reproduces the old division of labour with its ossified particularisations. We have seen how this absolute contradiction between the technical necessities of modern industry, and the social character inherent in its capitalistic form, dispels all fixity and security in the situation of the labourer; how it constantly threatens, by taking away the instruments of labour, to snatch from his hands his means of subsistence, [226] and, by suppressing his detail-function, to make him superfluous, we have seen, too, how this antagonism vents its rage in the creation of that monstrosity, an industrial reserve army, kept in misery in order to be always at the disposal of capital; in the incessant human sacrifices from among the working-class, in the most reckless squandering of labour-power and in the devastation caused by a social anarchy which turns every economic progress into a social calamity. This is the negative side. But if, on the one hand, variation of work at present imposes itself after the manner of an overpowering natural law, and with the blindly destructive action of a natural law that meets with resistance [227] at all points, modern industry, on the other hand, through its catastrophes imposes the necessity of recognising, as a fundamental law of production, variation of work, consequently fitness of the labourer for varied work, consequently the greatest possible development of his varied aptitudes. It becomes a question of life and death for society to adapt the mode of production to the normal functioning of this law. Modern Industry, indeed, compels society, under penalty of death, to replace the detail-worker of to-day, grappled by life-long repetition of one and the same trivial operation, and thus reduced to the mere fragment of a man, by the fully developed individual, fit for a variety of labours, ready to face any change of production, and to whom the different social functions he performs, are but so many modes of giving free scope to his own natural and acquired powers.

One step already spontaneously taken towards effecting this revolution is the establishment of technical and agricultural schools, and of “écoles d’enseignement professionnel,” in which the children of the working-men receive some little instruction in technology and in the practical handling of the various implements of labour. Though the Factory Act, that first and meagre concession wrung from capital, is limited to combining elementary education with work in the factory, there can be no doubt that when the working-class comes into power, as inevitably it must, technical instruction, both theoretical and practical, will take its proper place in the working-class schools. There is also no doubt that such revolutionary ferments, the final result of which is the abolition of the old division of labour, are diametrically opposed to the capitalistic form of production, and to the economic status of the labourer corresponding to that form. But the historical development of the antagonisms, immanent in a given form of production, is the only way in which that form of production can be dissolved and a new form established. “Ne sutor ultra crepidam” — this nec plus ultra of handicraft wisdom became sheer nonsense, from the moment the watchmaker Watt invented the steam-engine, the barber Arkwright, the throstle, and the working-jeweller, Fulton, the steamship. [228]

So long as Factory legislation is confined to regulating the labour in factories, manufactories, &c., it is regarded as a mere interference with the exploiting rights of capital. But when it comes to regulating the so-called “home-labour,” [229] it is immediately viewed as a direct attack on the patria potestas, on parental authority. The tender-hearted English Parliament long affected to shrink from taking this step. The force of facts, however, compelled it at last to acknowledge that modern industry, in overturning the economic foundation on which was based the traditional family, and the family labour corresponding to it, had also unloosened all traditional family ties. The rights of the children had to be proclaimed. The final report of the Ch. Empl. Comm. of 1866, states:

> "It is unhappily, to a painful degree, apparent throughout the whole of the evidence, that against no persons do the children of both sexes so much require protection as against their parents." The system of unlimited exploitation of children's labour in general and the so-called home-labour in particular is "maintained only because the parents are able, without check or control, to exercise this arbitrary and mischievous power over their young and tender offspring.... Parents must not possess the absolute power of making their children mere 'machines to earn so much weekly wage....' The children and young persons, therefore, in all such cases may justifiably claim from the legislature, as a natural right, that an exemption should be secured to them, from what destroys prematurely their physical strength, and lowers them in the scale of intellectual and moral beings." [230]

It was not, however, the misuse of parental authority that created the capitalistic exploitation, whether direct or indirect, of children's labour; but, on the contrary, it was the capitalistic mode of exploitation which, by sweeping away the economic basis of parental authority, made its exercise degenerate into a mischievous misuse of power. However terrible and disgusting the dissolution, under the capitalist system, of the old family ties may appear, nevertheless, modern industry, by assigning as it does an important part in the process of production, outside the domestic sphere, to women, to young persons, and to children of both sexes, creates a new economic foundation for a higher form of the family and of the relations between the sexes. It is, of course, just as absurd to hold the Teutonic-Christian form of the family to be absolute and final as it would be to apply that character to the ancient Roman, the ancient Greek, or the Eastern forms which, moreover, taken together form a series in historical development. Moreover, it is obvious that the fact of the collective working group being composed of individuals of both sexes and all ages, must necessarily, under suitable conditions, become a source of humane development; although in its spontaneously developed, brutal, capitalistic form, where the labourer exists for the process of production, and not the process of production for the labourer, that fact is a pestiferous source of corruption and slavery. [231]

The necessity for a generalisation of the Factory Acts, for transforming them from an exceptional law relating to mechanical spinning and weaving — those first creations of machinery — into a law affecting social production as a whole, arose, as we have seen, from the mode in which modern industry was historically developed. In the rear of that industry, the traditional form of manufacture, of handicraft, and of domestic industry, is entirely revolutionised; manufactures are constantly passing into the factory system, and handicrafts into manufactures; and lastly, the spheres of handicraft and of the domestic industries become, in a, comparatively speaking, wonderfully short time, dens of misery in which capitalistic exploitation obtains free play for the wildest excesses. There are two circumstances that finally turn the scale: first, the constantly recurring experience that capital, so soon as it finds itself subject to legal control at one point, compensates itself all the more recklessly at other points; [232] secondly, the cry of the capitalists for equality in the conditions of competition, i.e., for equal restrain on all exploitation of labour. [233] On this point let us listen to two heart-broken cries. Messrs. Cooksley of Bristol, nail and chain, &c., manufacturers, spontaneously introduced the regulations of the Factory Act into their business.

> "As the old irregular system prevails in neighbouring works, the Messrs. Cooksley are subject to the disadvantage of having their boys enticed to continue their labour elsewhere after 6 p.m. 'This,' they naturally say, 'is an unjustice and loss to us, as it exhausts a portion of the boy's strength, of which we ought to have the full benefit'." [234]

Mr. J. Simpson (paper box and bagmaker, London) states before the commissioners of the Ch. Empl. Comm.:

> "He would sign any petition for it" (legislative interference)... "As it was, he always felt restless at night, when he had closed his place, lest others should be working later than him and getting away his orders." [235]

Summarising, the Ch. Empl. Comm. says:

> "It would be unjust to the larger employers that their factories should be placed under regulation, while the hours of labour in the smaller places in their own branch of business were under no legislative restriction. And to the injustice arising from the unfair conditions of competition, in regard to hours, that would be created if the smaller places of work were exempt, would be added the disadvantage to the larger manufacturers, of finding their supply of juvenile and female labour drawn off to the places of work exempt from legislation. Further, a stimulus would be given to the multiplication of the smaller places of work, which are almost invariably the least favourable to the health, comfort, education, and general improvement

of the people." [236]

In its final report the Commission proposes to subject to the Factory Act more than 1,400,000 children, young persons, and women, of which number about one half are exploited in small industries and by the so-called home-work. [237] It says,

> "But if it should seem fit to Parliament to place the whole of that large number of children, young persons and females under the protective legislation above adverted to ... it cannot be doubted that such legislation would have a most beneficent effect, not only upon the young and the feeble, who are its more immediate objects, but upon the still larger body of adult workers, who would in all these employments, both directly and indirectly, come immediately under its influence. It would enforce upon them regular and moderate hours; it would lead to their places of work being kept in a healthy and cleanly state; it would therefore husband and improve that store of physical strength on which their own well-being and that of the country so much depends; it would save the rising generation from that overexertion at an early age which undermines their constitutions and leads to premature decay; finally, it would ensure them — at least up to the age of 13 — the opportunity of receiving the elements of education, and would put an end to that utter ignorance ... so faithfully exhibited in the Reports of our Assistant Commissioners, and which cannot be regarded without the deepest pain, and a profound sense of national degradation." [238]

The Tory Cabinet [239] announced in the Speech from the Throne, on February 5, 1867, that it had framed the proposals of the Industrial Commission of Inquiry [240] into Bills. To get that far, another twenty years of *experimentum in corpore vili* had been required. Already in 1840 a Parliamentary Commission of Inquiry on the labour of children had been appointed. Its Report, in 1842, unfolded, in the words of Nassau W. Senior,

> "the most frightful picture of avarice, selfishness and cruelty on the part of masters and of parents, and of juvenile and infantile misery, degradation and destruction ever presented.... It may be supposed that it describes the horrors of a past age. But there is unhappily evidence that those horrors continue as intense as they were. A pamphlet published by Hardwicke about 2 years ago states that the abuses complained of in 1842, are in full bloom at the present day. It is a strange proof of the general neglect of the morals and health of the children of the working-class, that this report lay unnoticed for 20 years, during which the children, 'bred up without the remotest sign of comprehension as to what is meant by the term morals, who had neither knowledge, nor religion, nor natural affection,' were allowed to become the parents of the present generation." [241]

The social conditions having undergone a change, Parliament could not venture to shelve the demands of the Commission of 1862, as it had done those of the Commission of 1840. Hence in 1864, when the Commission had not yet published more than a part of its reports, the earthenware industries (including the potteries), makers of paperhangings, matches, cartridges, and caps, and fustian cutters were made subject to the Acts in force in the textile industries. In the Speech from the Throne, on 5th February, 1867, the Tory Cabinet of the day announced the introduction of Bills, founded on the final recommendations of the Commission, which had completed its labours in 1866.

On the 15th August, 1867, the Factory Acts Extension Act, and on the 21st August, the Workshops' Regulation Act received the Royal Assent; the former Act having reference to large industries, the latter to small.

The former applies to blast-furnaces, iron' and copper mills, foundries, machine shops, metal manufactories, gutta-percha works, paper mills, glass-works, tobacco manufactories, letter-press printing (including newspapers), book-binding, in short to all industrial establishments of the above kind, in which 50 individuals or more are occupied simultaneously, and for not less than 100 days during the year.

To give an idea of the extent of the sphere embraced by the Workshops' Regulation Act in its application, we cite from its interpretation clause, the following passages:

> "*Handicraft* shall mean any manual labour exercised by way of trade, or for purposes of gain in, or incidental to, the making any article or part of an article, or in, or incidental to, the altering, repairing, ornamenting, finishing, or otherwise adapting for sale any article."
>
> "*Workshop* shall mean any room or place whatever in the open air or undercover, in which any handicraft is carried on by any child, young person, or woman, and to which and over which the person by whom such child, young person, or woman is employed, has the right of access and control."
>
> "*Employed* shall mean occupied in any handicraft, whether for wages or not, under a master or under a

parent as herein defined."

"*Parent* shall mean parent, guardian, or person, having the custody of, or control over, any... child or young person."

Clause 7, which imposes a penalty for employment of children, young persons, and women, contrary to the provisions of the Act, subjects to fines, not only the occupier of the workshop, whether parent or not, but even

"the parent of, or the person deriving any direct benefit from the labour of, or having the control over, the child, young person or woman."

The Factory Acts Extension Act, which affects the large establishments, derogates from the Factory Act by a crowd of vicious exceptions and cowardly compromises with the masters.

The Workshops' Regulation Act, wretched in all its details, remained a dead letter in the hands of the municipal and local authorities who were charged with its execution. When, in 1871, Parliament withdrew from them this power, in order to confer it on the Factory Inspectors, to whose province it thus added by a single stroke more than one hundred thousand workshops, and three hundred brickworks, care was taken at the same time not to add more than eight assistants to their already undermanned staff. [242]

What strikes us, then, in the English legislation of 1867, is, on the one hand, the necessity imposed on the parliament of the ruling classes, of adopting in principle measures so extraordinary, and on so great a scale, against the excesses of capitalistic exploitation; and on the other hand, the hesitation, the repugnance, and the bad faith, with which it lent itself to the task of carrying those measures into practice.

The Inquiry Commission of 1862 also proposed a new regulation of the mining industry, an industry distinguished from others by the exceptional characteristic that the interests of landlord and capitalist there join hands. The antagonism of these two interests had been favourable to Factory legislation, while on the other hand the absence of that antagonism is sufficient to explain the delays and chicanery of the legislation on mines.

The Inquiry Commission of 1840 had made revelations so terrible, so shocking, and creating such a scandal all over Europe, that to salve its conscience Parliament passed the Mining Act of 1842, in which it limited itself to forbidding the employment underground in mines of children under 10 years of age and females.

Then another Act, The Mines' Inspecting Act of 1860, provides that mines shall be inspected by public officers nominated specially for that purpose, and that boys between the ages of 10 and 12 years shall not be employed, unless they have a school certificate, or go to school for a certain number of hours. This Act was a complete dead letter owing to the ridiculously small number of inspectors, the meagreness of their powers, and other causes that will become apparent as we proceed.

One of the most recent Blue books on mines is the "Report from the Select Committee on Mines, together with &c. Evidence, 23rd July, 1866." This Report is the work of a Parliamentary Committee selected from members of the House of Commons, and authorised to summon and examine witnesses. It is a thick folio volume in which the Report itself occupies only five lines to this effect; that the committee has nothing to say, and that more witnesses must be examined!

The mode of examining the witnesses reminds one of the cross-examination of witnesses in English courts of justice, where the advocate tries, by means of impudent, unexpected, equivocal and involved questions, put without connexion, to intimidate, surprise, and confound the witness, and to give a forced meaning to the answers extorted from him. In this inquiry the members of the committee themselves are the cross-examiners, and among them are to be found both mine-owners and mine exploiters; the witnesses are mostly working coal miners. The whole farce is too characteristic of the spirit of capital, not to call for a few extracts from this Report. For the sake of conciseness I have classified them. I may also add that every question and its answer are numbered in the English Blue books.

1. Employment in mines of boys of 10 years and upwards. — In the mines the work, inclusive of going and returning, usually lasts 14 or 15 hours, sometimes even from 3, 4 and 5 o'clock a.m., till 5 and 6 o'clock p.m. (n. 6, 452, 83). The adults work in two shifts, of eight hours each; but there is no alternation with the boys, on account of the expense (n. 80, 203, 204). The younger boys are chiefly employed in opening and shutting the ventilating doors in the various parts of the mine; the older ones are employed on heavier work, in carrying coal, &c. (n. 122, 739, 1747). They work these long hours underground until

their 18th or 22nd year, when they are put to miner's work proper (n. 161). Children and young persons are at present worse treated, and harder worked than at any previous period (n. 1663-1667). The miners demand almost unanimously an act of Parliament prohibiting the employment in mines of children under 14. And now Hussey Vivian (himself an exploiter of mines) asks:

> "Would not the opinion of the workman depend upon the poverty of the workman's family?" Mr. Bruce: "Do you not think it would be a very hard case, where a parent had been injured, or where he was sickly, or where a father was dead, and there was only a mother, to prevent a child between 12 and 14 earning 1s. 7d. a day for the good of the family? ... You must lay down a general rule? ... Are you prepared to recommend legislation which would prevent the employment of children under 12 and 14, whatever the state of their parents might be?" "Yes." (ns. 107-110). Vivian: "Supposing that an enactment were passed preventing the employment of children under the age of 14, would it not be probable that ... the parents of children would seek employment for their children in other directions, for instance, in manufacture?" "Not generally I think" (n. 174). Kinnaird: "Some of the boys are keepers of doors?" "Yes." "Is there not generally a very great draught every time you open a door or close it?" "Yes, generally there is." "It sounds a very easy thing, but it is in fact rather a painful one?" "He is imprisoned there just the same as if he was in a cell of a gaol." Bourgeois Vivian: "Whenever a boy is furnished with a lamp cannot he read?" "Yes, he can read, if he finds himself in candles.... I suppose he would be found fault with if he were discovered reading; he is there to mind his business, he has a duty to perform, and he has to attend to it in the first place, and I do not think it would be allowed down the pit." (ns. 139, 141, 143, 158, 160).

II. Education. — The working miners want a law for the compulsory education of their children, as in factories. They declare the clauses of the Act of 1860, which require a school certificate to be obtained before employing boys of 10 and 12 years of age, to be quite illusory. The examination of the witnesses on this subject is truly droll.

> "Is it (the Act) required more against the masters or against the parents?" "It is required against both I think." "You cannot say whether it is required against one more than against the other?" "No; I can hardly answer that question." (ns. 115, 116). "Does there appear to be any desire on the part of the employers that the boys should have such hours as to enable them to go to school?" "No; the hours are never shortened for that purpose." (n. 137) Mr. Kinnaird: "Should you say that the colliers generally improve their education; have you any instances of men who have, since they began to work, greatly improved their education, or do they not rather go back, and lose any advantage that they may have gained?" "They generally become worse: they do not improve; they acquire bad habits; they get on to drinking and gambling and such like, and they go completely to wreck." (n. 211.) "Do they make any attempt of the kind (for providing instruction) by having schools at night?" "There are few collieries where night schools are held, and perhaps at those collieries a few boys do go to those schools; but they are so physically exhausted that it is to no purpose that they go there." (n. 454.) "You are then," concludes the bourgeois, "against education?" "Most certainly not; but," &c. (n. 443.) "But are they (the employers) not compelled to demand them (school certificates)?" "By law they are; but I am not aware that they are demanded by the employers." "Then it is your opinion, that this provision of the Act as to requiring certificates, is not generally carried out in the collieries?" "It is not carried out." (ns. 443, 444.) "Do the men take a great interest in this question (of education)?" "The majority of them do." (n. 717.) "Are they very anxious to see the law enforced?" "The majority are." (n. 718.) "Do you think that in this country any law that you pass ... can really be effectual unless the population themselves assist in putting it into operation?" "Many a man might wish to object to employing a boy, but he would perhaps become marked by it." (n. 720.) "Marked by whom?" "By his employers." (n. 721.) "Do you think that the employers would find any fault with a man who obeyed the law... ?" "I believe they would." (n. 722.) "Have you ever heard of any workman objecting to employ a boy between 10 and 12, who could not write or read?" "It is not left to men's option." (n. 123.) "Would you call for the interference of Parliament?" "I think that if anything effectual is to be done in the education of the colliers' children, it will have to be made compulsory by Act of Parliament." (n. 1634.) "Would you lay that obligation upon the colliers only, or all the workpeople of Great Britain?" "I came to speak for the colliers." (n. 1636.) "Why should you distinguish them (colliery boys) from other boys?" "Because I think they are an exception to the rule." (n. 1638.) "In what respect?" "In a physical respect." (n. 1639.) "Why should education be more valuable to them than to other classes of lads?" "I do not know that it is more valuable; but through the over-exertion in mines there is less chance for the boys that are employed there to get education, either at Sunday schools, or at day schools." (n. 1640.) "It is impossible to look at a question of this sort absolutely by itself?" (n. 1644.) "Is there a sufficiency of schools?" — "No"... (n. 1646). "If the State were to require that every child should be sent to school, would there be schools for the children to go to?" "No; but I think if the circumstances were to spring up, the schools would be forthcoming." (n. 1647.) "Some of them (the boys) cannot read and write at all, I suppose?" "The majority cannot... The majority of the men themselves cannot." (ns. 705, 725.)

III. Employment of women. — Since 1842 women are no more employed underground, but are occupied on the surface in loading the coal, &c., in drawing the tubs to the canals and railway waggons, in sorting, &c. Their numbers have considerably increased during the last three or four years. (n. 1727.) They are mostly the wives, daughters, and widows of the working miners, and their ages range from 12 to 50 or 60 years. (ns. 645, 1779.)

> "What is the feeling among the working miners as to the employment of women?" "I think they generally condemn it." (n. 648.) "What objection do you see to it?" "I think it is degrading to the sex." (n. 649.) "There is a peculiarity of dress?" "Yes ... it is rather a man's dress, and I believe in some cases, it drowns all sense of decency." "Do the women smoke?" "Some do." "And I suppose it is very dirty work?" "Very dirty." "They get black and grimy?" "As black as those who are down the mines ... I believe that a woman having children (and there are plenty on the banks that have) cannot do her duty to her children." (ns. 650-654, 701.) "Do you think that those widows could get employment anywhere else, which would bring them in as much wages as that (from 8s. to 10s. a week)?" "I cannot speak to that." (n. 709.) "You would still be prepared, would you," (flint-hearted fellow!) "to prevent their obtaining a livelihood by these means?" "I would." (n. 710.) "What is the general feeling in the district ... as to the employment of women?" "The feeling is that it is degrading; and we wish as miners to have more respect to the fair sex than to see them placed on the pit bank... Some part of the work is very hard; some of these girls have raised as much as 10 tons of stuff a day." (ns. 1715,1717.) "Do you think that the women employed about the collieries are less moral than the women employed in the factories?" ". ..the percentage of bad ones may be a little more ... than with the girls in the factories." (n. 1237.) "But you are not quite satisfied with the state of morality in the factories?" "No." (n. 1733.) "Would you prohibit the employment of women in factories also?" "No, I would not." (n. 1734.) "Why not?" "I think it a more honourable occupation for them in the mills." (n. 1735.) "Still it is injurious to their morality, you think?" "Not so much as working on the pit bank; but it is more on the social position I take it; I do not take it on its moral ground alone. The degradation, in its social bearing on the girls, is deplorable in the extreme. When these 400 or 500 girls become colliers' wives, the men suffer greatly from this degradation, and it causes them to leave their homes and drink." (n. 1736.) "You would be obliged to stop the employment of women in the ironworks as well, would you not, if you stopped it in the collieries?" "I cannot speak for any other trade." (n. 1737.) "Can you see any difference in the circumstances of women employed in ironworks, and the circumstances of women employed above ground in collieries?" "I have not ascertained anything as to that." (n. 1740.) "Can you see anything that makes a distinction between one class and the other?" "I have not ascertained that, but I know from house to house visitation, that it is a deplorable state of things in our district...." (n. 1741.) "Would you interfere in every case with the employment of women where that employment was degrading?" "It would become injurious, I think, in this way: the best feelings of Englishmen have been gained from the instruction of a mother. ..." (n. 1750.) "That equally applies to agricultural employments, does it not?" "Yes, but that is only for two seasons, and we have work all the four seasons." (n. 1751.) "They often work day and night, wet through to the skin, their constitution undermined and their health ruined." "You have not inquired into that subject perhaps?" "I have certainly taken note of it as I have gone along, and certainly I have seen nothing parallel to the effects of the employment of women on the pit bank.... It is the work of a man... a strong man." (ns. 1753, 1793, 1794.) "Your feeling upon the whole subject is that the better class of colliers who desire to raise themselves and humanise themselves, instead of deriving help from the women, are pulled down by them?" "Yes." (n. 1808.) After some further crooked questions from these bourgeois, the secret of their "sympathy" for widows, poor families, &c., comes out at last. "The coal proprietor appoints certain gentlemen to take the oversight of the workings, and it is their policy, in order to receive approbation, to place things on the most economical basis they can, and these girls are employed at from 1s. up to 1s. 6d. a day, where a man at the rate of 2s. 6d. a day would have to be employed." (n. 1816.)

IV. Coroner's inquests. —

> "With regard to coroner's inquests in your district, have the workmen confidence in the proceedings at those inquests when accidents occur?" "No; they have not." (n. 360.) "Why not?" "Chiefly because the men who are generally chosen, are men who know nothing about mines and such like." "Are not workmen summoned at all upon the juries?" "Never but as witnesses to my knowledge." "Who are the people who are generally summoned upon these juries?" "Generally tradesmen in the neighbourhood ... from their circumstances they are sometimes liable to be influenced by their employers ... the owners of the works. They are generally men who have no knowledge, and can scarcely understand the witnesses who are called before them, and the terms which are used and such like." "Would you have the jury composed of persons who had been employed in mining?" "Yes, partly... they (the workmen) think that the verdict is not in accordance with the evidence given generally." (ns. 361, 364, 366, 368, 371, 375.) "One great object in summoning a jury is to have an impartial one, is it not?" "Yes, I should think so." "Do you think that the juries would be impartial if they were composed to a considerable extent of workmen?" "I cannot see any motive which the workmen

would have to act partially ... they necessarily have a better knowledge of the operations in connexion with the mine." "You do not think there would be a tendency on the part of the workmen to return unfairly severe verdicts?" "No, I think not." (ns. 378, 379, 380.)

V. False weights and measures. — The workmen demand to be paid weekly instead of fortnightly, and by weight instead of by cubical contents of the tubs; they also demand protection against the use of false weights, &c. (n. 1071.)

"If the tubs were fraudulently increased, a man could discontinue working by giving 14 days' notice?" "But if he goes to another place, there is the same thing going on there." (n. 1071.) "But he can leave that place where the wrong has been committed?" "It is general; wherever he goes, he has to submit to it." (n. 1072.) "Could a man leave by giving 14 days' notice?" "Yes." (n. 1073.) And yet they are not satisfied!

VI. Inspection of mines. — Casualties from explosions are not the only things the workmen suffer from. (n. 234, sqq.)

"Our men complained very much of the bad ventilation of the collieries ... the ventilation is so bad in general that the men can scarcely breathe; they are quite unfit for employment of any kind after they have been for a length of time in connexion with their work; indeed, just at the part of the mine where I am working, men have been obliged to leave their employment and come home in consequence of that ... some of them have been out of work for weeks just in consequence of the bad state of the ventilation where there is not explosive gas ... there is plenty of air generally in the main courses, yet pains are not taken to get air into the workings where men are working." "Why do you not apply to the inspector?" "To tell the truth there are many men who are timid on that point; there have been cases of men being sacrificed and losing their employment in consequence of applying to the inspector." "Why is he a marked man for having complained?" "Yes..... And he finds it difficult to get employment in another mine?" "Yes." "Do you think the mines in your neighbourhood are sufficiently inspected to insure a compliance with the provisions of the Act?" "No; they are not inspected at all ... the inspector has been down just once in the pit, and it has been going seven years.... In the district to which I belong there are not a sufficient number of inspectors. We have one old man more than 70 years of age to inspect more than 130 collieries." "You wish to have a class of sub-inspectors?" "Yes." (ns. 234, 241, 251, 254, 274, 275, 554, 276, 293.) "But do you think it would be possible for Government to maintain such an army of inspectors as would be necessary to do all that you want them to do, without information from the men?" "No, I should think it would be next to impossible...."

"It would be desirable the inspectors should come oftener?" "Yes, and without being sent for." (n. 280, 277.) "Do you not think that the effect of having these inspectors examining the collieries so frequently would be to shift the responsibility (!) of supplying proper ventilation from the owners of the collieries to the Government officials?" "No, I do not think that, I think that they should make it their business to enforce the Acts which are already in existence." (n. 285.) "When you speak of sub-inspectors, do you mean men at a less salary, and of an inferior stamp to the present inspectors?" "I would not have them inferior, if you could get them otherwise." (n. 294.) "Do you merely want more inspectors, or do you want a lower class of men as an inspector?" "A man who would knock about, and see that things are kept right; a man who would not be afraid of himself." (n. 295.) "If you obtained your wish in getting an inferior class of inspectors appointed, do you think that there would be no danger from want of skill, &c?" "I think not, I think that the Government would see after that, and have proper men in that position." (n. 297.)

This kind of examination becomes at last too much even for the chairman of the committee, and he interrupts with the observation:

"You want a class of men who would look into all the details of the mine, and would go into all the holes and corners, and go into the real facts ... they would report to the chief inspector, who would then bring his scientific knowledge to bear on the facts they have stated?" (ns. 298, 299.) "Would it not entail very great expense if all these old workings were kept ventilated?" "Yes, expense might be incurred, but life would be at the same time protected." (n. 531.)

A working miner objects to the 17th section of the Act of 1860; he says,

"At the present time, if the inspector of mines finds a part of the mine unfit to work in, he has to report it to the mine-owner and the Home Secretary. After doing that, there is given to the owner 20 days to look over the matter; at the end of 20 days he has the power to refuse making any alteration in the mine; but, when he refuses, the mine-owner writes to the Home Secretary, at the same time nominating five engineers, and from those five engineers named by the mine-owner himself, the Home Secretary appoints one, I think, as arbitrator, or appoints arbitrators from them; now we think in that case the mine-owner virtually appoints his own arbitrator." (n. 581.)

Bourgeois examiner, himself a mine-owner:

"But ... is this a merely speculative objection?" (n. 586.) "Then you have a very poor opinion of the integrity

of mining engineers?" "It is most certainly unjust and inequitable." (n. 588.) "Do not mining engineers possess a sort of public character, and do not you think that they are above making such a partial decision as you apprehend?" "I do not wish to answer such a question as that with respect to the personal character of those men. I believe that in many cases they would act very partially indeed, and that it ought not to be in their hands to do so, where men's lives are at stake." (n. 589.)

This same bourgeois is not ashamed to put this question: "Do you not think that the mine-owner also suffers loss from an explosion?" Finally, "Are not you workmen in Lancashire able to take care of your own interests without calling in the Government to help you?" "No." (n. 1042.)

In the year 1865 there were 3,217 coal mines in Great Britain, and 12 inspectors. A Yorkshire mine-owner himself calculates (*Times*, 26th January, 1867), that putting on one side their office work, which absorbs all their time, each mine can be visited but once in ten years by an inspector. No wonder that explosions have increased progressively, both in number and extent (sometimes with a loss of 200-300 men), during the last ten years. These are the beauties of "free" capitalist production! *[This sentence has been added to the English text in conformity with the 4th German edition. — Ed.*]

The very defective Act, passed in 1872, is the first that regulates the hours of labour of the children employed in mines, and makes exploiters and owners, to a certain extent, responsible for so-called accidents.

The Royal Commission appointed in 1867 to inquire into the employment in agriculture of children, young persons, and women, has published some very important reports. Several attempts to apply the principles of the Factory Acts, but in a modified form, to agriculture have been made, but have so far resulted in complete failure. All that I wish to draw attention to here is the existence of an irresistible tendency towards the general application of those principles.

If the general extension of factory legislation to all trades for the purpose of protecting the working-class both in mind and body has become inevitable, on the other hand, as we have already pointed out, that extension hastens on the general conversion of numerous isolated small industries into a few combined industries carried on upon a large scale; it therefore accelerates the concentration of capital and the exclusive predominance of the factory system. It destroys both the ancient and the transitional forms, behind which the dominion of capital is still in part concealed, and replaces them by the direct and open sway of capital; but thereby it also generalises the direct opposition to this sway. While in each individual workshop it enforces uniformity, regularity, order, and economy, it increases by the immense spur which the limitation and regulation of the working-day give to technical improvement, the anarchy and the catastrophes of capitalist production as a whole, the intensity of labour, and the competition of machinery with the labourer. By the destruction of petty and domestic industries it destroys the last resort of the "redundant population," and with it the sole remaining safety-valve of the whole social mechanism. By maturing the material conditions, and the combination on a social scale of the processes of production, it matures the contradictions and antagonisms of the capitalist form of production, and thereby provides, along with the elements for the formation of a new society, the forces for exploding the old one. [243]

SECTION 10.

MODERN INDUSTRY AND AGRICULTURE

The revolution called forth by modern industry in agriculture, and in the social relations of agricultural producers, will be investigated later on. In this place, we shall merely indicate a few results by way of anticipation. If the use of machinery in agriculture is for the most part free from the injurious physical effect it has on the factory operative, its action in superseding the labourers is more intense, and finds less resistance, as we shall see later in detail. In the counties of Cambridge and Suffolk, for example, the area of cultivated land has extended very much within the last 20 years (up to 1868), while in the same period the rural population has diminished, not only relatively, but absolutely. In the United States it is as yet only

virtually that agricultural machines replace labourers; in other words, they allow of the cultivation by the farmer of a larger surface, but do not actually expel the labourers employed. In 1861 the number of persons occupied in England and Wales in the manufacture of agricultural machines was 1,034, whilst the number of agricultural labourers employed in the use of agricultural machines and steam-engines did not exceed 1,205.

In the sphere of agriculture, modern industry has a more revolutionary effect than elsewhere, for this reason, that it annihilates the peasant, that bulwark of the old society, and replaces him by the wage-labourer. Thus the desire for social changes, and the class antagonisms are brought to the same level in the country as in the towns. The irrational, old-fashioned methods of agriculture are replaced by scientific ones. Capitalist production completely tears asunder the old bond of union which held together agriculture and manufacture in their infancy. But at the same time it creates the material conditions for a higher synthesis in the future, viz., the union of agriculture and industry on the basis of the more perfected forms they have each acquired during their temporary separation. Capitalist production, by collecting the population in great centres, and causing an ever-increasing preponderance of town population, on the one hand concentrates the historical motive power of society; on the other hand, it disturbs the circulation of matter between man and the soil, i.e., prevents the return to the soil of its elements consumed by man in the form of food and clothing; it therefore violates the conditions necessary to lasting fertility of the soil. By this action it destroys at the same time the health of the town labourer and the intellectual life of the rural labourer. [244] But while upsetting the naturally grown conditions for the maintenance of that circulation of matter, it imperiously calls for its restoration as a system, as a regulating law of social production, and under a form appropriate to the full development of the human race. In agriculture as in manufacture, the transformation of production under the sway of capital, means, at the same time, the martyrdom of the producer; the instrument of labour becomes the means of enslaving, exploiting, and impoverishing the labourer; the social combination and organisation of labour-processes is turned into an organised mode of crushing out the workman's individual vitality, freedom, and independence. The dispersion of the rural labourers over larger areas breaks their power of resistance while concentration increases that of the town operatives. In modern agriculture, as in the urban industries, the increased productiveness and quantity of the labour set in motion are bought at the cost of laying waste and consuming by disease labour-power itself. Moreover, all progress in capitalistic agriculture is a progress in the art, not only of robbing the labourer, but of robbing the soil; all progress in increasing the fertility of the soil for a given time, is a progress towards ruining the lasting sources of that fertility. The more a country starts its development on the foundation of modern industry, like the United States, for example, the more rapid is this process of destruction. [245] Capitalist production, therefore, develops technology, and the combining together of various processes into a social whole, only by sapping the original sources of all wealth — the soil and the labourer.

Footnotes

1. Mill should have said, "of any human being not fed by other people's labour," for, without doubt, machinery has greatly increased the number of well-to-do idlers.

2. See, for instance, Hutton: "Course of Mathematics."

3. "From this point of view we may draw a sharp line of distinction between a tool and a machine: spades, hammers, chisels, &c., combinations of levers and of screws, in all of which, no matter how complicated they may be in other respects, man is the motive power, ... all this falls under the idea of a tool; but the plough, which is drawn by animal power, and wind-mills, &c., must be classed among machines." (Wilhelm Schulz: "Die Bewegung der Produktion." Zürich, 1843, p. 38.) In many respects a book to be recommended.

4. Before his time, spinning machines, although very imperfect ones, had already been used, and Italy was probably the country of their first appearance. A critical history of technology would show how little any of the inventions of the 18th century are the work of a single individual. Hitherto there is no such book.

Darwin has interested us in the history of Nature's Technology, i.e., in the formation of the organs of plants and animals, which organs serve as instruments of production for sustaining life. Does not the history of the productive organs of man, of organs that are the material basis of all social organisation, deserve equal attention? And would not such a history be easier to compile, since, as Vico says, human history differs from natural history in this, that we have made the former, but not the latter? Technology discloses man's mode of dealing with Nature, the process of production by which he sustains his life, and thereby also lays bare the mode of formation of his social relations, and of the mental conceptions that flow from them. Every history of religion, even, that fails to take account of this material basis, is uncritical. It is, in reality, much easier to discover by analysis the earthly core of the misty creations of religion, than, conversely, it is, to develop from the actual relations of life the corresponding celestialised forms of those relations. The latter method is the only materialistic, and therefore the only scientific one. The weak points in the abstract materialism of natural science, a materialism that excludes history and its process, are at once evident from the abstract and ideological conceptions of its spokesmen, whenever they venture beyond the bounds of their own speciality.

5. Especially in the original form of the power-loom, we recognise, at the first glance, the ancient loom. In its modern form, the power-loom has undergone essential alterations.

6. It is only during the last 15 years (i.e., since about 1850), that a constantly increasing portion of these machine tools have been made in England by machinery, and that not by the same manufacturers who make the machines. Instances of machines for the fabrication of these mechanical tools are, the automatic bobbin-making engine, the cardsetting engine, shuttle-making machines, and machines for forging mule and throstle spindles.

7. Moses says: "Thou shalt not muzzle the ox that treads the corn." The Christian philanthropists of Germany, on the contrary, fastened a wooden board round the necks of the serfs, whom they used as a motive power for grinding, in order to prevent them from putting flour into their mouths with their hands.

8. It was partly the want of streams with a good fall on them, and partly their battles with superabundance of water in other respects, that compelled the Dutch to resort to wind as a motive power. The wind-mill itself they got from Germany, where its invention was the origin of a pretty squabble between the nobles, the priests, and the emperor, as to which of those three the wind "belonged." The air makes bondage, was the cry in Germany, at the same time that the wind was making Holland free. What it reduced to bondage in this case, was not the Dutchman, but the land for the Dutchman. In 1836, 12,000 windmills of 6,000 horse-power were still employed in Holland, to prevent two-thirds of the land from being reconverted into morasses.

9. It was, indeed, very much improved by Watt's first so-called single acting engine; but, in this form, it continued to be a mere machine for raising water, and the liquor from salt mines.

10. "The union of all these simple instruments, set in motion by a single motor, constitutes a machine." (Babbage, l.c.)

11. In January, 1861, John C. Morton read before the Society of Arts a paper on "The forces employed in agriculture." He there states: "Every improvement that furthers the uniformity of the land makes the steam-engine more and more applicable to the production of pure mechanical force.... Horse-power is requisite wherever crooked fences and other obstructions prevent uniform action. These obstructions are vanishing day by day. For operations that demand more exercise of will than actual force, the only power applicable is that controlled every instant by the human mind-in other words, man-power." Mr. Morton then reduces steam-power, horse-power, and man-power, to the unit in general use for steam-engines, namely, the force required to raise 33,000 lbs. one foot in one minute, and reckons the cost of one horse-power from a steam-engine to be 3d., and from a horse to be 5½d. per hour. Further, if a horse must fully maintain its health, it can work no more than 8 hours a day. Three at the least out of every seven horses used on tillage land during the year can be dispensed with by using steam-power, at an expense not greater than that which, the horses dispensed with, would cost during the 3 or 4 months in which alone they can be used effectively. Lastly, steam-power, in those agricultural operations in which it can be employed, improves, in comparison with horse-power, the quality of the work. To do the work of a steam-engine would require 66 men, at a total cost of 15s. an hour, and to do the work of a horse, 32 men, at a total cost of 8s. an hour.

12. Faulhaber, 1625; De Caus, 1688.

13. The modern turbine frees the industrial exploitation of water-power from many of its former fetters.

14. "In the early days of textile manufactures, the locality of the factory depended upon the existence of a stream having a sufficient fall to turn a water-wheel; and, although the establishment of the water-mills was the commencement of the breaking up of the domestic system of manufacture, yet the mills necessarily situated upon streams, and frequently at considerable distances the one from the other, formed part of a rural, rather than an urban system; and it was not until the introduction of the steam-power as a substitute for the stream that factories were congregated in towns, and localities where the coal and water required for the production of steam were found in sufficient quantities. The steam-engine is the parent of manufacturing towns." (A. Redgrave in "Reports of the Insp. of Fact., 30th April, 1860," p. 36.)

15. From the standpoint of division of labour in Manufacture, weaving was not simple, but, on the contrary, complicated manual labour; and consequently the power-loom is a machine that does very complicated work. It is altogether erroneous to suppose that modern machinery originally appropriated those operations alone, which division of labour had simplified. Spinning and weaving were, during the manufacturing period, split up into new species, and the implements were modified and improved; but the labour itself was in no way divided, and it retained its handicraft character. It is not the labour, but the instrument of labour, that serves as the starting-point of the machine.

16. Before the epoch of Mechanical Industry, the wool manufacture was the predominating manufacture in England. Hence it was in this industry that, in the first half of the 18th century, the most experiments were made. Cotton, which required less careful preparation for its treatment by machinery, derived the benefit of the experience gained on wool, just as afterwards the manipulation of wool by machinery was developed on the lines of cotton-spinning and weaving by machinery. It was only during the 10 years immediately preceding 1866, that isolated details of the wool manufacture, such as woolcombing, were incorporated in the factory system. "The application of power to the process of combing wool ... extensively in operation since the introduction of the combingmachine, especially Lister's ... undoubtedly had the effect of throwing a very large number of men out of work. Wool was formerly combed by hand, most frequently in the cottage of the comber. It is now very generally combed in the factory, and hand-labour is superseded, except in some particular kinds of work, in which hand-combed wool is still preferred. Many of the hand-combers found employment in the factories, but the produce of the hand-combers bears so small a proportion to that of the machine, that the employment of a very large number of combers has passed away." ("Rep. of lnsp. of Fact. for 31st Oct., 1856," p. 16.)

17. "The principle of the factory system, then, is to substitute ... the partition of a process into its essential constituents, for the division or graduation of labour among artisans." (Andrew Ure: "The Philosophy of Manufactures," Lond., 1835, p. 20.)

18. The power-loom was at first made chiefly of wood; in its improved modern form it is made of iron. To what an extent the old forms of the instruments of production influenced their new forms at first starting, is shown by, amongst other things, the most superficial comparison of the present power-loom with the old one, of the modern blowing apparatus of a blast-furnace with the first inefficient mechanical reproduction of the ordinary bellows, and perhaps more strikingly than in any other way, by the attempts before the invention of the present locomotive, to construct a locomotive that actually had two feet, which after the fashion of a horse, it raised alternately from the ground. It is only after considerable development of the science of mechanics, and accumulated practical experience, that the form of a machine becomes settled entirely in accordance with mechanical principles, and emancipated from the traditional form of the tool that gave rise to it.

19. Eli Whitney's cotton gin had until very recent times undergone less essential changes than any other machine of the 18th century. It is only during the last decade (i.e., since 1856) that another American, Mr. Emery, of Albany, New York, has rendered Whitney's gin antiquated by an improvement as simple as it is effective.

20. "The Industry of Nations," Lond., 1855, Part II., p. 239. This work also remarks: 'Simple and outwardly unimportant as this appendage to lathes may appear, it is not, we believe, averring too much to state, that its influence in improving and extending the use of machinery has been as great as that produced by Watt's improvements of the steam-engine itself. Its introduction went at once to perfect all machinery, to cheapen

it, and to stimulate invention and improvement."

21. One of these machines, used for forging paddle-wheel shafts in London, is called "Thor." It forges a shaft of 16½ tons with as much ease as a blacksmith forges a horseshoe.

22. Wood-working machines that are also capable of being employed on a small scale are mostly American inventions.

23. Science, generally speaking, costs the capitalist nothing, a fact that by no means hinders him from exploiting it. The science of others is as much annexed by capital as the labour of others. Capitalistic appropriation and personal appropriation, whether of science or of material wealth, are, however, totally different things. Dr. Ure himself deplores the gross ignorance of mechanical science existing among his dear machinery-exploiting manufacturers, and Liebig can a tale unfold about the astounding ignorance of chemistry displayed by English chemical manufacturers.

24. Ricardo lays such stress on this effect of machinery (of which, in other connexions, he takes no more notice than he does of the general distinction between the labour process and the process of creating surplus-value), that he occasionally loses sight of the value given up by machines to the product, and puts machines on the same footing as natural forces. Thus "Adam Smith nowhere undervalues the services which the natural agents and machinery perform for us, but he very justly distinguishes the nature of the value which they add to commodities... as they perform their work gratuitously, the assistance which they afford us, adds nothing to value in exchange." (Ric., l.c., pp. 336, 337.) This observation of Ricardo is of course correct in so far as it is directed against J. B. Say, who imagines that machines render the "service" of creating value which forms a part of "profits."

25. A horse-power is equal to a force of 33,000 foot-pounds per minute, i.e., to a force that raises 33,000 pounds one foot in a minute, or one pound 33,000 feet. This is the horse power meant in the text. In ordinary language, and also here and there in quotations in this work, a distinction is drawn between the "nominal" and the "commercial" or "indicated" horse-power of the same engine. The old or nominal horse-power is calculated exclusively from the length of piston-stroke, and the diameter of the cylinder, and leaves pressure of steam and piston speed out of consideration. It expresses practically this: This engine would be one of 50 horse-power, if it were driven with the same low pressure of steam, and the same slow piston speed, as in the days of Boulton and Watt. But the two latter factors have increased enormously since those days. In order to measure the mechanical force exerted today by an engine, an indicator has been invented which shows the pressure of the steam in the cylinder. The piston speed is easily ascertained. Thus the "indicated" or "commercial" horse-power of an engine is expressed by a mathematical formula, involving diameter of cylinder, length of stroke, piston speed, and steam pressure, simultaneously, and showing what multiple of 33,000 pounds is really raised by the engine in a minute. Hence, one "nominal" horse-power may exert three, four, or even five "indicated" or "real" horse-powers. This observation is made for the purpose of explaining various citations in the subsequent pages. — *F. E.*

26. The reader who is imbued with capitalist notions will naturally miss here the "interest" that the machine, in proportion to its capital value, adds to the product. It is, however, easily seen that since a machine no more creates new value than any other part of constant capital, it cannot add any value under the name of "interest." It is also evident that here, where we are treating of the production of surplus-value, we cannot assume *a priori* the existence of any part of that value under the name of interest. The capitalist mode of calculating, which appears, *primâ facie*, absurd, and repugnant to the laws of the creation of value, will be explained in the third book of this work.

27. This portion of value which is added by the machinery, decreases both absolutely and relatively, when the machinery does away with horses and other animals that are employed as mere moving forces, and not as machines for changing the form of matter. It may here be incidentally observed, that Descartes, in defining animals as mere machines, saw with eyes of the manufacturing period, while to eyes of the middle ages, animals were assistants to man, as they were later to Von Haller in his "Restauration der Staatswissenschaften." That Descartes, like Bacon, anticipated an alteration in the form of production, and the practical subjugation of Nature by Man, as a result of the altered methods of thought, is plain from his "Discours de la Méthode." He there says: "Il est possible (by the methods he introduced in philosophy) de parvenir à des connaissances fort utiles à la vie, et qu'au lieu de cette philosophie spéculative qu'on enseigne dans les écoles, on en peut trouver une pratique, par laquelle, connaissant la force et les actions du feu, de l'eau, de l'air, des astres, et de tous les autres corps qui nous environnent, aussi distinctement

que nous connaissons les divers métiers de nos artisans, nous les pourrions employer en même façon à tous les usages auxquels ils sont propres, et ainsi nous rendre comme maîtres et possesseurs de la nature" and thus "contribuer au perfectionnement de la vie humaine." [It is possible to attain knowledge very useful in life and, in place of the speculative philosophy taught in the schools, one can find a practical philosophy by which, given that we know the powers and the effectiveness of fire, water, air, the stars, and all the other bodies that surround us, as well and as accurately as we know the various trades of our craftsmen, we shall be able to employ them in the same manner as the latter to all uses to which they are adapted, and thus as it were make ourselves the masters and possessors of nature, and thus contributing to the perfection of human life.] In the preface to Sir Dudley North's "Discourses upon Trade" (1691) it is stated, that Descartes' method had begun to free Political Economy from the old fables and superstitious notions of gold, trade, &c. On the whole, however, the early English economists sided with Bacon and Hobbes as their philosophers; while, at a later period, the philosopher [...] of Political Economy in England, France, and Italy, was Locke.

28. According to the annual report (1863) of the Essen chamber of commerce, there was produced in 1862, at the cast-steel works of Krupp, with its 161 furnaces, thirty-two steam-engines (in the year 1800 this was about the number of all the steam-engines working in Manchester), and fourteen steam-hammers (representing in all 1,236 horse-power) forty-nine forges, 203 tool-machines, and about 2,400 workmen – thirteen million pounds of cast steel. Here there are not two workmen to each horse-power.

29. Babbage estimates that in Java the spinning labour alone adds 117% to the value of the cotton. At the same period (1832) the total value added to the cotton by machinery and labour in the fine-spinning industry, amounted to about 33% of the value of the cotton. ("On the Economy of Machinery," pp. 165, 166.)

30. Machine printing also economises colour.

31. See Paper read by Dr. Watson, Reporter on Products to the Government of India, before the Society of Arts, 17th April, 1860.

32. "These mute agents (machines) are always the produce of much less labour than that which they displace, even when they are of the same money-value." (Ricardo, l.c., p. 40.)

33. Hence in a communistic society there would be a very different scope for the employment of machinery than there can be in a bourgeois society.

34. "Employers of labour would not unnecessarily retain two sets of children under thirteen.... In fact one class of manufacturers, the spinners of woollen yarn, now rarely employ children under thirteen years of age, i.e., half-timers. They have introduced improved and new machinery of various kinds, which altogether supersedes the employment of children (i.e., under 13 years); f. i., I will mention one process as an illustration of this diminution in the number of children, wherein by the addition of an apparatus, called a piecing machine, to existing machines, the work of six or four half-timers, according to the peculiarity of each machine, can be performed by one young person (over 13 years)... the half-time system 'stimulated' the invention of the piecing machine." (Reports of Insp. of Fact. for 31st Oct., 1858.)

35. "Wretch" is the recognised term in English Political Economy for the agricultural labourer.

36. "Machinery ... can frequently not be employed until labour (he means wages) rises." (Ricardo, l.c., p. 479.)

37. See "Report of the Social Science Congress, at Edinburgh." Oct., 1863.

38. Dr. Edward Smith, during the cotton crisis caused by the American Civil War, was sent by the English Government to Lancashire, Cheshire, and other places, to report on the sanitary condition of the cotton operatives. He reported, that from a hygienic point of view, and apart from the banishment of the operatives from the factory atmosphere, the crisis had several advantages. The women now had sufficient leisure to give their infants the breast, instead of poisoning them with "Godfrey's cordial." They had time to learn to cook. Unfortunately the acquisition of this art occurred at a time when they had nothing to cook. But from this we see how capital, for the purposes of its self-expansion, has usurped the labour necessary in the home of the family. This crisis was also utilised to teach sewing to the daughters of the workmen in sewing schools. An American revolution and a universal crisis, in order that the working girls, who spin for the whole world, might learn to sew!

39. "The numerical increase of labourers has been great, through the growing substitution of female for male, and above all, of childish for adult labour. Three girls of 13, at wages of from 6 shillings to 8 shillings a week, have replaced the one man of mature age, of wages varying from 18 shillings to 45 shillings." (Th. de Quincey: "The Logic of Political Econ.," London, 1844. Note to p. 147.) Since certain family functions, such as nursing and suckling children, cannot be entirely suppressed, the mothers confiscated by capital, must try substitutes of some sort. Domestic work, such as sewing and mending, must be replaced by the purchase of ready-made articles. Hence, the diminished expenditure of labour in the house is accompanied by an increased expenditure of money. The cost of keeping the family increases, and balances the greater income. In addition to this, economy and judgment in the consumption and preparation of the means of subsistence becomes impossible. Abundant material relating to these facts, which are concealed by official Political Economy, is to be found in the Reports of the Inspectors of Factories, of the Children's Employment Commission, and more especially in the Reports on Public Health.

40. In striking contrast with the great fact, that the shortening of the hours of labour of women and children in English factories was exacted from capital by the male operatives, we find in the latest reports of the Children's Employment Commission traits of the operative parents in relation to the traffic in children, that are truly revolting and thoroughly like slave-dealing. But the Pharisee of a capitalist, as may be seen from the same reports, denounces this brutality which he himself creates, perpetuates, and exploits, and which he moreover baptises "freedom of labour." "Infant labour has been called into aid ... even to work for their own daily bread. Without strength to endure such disproportionate toil, without instruction to guide their future life, they have been thrown into a situation physically and morally polluted. The Jewish historian has remarked upon the overthrow of Jerusalem by Titus that it was no wonder it should have been destroyed, with such a signal destruction, when an inhuman mother sacrificed her own offspring to satisfy the cravings of absolute hunger." ("Public Economy Concentrated." Carlisle, 1833, p. 66.)

41. A. Redgrave in "Reports of lnsp. of Fact. for 31st October, 1858," pp. 40, 41.

42. "Children's Employment Commission, Fifth Report," London, 1866, p. 81, n. 31. *[Added in the 4th German edition. — The Bethnal Green silk industry is now almost destroyed. — F. E.]*

43. "Children's Employment Commission, Third Report," London, 1864, p. 53, n. 15.

44. l.c., Fifth Report, p. 22, n. 137.

45. "Sixth Report on Public Health," Lond., 1864, p. 34.

46. "It (the inquiry of 1861)... showed, moreover, that while, with the described circumstances, infants perish under the neglect and mismanagement which their mothers' occupations imply, the mothers become to a grievous extent denaturalised towards their offspring – commonly not troubling themselves much at the death, and even sometimes... taking direct measures to insure it." (l.c.)

47. l.c., p. 454.

48. l.c., pp. 454-463. "Report by Dr. Henry Julian Hunter on the excessive mortality of infants in some rural districts of England."

49. l.c., p. 35 and pp. 455, 456.

50. l.c., p. 456.

51. In the agricultural as well as in the factory districts the consumption of opium among the grown-up labourers, both male and female, is extending daily. "To push the sale of opiate... is the great aim of some enterprising wholesale merchants. By druggists it is considered the leading article." (l.c., p. 459.) Infants that take opiates "shrank up into little old men," or "wizened like little monkeys." (l.c., p. 460.) We here see how India and China avenged themselves on England.

52. l.c., p. 37.

53. "Rep. of Insp. of Fact. for 31st Oct., 1862," p. 59. Mr. Baker was formerly a doctor.

54. L. Horner in "Reports of Insp. of Fact. for 30th June, 1857," p. 17.

55. L. Horner in "Rep. of lnsp. of Fact. for 31st Oct., 1855," pp. 18, 19.

56. Sir John Kincaid in "Rep. of Insp. of Fact. for 31st Oct., 1858," pp. 31, 32.

57. L. Horner in "Reports, &c., for 31st Oct., 1857," pp. 17, 18.

58. Sir J. Kincaid in "Reports, &c., 31st Oct., 1856," p. 66.

59. A. Redgrave in "Rep. of Insp. of Fact., 31st. Oct., 1857," pp. 41-42. In those industries where the Factory Act proper (not the Print Works Act referred to in the text) has been in force for some time, the obstacles in the way of the education clauses have, in recent years, been overcome. In industries not under the Act, the views of Mr. J. Geddes, a glass manufacturer, still extensively prevail. He informed Mr. White, one of the Inquiry Commissioners: "As far as I can see, the greater amount of education which a part of the working-class has enjoyed for some years past is an evil. It is dangerous, because it makes them independent." ("Children's Empl. Comm., Fourth Report," Lond., 1865, p. 253.)

60. "Mr. E., a manufacturer ... informed me that he employed females exclusively at his power-looms ... gives a decided preference to married females, especially those who have families at home dependent on them for support; they are attentive, docile, more so than unmarried females, and are compelled to use their utmost exertions to procure the necessaries of life. Thus are the virtues, the peculiar virtues of the female character to be perverted to her injury – thus all that is most dutiful and tender in her nature is made a means of her bondage and suffering." (Ten Hours' Factory Bill. The Speech of Lord Ashley, March 15th, Lond., 1844, p. 20.)

61. "Since the general introduction of machinery, human nature has been forced far beyond its average strength." (Rob. Owen: "Observations on the Effects of the Manufacturing System," 2nd Ed., London, 1817.)

62. The English, who have a tendency to look upon the earliest form of appearance of a thing as the cause of its existence, are in the habit of attributing the long hours of work in factories to the extensive kidnapping of children, practised by capitalists in the infancy of the factory system, on workhouses and orphanages, by means of which robbery, unresisting material for exploitation was procured. Thus, for instance, Ficiden, himself a manufacturer, says: "It is evident that the long hours of work were brought about by the circumstance of so great a number of destitute children being supplied from different parts of the country, that the masters were independent of the hands, and that having once established the custom by means of the miserable materials they had procured in this way, they could impose it on their neighbours with the greater facility." (J. Ficiden: "The Curse of the Factory System," Lond., 1836, p. 11.) With reference to the labour of women, Saunders, the factory inspector, says in his report of 1844: "Amongst the female operatives there are some women who, for many weeks in succession, except for a few days, are employed from 6 a.m. till midnight, with less than 2 hours for meals, so that on 5 days of the week they have only 6 hours left out of the 24, for going to and from their homes and resting in bed."

63. "Occasion... injury to the delicate moving parts of metallic mechanism by inaction." (Ure, l.c., p. 281.)

64. The Manchester Spinner (*Times*, 26th Nov., 1862) before referred to says in relation to this subject: "It (namely, the "allowance for deterioration of machinery") is also intended to cover the loss which is constantly arising from the superseding of machines before they are worn out, by others of a new and better construction."

65. "It has been estimated, roughly, that the first individual of a newly-invented machine will cost about five times as much as the construction of the second." Babbage, l.c., p. 349.

66. "The improvements which took place not long ago in frames for making patent net were so great that a machine in good repair which had cost £1,200, sold a few years after for £60 ... improvements succeeded each other so rapidly, that machines which had never been finished were abandoned in the hands of their makers, because new improvements had superseded their utility." (Babbage, l.c., p. 233.) In these stormy, go-ahead times, therefore, the tulle manufacturers soon extended the working-day, by means of double sets of hands, from the original 8 hours to 24.

67. "It is self-evident, that, amid the ebbings and flowings of the markets and the alternate expansions and contractions of demand, occasions will constantly recur, in which the manufacturer may employ additional floating capital without employing additional fixed capital... if additional quantities of raw material can be worked up without incurring an additional expense for buildings and machinery." (R. Torrens: "On Wages and Combination." London, 1834, p. 64.)

68. This circumstance is mentioned only for the sake of completeness, for I shall not consider the rate of profit, i.e., the ratio of the surplus-value to the total capital advanced, until I come to the third book.

69. Senior, "Letters on the Factory Act." London, 1837, pp. 13, 14.

70. “The great proportion of fixed to circulating capital … makes long hours of work desirable.” With the increased use of machinery, &c., “the motives to long hours of work will become greater, as the only means by which a large proportion of fixed capital can be made profitable.” (l.c., pp. 11-13.) “There are certain expenses upon a mill which go on in the same proportion whether the mill be running short or full time, as, for instance, rent rates, and taxes, insurance against fire, wages of several permanent servants, deterioration of machinery, with various other charges upon a manufacturing establishment, the proportion of which to profits increases as the production decreases.” (“Rep. of Insp. of Fact. for 31st Oct., 1862,” p. 19.)

71. Why it is, that the capitalist, and also the political economists who are imbued with his views, are unconscious of this immanent contradiction, will appear from the first part of the third book.

72. It is one of the greatest merits of Ricardo to have seen in machinery not only the means of producing commodities, but of creating a “redundant population.”

73. F. Biese. “Die Philosophie des Aristoteles,” Vol. 2. Berlin, 1842, p. 408.

74. I give below the translation of this poem by Stolberg, because it brings into relief, quite in the spirit of former quotations referring to division of labour, the antithesis between the views of the ancients and the moderns. “Spare the hand that grinds the corn, Oh, miller girls, and softly sleep. Let Chanticleer announce the morn in vain! Deo has commanded the work of the girls to be done by the Nymphs, and now they skip lightly over the wheels, so that the shaken axles revolve with their spokes and pull round the load of the revolving stones. Let us live the life of our fathers, and let us rest from work and enjoy the gifts that the Goddess sends us.”

> “Schonet der mahlenden Hand, o Müllerinnen, und schlafet
> Sanft! es verkünde der Hahn euch den Morgen umsonst!
> Däo hat die Arbeit der Midchen den Nymphen befohlen,
> Und itzt hüpfen sic leicht über die Räder dahin,
> Daß die erschütterten Achsen mit ihren Speichen sich wälzen,
> Und im Kreise die Last drehen des wälzenden Steins.
> Laßt uns leben das Leben der Väter, und laBt uns der Gaben
> Arbeitslos uns freun, welche die Göttin uns schenkt.”
>
> (Gedichte aus dem Griechischen übersetzt von Christian Graf zu Stolberg, Hamburg, 1782.)

75. There are, of course, always differences, in the intensities of the labour in various industries. But these differences are, as Adam Smith has shown, compensated to a partial extent by minor circumstances, peculiar to each sort of labour. Labour-time, as a measure of value, is not, however, affected in this case, except in so far as the duration of labour, and the degree of its intensity, are two antithetical and mutually exclusive expressions for one and the same quantity of labour.

76. Especially by piece-work, a form we shall investigate in Part VI. of this book.

77. See “Rep. of lnsp. of Fact. for 31st October, 1865.”

78. Rep. of Insp. of Fact. for 1844 and the quarter ending 30th April, 1845, pp. 20-21.

79. l.c., p. 19. Since the wages for piece-work were unaltered, the weekly wages depended on the quantity produced.

80. l.c., p. 20.

81. The moral element played an important part in the above experiments. The workpeople told the factory inspector: “We work with more spirit, we have the reward ever before us of getting away sooner at night, and one active and cheerful spirit pervades the whole mill, from the youngest piecer to the oldest hand, and we can greatly help each other.” (l.c., p. 21.)

82. John Fielden, l.c., p. 32.

83. Lord Ashley, l.c., pp. 6-9, passim.

84. Rep. of Insp. of Fact. for Quarter ending 30th September, 1844, and from 1st October, 1844, to 30th April, 1845, p. 20.

85. l.c., p. 22.

86. “Rep. of lnsp. of Fact. for 31st October, 1862,” p. 62.

87. This was altered in the "Parliamentary Return" of 1862. In it the actual horse-power of the modern steam engines and water wheels appears in place of the nominal. The doubling spindles, too, are no longer included in the spinning spindles (as was the case in the "Returns" of 1839, 1850, and 1856); further, in the case of woollen mills, the number of "gigs" is added, a distinction made between jute and hemp mills on the one hand and flax mills on the other, and finally stocking-weaving is for the first time inserted in the report.

88. "Rep. of Insp. of Fact. for 31st October, 1856," pp. 13-14, 20 and 1852, p. 23.

89. l.c., pp. 14-15.

90. l.c., P. 20.

91. "Reports, &c., for 31st October, 1858," pp. 9-10. Compare "Reports, &c., for 30th April, 1860," p. 30, sqq.

92. "Reports of lnsp. of Fact. for 31st Oct., 1862," pp. 100 and 130.

93. On 2 modern power-looms a weaver now makes in a week of 60 hours 26 pieces of certain quality, length, and breadth; while on the old power-looms he could make no more than 4 such pieces. The cost of weaving a piece of such cloth had already soon after 1850 fallen from 2s. 9d. to 5 1/8d.

> "Thirty years ago (1841) one spinner with three placers was not required to attend to more than one pair of mules with 300-324 spindles. At the present time (1871) he has to mind with the help of 5 piecers 2,200 spindles, and produces not less than seven times as much yarn as in 1841." (Alex. Redgrave, Factory Inspector – in the *Journal of Arts*, 5th January, 1872.)

94. "Rep. of Insp. of Fact. for 31st Oct., 1861," pp. 25, 26.

95. The agitation for a working-day of 8 hours has now (1867) begun in Lancashire among the factory operatives.

96. The following few figures indicate the increase in the "factories" of the United Kingdom since 1848:

	Quantity Exported. **1848.**	Quantity Exported. **1851.**	Quantity Exported. **1860.**	Quantity Exported. **1865.**
COTTON				
Cotton yarn	lbs. 135,831,162	lbs. 143,966,106	lbs. 197,343,655	lbs. 103,751,455
Sewing thread	—	lbs. 4,392,176	lbs. 6,297,554	lbs. 4,648,611
Cotton cloth	yds. 1,091,373,930	yds. 1,543,161,789	yds. 2,776,218,427	yds. 2,015,237,851
FLAX & HEMP				
Yarn	lbs. 11,722,182	lbs. 18,841,326	lbs. 31,210,612	lbs. 36,777,334
Cloth	yds. 88,901,519	yds. 129,106,753	yds. 143,996,773	yds. 247,012.529
SILK				
Yarn	lbs. 466,825	lbs. 462,513	lbs. 897,402	lbs. 812,589
Cloth	—	yds. 1,181,455	yds. 1,307,293	yds. 2,869,837
WOOL				
Woollen and Worsted yarns	—	lbs. 14,670,880	lbs. 27,533,968	lbs. 31,669,267
Cloth	—	yds. 151,231,153	yds. 190,371,507	yds. 278,837,418

	Value Exported. **1848.**	Value Exported. **1851.**	Value Exported. **1860.**	Value Exported. **1865.**

	£	£	£	£
COTTON				
Yarn	5,927,831	6,634,026	9,870,875	10,351,049
Cloth	16,753,369	23,454,810	42,141,505	46,903,796
FLAX & HEMP				
Yarn	493,449	951,426	1,801,272	2,505,497
Cloth	2,802,789	4,107,396	4,804,803	9,155,358
SILK				
Yarn	77,789	196,380	826,107	768,064
Cloth	—	1,130,398	1,587,303	1,409,221
WOOL				
Yarn	776,975	1,484,544	3,843,450	5,424,047
Cloth	5,733,828	8,377,183	12,156,998	20,102,259

See the Blue books “Statistical Abstract of the United Kingdom,” Nos. 8 and 13. Lond., 1861 and 1866. In Lancashire the number of mills increased only 4 per cent. between 1839 and 1850; 19 per cent. between 1850 and 1856; and 33 per cent. between 1856 and 1862; while the persons employed in them during each of the above periods of It years increased absolutely, but diminished relatively. (See “Rep. of Insp. of Fact., for 31st Oct., 1862,” p. 63.) The cotton trade preponderates in Lancashire. We may form an idea of the stupendous nature of the cotton trade in that district when we consider that, of the gross number of textile factories in the United Kingdom, it absorbs 45.2 per cent., of the spindles 83.3 per cent., of the power-looms 81.4 per cent., of the mechanical horse-power 72.6 per cent., and of the total number of persons employed 58.2 per cent. (l.c., pp. 62-63.)

97. Ure, l.c., p. 18.

98. Ure, l.c., P. 3 1. See Karl Marx, l.c., pp. 140-141.

99. It looks very like intentional misleading by statistics (which misleading it would be possible to prove in detail in other cases too), when the English factory legislation excludes from its operation the class of labourers last mentioned in the text, while the parliamentary returns expressly include in the category of factory operatives, not only engineers, mechanics, &c., but also managers, salesmen, messengers, warehousemen, packers, &c., in short everybody, except the owner of the factory himself.

100. Ure grants this. He says, “in case of need,” the workmen can be moved at the will of the manager from one machine to another, and he triumphantly exclaims: “Such a change is in flat contradiction with the old routine, that divides the labour, and to one workman assigns the task of fashioning the head of a needle, to another the sharpening of the point.” He had much better have asked himself, why this “old routine” is departed from in the automatic factory, only “in case of need. “

101. When distress is very great, as, for instance, during the American Civil War, the factory operative is now and then set by the Bourgeois to do the roughest of work, such as road-making, &c.. The English “ateliers nationaux” [national workshops] of 1862 and the following years, established for the benefit of the destitute cotton operatives, differ from the French of 1848 in this, that in the latter the workmen had to do unproductive work at the expense of the state, in the former they had to do productive municipal work to the advantage of the bourgeois, and that, too, cheaper than the regular workmen, with whom they were thus thrown into competition. “The physical appearance of the cotton operatives is unquestionably improved. This I attribute ... as to the men, to outdoor labour on public works.” (“Rep. of Insp. of Fact., 31st Oct., 1863,” p. 59.) The writer here alludes to the Preston factory operatives, who were employed on Preston Moor.

102. An example: The various mechanical apparatus introduced since the Act of 1844 into woollen mills, for replacing the labour of children. So soon as it shall happen that the children of the manufacturers themselves have to go through a course of schooling as helpers in the mill, this almost unexplored territory of mechanics will soon make remarkable progress. “Of machinery, perhaps self-acting mules are as dangerous as any other kind. Most of the accidents from them happen to little children, from their creeping under the mules to sweep the floor whilst the mules are in motion. Several ‘minders’ have been fined for this offence, but without much general benefit. If machine makers would only invent a self-sweeper, by whose use the necessity for these little children to creep under the machinery might be

prevented, it would be a happy addition to our protective measures." ("Reports of Insp. of Fact. for 31st. Oct., 1866," p. 63.)

103. So much then for Proudhon's wonderful idea: he "construes" machinery not as a synthesis of instruments of labour, but as a synthesis of detail operations for the benefit of the labourer himself.

104. F. Engels, l.c., p. 217. Even an ordinary and optimist Free-trader, like Mr. Molinari, goes so far as to say, "Un homme s'use plus vite en surveillant, quinze heures par jour, l'évolution uniforme d'un mécanisme, qu'en exercant, dans le même espace de temps, sa force physique. Ce travail de surveillance qui servirait peut-être d'utile gymnastique à l'intelligence, s'il n'était pas trop prolongé, détruit à la longue, par son excès, et l'intelligence, et le corps même." [A man becomes exhausted more quickly when he watches over the uniform motion of mechanism for fifteen hours a day, than when he applies his physical strength over the same period of time. This labour of surveillance, which might perhaps serve as a useful exercise for the mind, if it did not go on too long, destroys both the mind and the body in the long run, through excessive application] (G. de Molinari: "Études Économiques." Paris, 1846.)

105. F. Engels, l.c., p. 216.

106. "The Master Spinners' and Manufacturers' Defence Fund. Report of the Committee." Manchester, 1854, p. 17. We shall see hereafter, that the "master" can sing quite another song, when he is threatened with the loss of his "living" automaton.

107. Ure, l.c., p. 15. Whoever knows the life history of Arkwright, will never dub this barber-genius "noble." Of all the great inventors of the 18th century, he was incontestably the greatest thiever of other people's inventions and the meanest fellow.

108. "The slavery in which the bourgeoisie has bound the proletariat, comes nowhere more plainly into daylight than in the factory system. In it all freedom comes to an end both at law and in fact. The workman must be in the factory at half past five. If he come a few minutes late, he is punished; if he come 10 minutes late, he is not allowed to enter until after breakfast, and thus loses a quarter of a day's wage. He must eat, drink and sleep at word of command.... The despotic bell calls him from his bed, calls him from breakfast and dinner. And how does he fare in the mill? There the master is the absolute law-giver. He makes what regulations he pleases; he alters and makes additions to his code at pleasure; and if he insert the veriest nonsense, the courts say to the workman: Since you have entered into this contract voluntarily, you must now carry it out .... These workmen are condemned to live, from their ninth year till their death, under this mental and bodily torture." (F. Engels, l.c., p. 217, sq.) What, "the courts say," I will illustrate by two examples. One occurs at Sheffield at the end of 1866. In that town a workman had engaged himself for 2 years in a steelworks. In consequence of a quarrel with his employer he left the works, and declared that under no circumstances would he work for that master any more. He was prosecuted for breach of contract, and condemned to two months' imprisonment. (If the master break the contract, he can be proceeded against only in a civil action, and risks nothing but money damages.) After the workman has served his two months, the master invites him to return to the works, pursuant to the contract. Workman says: No, he has already been punished for the breach. The master prosecutes again, the court condemns again, although one of the judges, Mr. Shee, publicly denounces this as a legal monstrosity, by which a man can periodically, as long as he lives, be punished over and over again for the same offence or crime. This judgment was given not by the "Great Unpaid," the provincial Dogberries, but by one of the highest courts of justice in London. — [Added *in the 4th German edition*. — *This* has now been done away with. With few exceptions, e.g., when public gas-works are involved, the worker in England is now put on an equal footing with the employer in case of breach of contract and can be sued only civilly. — F. E.] The second case occurs in Wiltshire at the end of November 1863. About 30 power-loom weavers, in the employment of one Harrup, a cloth manufacturer at Leower's Mill, Westbury Leigh, struck work because master Harrup indulged in the agreeable habit of making deductions from their wages for being late in the morning; 6d. for 2 minutes; 1s. for 3 minutes, and 1s. 6d. for ten minutes. This is at the rate of 9s. per hour, and £4 10s. 0d. per diem; while the wages of the weavers on the average of a year, never exceeded 10s. to 12s. weekly. Harrup also appointed a boy to announce the starting time by a whistle, which he often did before six o'clock in the morning: and if the hands were not all there at the moment the whistle ceased, the doors were closed, and those hands who were outside were fined: and as there was no clock on the premises, the unfortunate hands were at the mercy of the young Harrup-inspired time-keeper. The hands on strike, mothers of families as well as girls, offered to resume work if the timekeeper were replaced by a clock, and

a more reasonable scale of fines were introduced. Harrup summoned I9 women and girls before the magistrates for breach of contract. To the utter indignation of all present, they were each mulcted in a fine of 6d. and 2s. 6d. for costs. Harrup was followed from the court by a crowd of people who hissed him. A favourite operation with manufacturers is to punish the workpeople by deductions made from their wages on account of faults in the material worked on. This method gave rise in 1866 to a general strike in the English pottery districts. The reports of the Ch. Empl. Com. (1863-1866), give cases where the worker not only receives no wages, but becomes, by means of his labour, and of the penal regulations, the debtor to boot, of his worthy master. The late cotton crisis also furnished edifying examples of the sagacity shown by the factory autocrats in making deductions from wages. Mr. R. Baker, the Inspector of Factories, says, “I have myself had lately to direct prosecutions against one cotton mill occupier for having in these pinching and painful times deducted 10d. a piece from some of the young workers employed by him, for the surgeon’s certificate (for which he himself had only paid 6d.), when only allowed by the law to deduct 3d., and by custom nothing at all .... And I have been informed of another, who, in order to keep without the law, but to attain the same object, charges the poor children who work for him a shilling each, as a fee for learning them the art and mystery of cotton spinning, so soon as they are declared by the surgeon fit and proper persons for that occupation. There may therefore be undercurrent causes for such extraordinary exhibitions as strikes, not only wherever they arise, but particularly at such times as the present, which without explanation, render them inexplicable to the public understanding.” He alludes here to a strike of power-loom weavers at Darwen, June, 1863. (“Reports of Insp. of Fact. for 30 April, 1863,” pp. 50-51.) The reports always go beyond their official dates.

109. The protection afforded by the Factory Acts against dangerous machinery has had a beneficial effect. “But ... there are other sources of accident which did not exist twenty years since; one especially, viz., the increased speed of the machinery. Wheels, rollers, spindles and shuttles are now propelled at increased and increasing rates; fingers must be quicker and defter in their movements to take up the broken thread, for, if placed with hesitation or carelessness, they are sacrificed.... A large number of accidents are caused by the eagerness of the workpeople to get through their work expeditiously. It must be remembered that it is of the highest importance to manufacturers that their machinery should be in motion, i.e., producing yarns and goods. Every minute’s stoppage is not only a loss of power, but of production, and the workpeople are urged by the overlookers, who are interested in the quantity of work turned off, to keep the machinery in motion, and it is no less important to those of the operatives who are paid by the weight or piece, that the machines should be kept in motion. Consequently, although it is strictly forbidden in many, nay in most factories, that machinery should be cleaned while in motion, it is nevertheless the constant practice in most, if not in all, that the workpeople do, unreproved, pick out waste, wipe rollers and wheels, &c., while their frames are in motion. Thus from this cause only, 906 accidents have occurred during the six months.... Although a great deal of cleaning is constantly going on day by day, yet Saturday is generally the day set apart for the thorough cleaning of the machinery, and a great deal of this is done while the machinery is in motion.” Since cleaning is not paid for, the workpeople seek to get done with it as speedily as possible. Hence “the number of accidents which occur on Fridays, and especially on Saturdays, is much larger than on any other day. On the former day the excess is nearly 12 per cent. over the average number of the four first days of the week, and on the latter day the excess is 25 per cent. over the average of the preceding five days; or, if the number of working-hours on Saturday being taken into account — 7½ hours on Saturday as compared with 10½ on other days — there is an excess of 65 per cent. on Saturdays over the average of the other five days.” (“Rep. of Insp. of Fact., 31st Oct., 1866,” pp. 9, 15, 16, 17.)

110. In Part I. of Book III. I shall give an account of a recent campaign by the English manufacturers against the Clauses in the Factory Acts that protect the “hands” against dangerous machinery. For the present, let this one quotation from the official report of Leonard Horner suffice: “I have heard some mill-owners speak with inexcusable levity of some of the accidents; such, for instance, as the loss of a finger being a trifling matter. A working-man’s living and prospects depend so much upon his fingers, that any loss of them is a very serious matter to him. When I have heard such inconsiderate remarks made, I have usually put this question: Suppose you were in want of an additional workman, and two were to apply, both equally well qualified in other respects, but one had lost a thumb or a forefinger, which would you engage? There never was a hesitation as to the answer....” The manufacturers have “mistaken prejudices against what they have heard represented as a pseudo-philanthropic legislation.” (“Rep. of Insp. of Fact., 31st Oct., 1855.") These manufacturers are clever folk, and not without reason were they enthusiastic for

the slave-holders' rebellion.

111. In those factories that have been longest subject to the Factory Acts, with their compulsory limitation of the hours of labour, and other regulations, many of the older abuses have vanished. The very improvement of the machinery demands to a certain extent "improved construction of the buildings," and this is an advantage to the workpeople. (See "Rep. of Insp. of Fact. for 31st Oct., 1863," p. 109.)

112. See amongst others, John Houghton: "Husbandry and Trade Improved." London, 1727. "The Advantages of the East India Trade, 1720." John Bellers, l.c. "The masters and their workmen are, unhappily, in a perpetual war with each other. The invariable object of the former is to get their work done as cheaply as possible; and they do not fail to employ every artifice to this purpose, whilst the latter are equally attentive to every occasion of distressing their masters into a compliance with higher demands." ("An Enquiry into the Causes of the Present High Price of Provisions," pp. 61-62. Author, the Rev. Nathaniel Forster, quite on the side of the workmen.)

113. In old-fashioned manufactures the revolts of the workpeople against machinery, even to this day, occasionally assume a savage character, as in the case of the Sheffield file cutters in 1865.

114. Sir James Steuart also understands machinery quite in this sense. "Je considère donc les machines comme des moyens d'augmenter (virtuellement) le nombre des gens industrieux qu'on n'est pas obligé de nourrir.... En quoi l'effet d'une machine diffère-t-il de celui de nouveaux habitants?" (French trans. t. I., l. I., ch. XIX.) More naïve is Petty, who says, it replaces "Polygamy." The above point of view is, at the most, admissible only for some parts of the United States. On the other hand, "machinery can seldom be used with success to abridge the labour of an individual; more time would be lost in its construction than could be saved by its application. It is only really useful when it acts on great masses, when a single machine can assist the work of thousands. It is accordingly in the most populous countries, where there are most idle men, that it is most abundant.... It is not called into use by a scarcity of men, but by the facility with which they can be brought to work in masses." (Piercy Ravenstone: "Thoughts on the Funding System and its Effects." London, 1824, p. 45.)

115. *[Note in the 4th German edition.*— This applies to Germany too. Where in our country agriculture on a large scale exists, hence particularly in the East, it has become possible only in consequence of the clearing of the estates ("Bauernlegen"), a practice which became widerspread in the 16th century and was particularly so since 1648. — *F. E.*]

116. "Machinery and labour are in constant competition." Ricardo, l.c., p. 479.

117. The competition between hand-weaving and power-weaving in England, before the passing of the Poor Law of 1833, was prolonged by supplementing the wages, which had fallen considerably below the minimum, with parish relief. "The Rev. Mr. Turner was, in 1827, rector of Wilmslow in Cheshire, a manufacturing district. The questions of the Committee of Emigration, and Mr. Turner's answers, show how the competition of human labour is maintained against machinery. 'Question: Has not the use of the power-loom superseded the use of the hand-loom? Answer: Undoubtedly; it would have superseded them much more than it has done, if the hand-loom weavers were not enabled to submit to a reduction of wages.' 'Question: But in submitting he has accepted wages which are insufficient to support him, and looks to parochial contribution as the remainder of his support? Answer: Yes, and in fact the competition between the hand-loom and the power-loom is maintained out of the poor-rates.' Thus degrading pauperism or expatriation, is the benefit which the industrious receive from the introduction of machinery, to be reduced from the respectable and in some degree independent mechanic, to the cringing wretch who lives on the debasing bread of charity. This they call a temporary inconvenience." ("A Prize Essay on the Comparative Merits of Competition and Co-operation." Lond., 1834, p. 29.)

118. "The same cause which may increase the revenue of the country" (i.e., as Ricardo explains in the same passage, the revenues of landlords and capitalists, whose wealth, from the economic point of view, forms the Wealth of the Nation), "may at the same time render the population redundant and deteriorate the condition of the labourer." (Ricardo, l.c., p. 469.) "The constant aim and the tendency of every improvement in machinery is, in fact, to do away entirely with the labour of man, or to lessen its price by substituting the labour of women and children for that of grown-up men, or of unskilled for that of skilled workmen." (Ure, l.c., t. I., p. 35.)

119. "Rep. Insp. Fact. for 31st October, 1858," p. 43.

120. “Rep. lnsp. Fact. for 31st October, 1856,” p. 15.

121. Ure, l.c., p. 19. “The great advantage of the machinery employed in brick-making consists in this, that the employer is made entirely independent of skilled labourers.” (“Ch. Empl. Comm. V. Report,” Lond., 1866, p. 130, n. 46.) Mr. A. Sturrock, superintendent of the machine department of the Great Northern Railway, says, with regard to the building of locomotives, &c.: “Expensive English workmen are being less used every day. The production of the workshops of England is being increased by the use of improved tools and these tools are again served by a low class of labour.... Formerly their skilled labour necessarily produced all the parts of engines. Now the parts of engines are produced by labour with less skill, but with good tools. By tools, I mean engineer’s machinery, lathes, planing machines, drills, and so on.” (“Royal Com. on Railways,” Lond., 1867, Minutes of Evidence, n. 17, 862 and 17, 863.)

122. Ure, l.c., p. 20.

123. Ure, l.c., p. 321.

124. Ure, l.c., p. 23.

125. “Rep. Insp. Fact., 31st Oct., 1863,” pp. 108,109.

126. l.c., p. 109. The rapid improvement of machinery, during the crisis, allowed the English manufacturers, immediately after the termination of the American Civil War, and almost in no time, to glut the markets of the world again. Cloth, during the last six months of 1866, was almost unsaleable. Thereupon began the consignment of goods to India and China, thus naturally making the glut more intense. At the beginning of 1867 the manufacturers resorted to their usual way out of the difficulty, viz., reducing wages 5 per cent. The workpeople resisted, and said that the only remedy was to work short time, 4 days a-week; and their theory was the correct one. After holding out for some time, the self-elected captains of industry had to make up their minds to short time, with reduced wages in some places, and in others without.

127. “The relation of master and man in the blown-flint bottle trades amounts to a chronic strike.” Hence the impetus given to the manufacture of pressed glass, in which the chief operations are done by machinery. One firm in Newcastle, who formerly produced 350,000 lbs. of blown-flint glass, now produces in its place 3,000,500 lbs. of pressed glass. (“Ch. Empl. Comm., Fourth Rep.,” 1865, pp. 262-263.)

128. Gaskell. “The Manufacturing Population of England,” London, 1833, pp. 3, 4.

129. W. Fairbairn discovered several very important applications of machinery to the construction of machines, in consequence of strikes in his own workshops.

130. Ure, l.c., pp. 368-370

131. Ure, l.c., pp. 368, 7, 370, 280, 281, 321, 370, 475.

132. Ricardo originally was also of this opinion, but afterwards expressly disclaimed it with the scientific impartiality and love of truth characteristic of him. See l.c., ch. xxxi. “On Machinery.”

133. *Nota bene.* My illustration is entirely on the lines of those given by the above named economists.

134. A disciple of Ricardo, in answer to the insipidities of J. B. Say, remarks on this point: “Where division of labour is well developed, the skill of the labourer is available only in that particular branch in which it has been acquired; he himself is a sort of machine. It does not therefore help matters one jot, to repeat in parrot fashion, that things have a tendency to find their level. On looking around us we cannot but see, that they are unable to find their level for a long time; and that when they do find it, the level is always lower than at the commencement of the process.” (“An Inquiry into those Principles Respecting the Nature of Demand,” &c., Lond. 1821, p. 72.)

135. MacCulloch, amongst others, is a past master in this pretentious cretinism. “If,” he says, with the affected naïveté of a child of 8 years, “if it be advantageous, to develop the skill of the workman more and more, so that he is capable of producing, with the same or with a less quantity of labour, a constantly increasing quantity of commodities, it must also be advantageous, that he should avail himself of the help of such machinery as will assist him most effectively in the attainment of this result.” (MacCulloch: “Princ. of Pol. Econ.,” Lond. 1830, p. 166.)

136. “The inventor of the spinning machine has ruined India, a fact, however, that touches us but little.” A. Thiers: De la propriété. — M. Thiers here confounds the spinning machine with the power-loom, “a fact,

however, that touches us but little."

137. According to the census of 1861 (Vol. II., Lond., 1863), the number of people employed in coal mines in England and Wales, amounted to 246,613 of which 73,545 were under, and 173,067 were over 20 years. Of those under 20, 835 were between 5 and 10 years, 30,701 between 10 and 15 years, 42,010 between 15 and 19 years. The number employed in iron, copper, lead, tin, and other mines of every description, was 319, 222.

138. In England and Wales, in 1861, there were employed in making machinery, 60,807 persons, including the masters and their clerks, &c., also all agents and business people connected with this industry, but excluding the makers of small machines, such as sewing-machines, &c., as also the makers of the operative parts of machines, such as spindles. The total number of civil engineers amounted to 3,329.

139. Since iron is one of the most important raw materials; let me here state that, in 1861, there were in England and Wales 125,771 operative iron founders, of whom 123,430 were males, 2,341 females. Of the former 30,810 were under, and 92,620 over 20 years.

140. "A family of four grown-up persons, with two children as winders, earned at the end of the last, and the beginning of the present century, by ten hours' daily labour, £4 a week. If the work was very pressing, they could earn more.... Before that, they had always suffered from a deficient supply of yarn." (Gaskell, l.c., pp. 25-27.)

141. F. Engels, in "Lage, &c.," points out the miserable condition of a large number of those who work on these very articles of luxury. See also numerous instances in the "Reports of the Children's Employment Commission."

142. In 1861, in England and Wales, there were 94,665 sailors in the merchant service.

143. Of these only 177,596 are males above 13 years of age.

144. Of these, 30,501 are females.

145. Of these, 137,447 males. None are included in the 1,208,648 who do not serve in private houses. Between 1861 and 1870 the number of male servants nearly doubled itself. It increased to 267,671. In the year 1847 there were 2,694 gamekeepers (for the landlords' preserves), in 1869 there were 4,921. The young servant girls in the houses of the London lower middle class are in common parlance called "slaveys."

146. Ganilh, on the contrary, considers the final result of the factory system to be an absolutely less number of operatives, at whose expense an increased number of "gens honnêtes" live and develop their well-known "perfectibilité perfectible." Little as he understands the movement of production, at least he feels, that machinery must needs be a very fatal institution, if its introduction converts busy workmen into paupers, and its development calls more slaves of labour into existence than it has suppressed. It is not possible to bring out the cretinism of his standpoint, except by his own words: "Les classes condamnées à produire et à consommer diminuent, et les classes qui dirigent le travail, qui soulagent, consolent, et éclairent toute la population, se multiplient ... et s'approprient tous les bienfaits qui résultent de la diminution des frais du travail, de l'abondance des productions, et du bon marché des consommations. Dans cette direction, l'espéce humaine s'élève aux plus hautes conceptions du génie, pénètre dans les profoundeurs mystérieuses de la religion, établit les principes salutaires de la morale (which consists in 's'approprier tous les beinfaits,' &c.), les lois tutélaires de la liberté (liberty of 'les classes condamnées à produire?') et du pouvoir, de l'obéissance et de la justice, du devoir et de la l'humanité." [The classes condemned to produce and to consume diminish, and the classes which direct labour, which relieve, console and enlighten the whole population, multiply ... and appropriate all the benefits which result from the diminution of the costs of labour, from the abundance of products and the cheapness of consumer goods. In this way, the human species rises to the highest creations of genius, penetrates the mysterious depths of religion, and establishes the salutory principles of morality, the laws for the protection of liberty, and power, of obedience and justice, of obligation and humanity] For this twaddle, see "Des Systèmes d'Economie Politique, &c., Par M. Ch. Ganilh," 2ème ed., Paris, 1821, t. I, p. 224, and see p. 212.

147. "Reports of Insp. of Fact., 31 Oct., 1865," p. 58, sq. At the same time, however, means of employment for an increased number of hands was ready in 110 new mills with 11,625 looms, 628,576 spindles and 2,695 total horse-power of steam and water (l.c.).

148. “Reports, &c., for 31 Oct., 1862,” p. 79. At the end of 1871, Mr. A. Redgrave, the factory inspector, in a lecture given at Bradford, in the New Mechanics’ Institution, said: “What has struck me for some time past is the altered appearance of the woollen factories. Formerly they were filled with women and children, now machinery seems to do all the work. At my asking for an explanation of this from a manufacturer, he gave me the following: ‘Under the old system I employed 63 persons; after the introduction of improved machinery I reduced my hands to 33, and lately, in consequence of new and extensive alterations, I have been in a position to reduce those 33 to 13’.”

149. See “Reports, &c., 31 Oct., 1856,” p. 16.

150. “The sufferings of the hand-loom weavers were the subject of an inquiry by a Royal Commission, but although their distress was acknowledged and lamented, the amelioration of their condition was left, and probably necessarily so, to the chances and changes of time, which it may now be hoped” [20 years later!] “have nearly obliterated those miseries, and not improbably by the present great extention of the power-loom.” (“Rep. Insp. of Fact., 31 Oct., 1856,” p. 15.)

151. Other ways in which machinery affects the production of raw material will be mentioned in the third book.

152.

EXPORT OF COTTON FROM INDIA TO GREAT BRITAIN.	
1846. —	34,540,143 lbs.
1860. —	204,141,168 lbs.
1865. —	445,947,600 lbs.
EXPORT OF WOOL FROM INDIA TO GREAT BRITAIN.	
1846. —	4,570,581 lbs.
1860. —	20,214,173 lbs.
1865. —	20,679,111 lbs.

153.

EXPORT OF WOOL FROM THE CAPE TO GREAT BRITAIN.	
1846. —	2,958,457 lbs.
1860. —	16,574,345 lbs.
1865. —	29,920,623 lbs.
EXPORT OF WOOL FROM AUSTRALIA TO GREAT BRITAIN.	
1846. —	21,789,346 lbs.
1860. —	59,166,616 lbs.
1865. —	109,734,261 lbs.

154. The economic development of the United States is itself a product of European, more especially of English modern industry. In their present form (1866) the States must still be considered a European colony. [*Added in the 4th German edition. — “Since then they have developed into country whose industry holds second place in the world, without on that account entirely losing their colonial character.” — F. E.*]

EXPORT OF COTTON FROM THE UNITED STATES TO GREAT BRITAIN	
1846. —	401,949,393 lbs.
1852. —	765,630,543 lbs.
1859. —	961,707,264 lbs.

1860. —	1,115,890,608 lbs.

EXPORT OF CORN, &c., FROM THE UNITED STATES TO GREAT BRITAIN 1862		
Wheat, cwts	16,202,312	41,033,503
Barley, cwts	3,669,653	6,624,800
Oats, cwts	3,174,801	4,496,994
Rye, cwts	388,749	7,108
Flour, cwts	3,819,440	7,207,113
Buckwheat, cwts	1,054	19,571
Maize, cwts	5,473,161	11,694,818
Bere or Bigg (a sort of Barley), cwts	2,039	7,675
Peas, cwts	811,620	1,024,722
Beans, cwts	1,822,972	2,037,137
Total exports	—	74,083,441

156. In an appeal made in July, 1866, to the Trade Societies of England, by the shoemakers of Leicester, who had been thrown on the streets by a lock-out, it is stated: “Twenty years ago the Leicester shoe trade was revolutionised by the introduction of riveting in the place of stitching. At that time good wages could be earned. Great competition was shown between the different firms as to which could turn out the neatest article. Shortly afterwards, however a worse kind of competition sprang up, namely, that of underselling one another in the market. The injurious consequences soon manifested themselves in reductions of wages, and so sweepingly quick was the fall in the price of labour, that many firms now pay only one half of the original wages. And yet, though wages sink lower and lower, profits appear, with each alteration in the scale of wages, to increase.” Even bad times are utilised by the manufacturers, for making exceptional profits by excessive lowering of wages, i.e., by a direct robbery of the labourer’s means of subsistence. One example (it has reference to the crisis in the Coventry silk weaving): “From information I have received from manufacturers as well as workmen, there seems to be no doubt that wages have been reduced to a greater extent than either the competition of the foreign producers, or other circumstances have rendered necessary ... the majority of weavers are working at a reduction of 30 to 40 per cent. in their wages. A piece of ribbon for making which the weaver got 6s. or 7s. five years back, now only brings them 3s. 3d. or 3s. 6d.; other work is now priced at 2s. and 2s. 3d. which was formerly priced at 4s. and 4s. 3d. The reduction in wage seems to have been carried to a greater extent than is necessary for increasing demand. Indeed, the reduction in the cost of weaving, in the case of many descriptions of ribbons, has not been accompanied by any corresponding reduction in the selling price of the manufactured article.” (Mr. F. D. Longe’s Report. “Ch. Emp. Com., V. Rep., 1866,” p. 114, 1.)

157. Conf “Reports of Insp. of Fact., 31st October, 1862,” p. 30.

158. l.c., p. 19.

159. “Rep. Insp. of Fact., 31st October, 1863,” pp. 41-45.

160. l.c., pp. 41-42

161. l.c., p. 57.

162. l.c., pp. 50-51.

163. l.c., pp. 62-63.

164. “Rep. &c., 30th April, 1864,” p. 27.

165. From a letter of Mr. Harris, Chief Constable of Bolton, in “Rep. of Insp. of Fact., 31st October, 1865,” pp. 61-62.

166. In an appeal, dated 1863, of the factory operatives of Lancashire, &c., for the purpose of forming a society for organised emigration, we find the following: “That a large emigration of factory workers is now absolutely essential to raise them from their present prostrate condition, few will deny; but to show that a

continuous stream of emigration is at all times demanded, and, without which it is impossible for than to maintain their position in ordinary times, we beg to call attention to the subjoined facts: — In 1814 the official value of cotton goods exported was £17,665,378, whilst the real marketable value was £20,070,824. In 1858 the official value of cotton goods exported, was £182,221,681; but the real or marketable value was only £43,001,322, being a ten-fold quantity sold for little more than double the former price. To produce results so disadvantageous to the country generally, and to the factory workers in particular, several causes have cooperated, which, had circumstances permitted, we should have brought more prominently under your notice; suffice it for the present to say that the most obvious one is the constant redundancy of labour, without which a trade so ruinous in its effects never could have been carried on, and which requires a constantly extending market to save it from annihilation. Our cotton mills may be brought to a stand by the periodical stagnations of trade, which, under present arrangements, are as inevitable as death itself; but the human mind is constantly at work, and although we believe we are under the mark in stating that six millions of persons have left these shores during the last 25 years, yet, from the natural increase of population, and the displacement of labour to cheapen production, a large percentage of the male adults in the most prosperous times find it impossible to obtain work in factories on any conditions whatever." ("Reports of Insp. of Fact., 30th April 1863," pp. 51-52.) We shall, in a later chapter, see how our friends, the manufacturers, endeavoured, during the catastrophe in the cotton trade, to prevent by every means, including State interference, the emigration of the operatives.

167. "Ch. Empt. Comm. III. Report, 1864," p. 108, n. 447.

168. In the United States the restoration, in this way, of handicrafts based on machinery is frequent; and therefore, when the inevitable transition to the factory system shall take place, the ensuing concentration will, compared with Europe and even with England, stride on in seven-league boots.

169. See "Rep. of Insp. of Fact., 31st Oct., 1865," p. 64.

170. Mr. Gillott erected in Birmingham the first steel-pen factory on a large scale. It produced, so early as 1851, over 180,000,000 of pens yearly, and consumed 120 tons of steel. Birmingham has the monopoly of this industry in the United Kingdom, and at present produces thousands of millions of steel-pens. According to the Census of 1861, the number of persons employed was 1,428, of whom 1,268 females from 5 years of age upwards.

171. "Ch. Empl. Comm. II. Rep. 1864," p. LXVIII., n. 415.

172. And now forsooth children are employed at file-cutting in Sheffield.

173. "Ch. Empl. Comm., V. Rep. 1866," p. 3, n. 24; p. 6, n. 55, 56; p. 7, n. 59, 60.

174. l.c., pp. 114, 115, n. 6, 7. The commissioner justly remarks that though as a rule machines take the place of men, here literally young persons replace machines.

175. See the Report on the rag trade, and numerous details in "Public Health, VIII. Rep." Lond. 1866, app., pp. 196, 208.

176. "Ch. Empl. Comm. V. Rep., 1866," pp. xvi-xviii, n. 86-97, and pp. 130-133, n. 39-71. See also III. Rep., 1864, pp. 48, 56.

177. "Public Health. Sixth Rep.," Lond. 1864, pp. 29, 31.

178. l.c., p. 30. Dr. Simon remarks that the mortality among the London tailors and printers between the ages of 25 and 35 is in fact much greater, because the employers in London obtain from the country a great number of young people up to 30 years of age, as "apprentices" and "improvers," who come for the purpose of being perfected in their trade. These figure in the census as Londoners, they swell out the number of heads on which the London death-rate is calculated, without adding proportionally to the number of deaths in that place. The greater part of them in fact return to the country, and especially in cases of severe illness. (l.c.)

179. I allude here to hammered nails, as distinguished from nails cut out and made by machinery. See "Child. Empl. Comm., Third Rep.," pp. xi., xix., n. 125-130, p. 52, n. 11, p. 114, n. 487, p. 137, n. 674.

180. "Ch. Empl. Comm., II. Rep.," p. xxii, n. 166.

181. "Ch. Empl. Comm., II. Rep., 1864," pp. xix., xx., xxi.

182. l.c., pp. xxi.. xxii.

183. l.c., pp. xxix., xxx.

184. l.c., pp. xi., xii.

185. "Child. Empl. Comm., I. Rep. 1863," p. 185.

186. In England millinery and dressmaking are for the most part carried on, on the premises of the employer, partly by workwomen who live there, partly by women who live off the premises.

187. Mr. White, a commissioner, visited a military clothing manufactory that employed 1,000 to 1,200 persons, almost all females, and a shoe manufactory with 1,300 persons; of these nearly one half were children and young persons.

188. An instance. The weekly report of deaths by the Registrar-General dated 26th Feb., 1864, contains 5 cases of death from starvation. On the same day *The Times* reports another case. Six victims of starvation in one week!

189. "Child. Empl. Comm., Second Rep., 1864," p. lxvii., n. 406-9, p. 84, n. 124, p. lxxiii, n. 441, p. 68, n. 6, p. 84, n. 126, p. 78, n. 85, p. 76, n. 69, p. lxxii, n. 483.

190. "The rental of premises required for workrooms seems the element which ultimately determines the point; and consequently it is in the metropolis, that the old system of giving work out to small employers and families has been longest retained, and earliest returned to." (l.c., p. 83, n. 123.) The concluding statement in this quotation refers exclusively to shoemaking.

191. In glove-making and other industries where the condition of the work-people is hardly distinguishable from that of paupers, this does not occur.

192. l.c., p. 83, n. 122.

193. In the wholesale boot and shoe trade of Leicester alone, there were in 1864, 800 sewing-machines already in use.

194. l.c., p. 84, n. 124.

195. Instances: The Army Clothing Depot at Pimlico, London, the Shirt factory of Tillie and Henderson at Londonderry, and the clothes factory of Messrs. Tait at Limerick which employs about 1,200 hands.

196. "Tendency to Factory System" (l.c., p. lxvii). "The whole employment is at this time in a state of transition, and is undergoing the same Change as that effected in the lace trade, weaving, &c." (l.c., n. 405.) "A complete revolution" (l.c., p. xlvi., n. 318). At the date of the Child. Empl. Comm. of 1840 stocking making was still done by manual labour. Since 1846 various sorts of machines have been introduced, which are now driven by steam. The total number of persons of both sexes and of all ages from 3 years upwards, employed in stocking making in England, was in 1862 about 129,000. Of these only 4,063 were, according to the Parliamentary Return of the 11th February, 1862, working under the Factory Acts.

197. Thus, e.g., in the earthenware trade, Messrs. Cochrane, of the Britain Pottery, Glasgow, report: "To keep up our quantity we have gone extensively into machines wrought by unskilled labour, and every day convinces us that we can produce a greater quantity than by the old method." ("Rep. of Insp. of Fact., 31st Oct., 1865," p. 13.) "The effect of the Fact. Acts is to force on the further introduction of machinery" (l.c., pp. 13-14).

198. Thus, after the extension of the Factory Act to the potteries, great increase of powerjiggers in place of hand-moved jiggers.

199. "Report of lnsp. of Fact., 31st Oct., 1865," pp. 96 and 127.

200. The introduction of this and other machinery into match-making caused in one department alone 230 young persons to be replaced by 32 boys and girls of 14 to 17 years of age. This saving in labour was carried still further in 1865, by the employment of steam power.

201. "Ch. Empl. Comm., 11. Rep., 1864," p. ix., n. 50.

202. "Rep. of Insp. of Fact., 31st Oct., 1865," p..22.

203. "But it must be borne in mind that those improvements, though carried out fully in some establishments, are by no means general, and are not capable of being brought into use in many of the old manufactories without an expenditure of capital beyond the means of many of the present occupiers." "I cannot but rejoice," writes Sub-Insp. May, "that notwithstanding the temporary disorganisation which

inevitably follows the introduction of such a measure (as the Factory Act Extension Act), and is, indeed, directly indicative of the evils which it was intended to remedy, &c." (Rep. of Insp. of Fact., 31st Oct., 1865.)

204. With blast furnaces, for instance, "work towards the end of the week being generally much increased in duration in consequence of the habit of the men of idling on Monday and occasionally during a part or the whole of Tuesday also." ("Child. Empl. Comm., III. Rep.," p. vi.) "The little masters generally have very irregular hours. They lose two or three days, and then work all night to make it up.... They always employ their own children, if they have any." (l.c., p. vii.) "The want of regularity in coming to work, encouraged by the possibility and practice of making up for this by working longer hours." (l.c., p. xviii.) "In Birmingham ... an enormous amount of time is lost ... idling part of the time, slaving the rest." (l.c., p. xi.)

205. "Child. Empl. Comm., IV., Rep.," p. xxxii., "The extension of the railway system is said to have contributed greatly to this custom of giving sudden orders, and the consequent hurry, neglect of meal-times, and late hours of the workpeople." (l.c., p. xxxi.)

206. "Ch. Empl. Comm, IV. Rep.," pp. xxxv., n. 235, 237.

207. "Ch. Empl. Comm. IV. Rep.," p. 127, n. 56.

208. "With respect to the loss of trade by non-completion of shipping orders in time, I remember that this was the pet argument of the factory masters in 1832 and 1833. Nothing that can be advanced now on this subject, could have the force that it had then, before steam had halved all distances and established new regulations for transit. It quite failed at that time of proof when put to the test, and again it will certainly fail should it have to be tried." ("Reports of Insp. of Fact., 31 Oct., 1862," pp. 54, 55.)

208a. "Ch. Empl. Comm. IV. Rep.," p. xviii, n. 118.

208b. John Bellers remarked as far back as 1699: "The uncertainty of fashions does increase necessitous poor. It has two great mischiefs in it. 1st, The journeymen are miserable in winter for want of work, the mercers and master-weavers not daring to lay out their stocks to keep the journeymen employed before the spring comes, and they know what the fashion will then be; 2ndly, In the spring the journeymen are not sufficient, but the master-weavers must draw in many prentices, that they may supply the trade of the kingdom in a quarter or half a year, which robs the plough of hands, drains the country of labourers, and in a great part stocks the city with beggars, and starves some in winter that are ashamed to beg." ("Essays about the Poor, Manufactures, &c.," p. 9.)

209. "Ch. Empl. Comm. V. Rep.," p. 171, n. 34.

210. The evidence of some Bradford export-houses is as follows: "Under these circumstances, it seems clear that no boys need be worked longer than from 8 a.m. to 7 or 7.30 p.m., in making up. It is merely a question of extra hands and extra outlay. If some masters were not so greedy, the boys would not work late; an extra machine costs only £16 or £18; much of such over-time as does occur is to be referred to an insufficiency of appliances, and a want of space." "Ch. Empl, Comm. V. Rep.," p. 171, n. 35, 36, 38.

211. l.c. A London manufacturer, who in other respects looks upon the compulsory regulation of the hours of labour as a protection for the workpeople against the manufacturers, and for the manufacturers themselves against the wholesale trade, states: "The pressure in our business is caused by the shippers, who want, e.g., to send the goods by sailing vessel so as to reach their destination at a given season, and at the same time want to pocket the difference in freight between a sailing vessel and a steamship, or who select the earlier of two steamships in order to be in the foreign market before their competitors."

212. "This could be obviated," says a manufacturer, "at the expense of an enlargement of the works under the pressure of a General Act of Parliament." l.c., p. x., n. 38.

213. l.c., p. xv., n. 72. sqq.

214. "Rep. Insp. Fact., 31st October, 1865," p. 127.

215. It has been found out by experiment, that with each respiration of average intensity made by a healthy average individual, about 25 cubic inches of air are consumed, and that about 20 respirations are made in each minute. Hence the air inhaled in 24 hours by each individual is about 720,000 cubic inches, or 416 cubic feet. It is clear, however, that air which has been once breathed, can no longer serve for the same process until it has been purified in the great workshop of Nature. According to the experiments of Valentin and Brunner, it appears that a healthy man gives off about 1,300 cubic inches of carbonic acid per

hour; this would give about 8 ounces of solid carbon thrown off from the lungs in 24 hours. “Every man should have at least 800 cubic feet.” (Huxley.)

216. According to the English Factory Act, parents cannot send their children under 14 years of age into Factories under the control of the Act, unless at the same time they allow them to receive elementary education. The manufacturer is responsible for compliance with the Act. “Factory education is compulsory, and it is a condition of labour.” (“Rep. Insp. Fact., 31st Oct., 1865,” p. 111.)

217. On the very advantageous results of combining gymnastics (and drilling in the case of boys) with compulsory education for factory children and pauper scholars, see the speech of N. W. Senior at the seventh annual congress of “The National Association for the Promotion of Social Science,” in “Report of Proceedings, &c.,” Lond. 1863, pp. 63, 64, also the “Rep. Insp. Fact., 31st Oct., 1865,” pp. 118, 119, 120, 126, sqq.

218. “Rep. Insp. Fact., 31st Oct., 1865,” p. 118. A silk manufacturer naively states to the Children’s Employment Commissioners: “I am quite sure that the true secret of producing efficient workpeople is to be found in uniting education and labour from a period of childhood. Of course the occupation must not be too severe, nor irksome, or unhealthy. But of the advantage of the union I have no doubt. I wish my own children could have some work as well as play to give variety to their schooling.” (“Ch. Empl. Comm. V. Rep.,” p. 82, n. 36.)

219. Senior, l.c., p. 66. How modern industry, when it has attained to a certain pitch, is capable, by the revolution it effects in the mode of production and in the social conditions of production, of also revolutionising people’s minds, is strikingly shown by a comparison of Senior’s speech in 1863, with his philippic against the Factory Act of 1833; or by a comparison, of the views of the congress above referred to, with the fact that in certain country districts of England poor parents are forbidden, on pain of death by starvation, to educate their children. Thus, e.g., Mr. Snell reports it to be a common occurrence in Somersetshire that, when a poor person claims parish relief, he is compelled to take his children from school. Mr. Wollarton, the clergyman at Feltham, also tells of cases where all relief was denied to certain families “because they were sending their children to school!”

220. Wherever handicraft-machines, driven by men, compete directly or indirectly with more developed machines driven by mechanical power, a great change takes place with regard to the labourer who drives the machine. At first the steam-engine replaces this labourer, afterwards he must replace the steam-engine. Consequently the tension and the amount of labour-power expended become monstrous, and especially so in the case of the children who are condemned to this torture. Thus Mr. Longe; one of the commissioners, found in Coventry and the neighbourhood boys of from 10 to 15 years employed in driving the ribbon-looms, not to mention younger children who had to drive smaller machines. “It is extraordinarily fatiguing work. The boy is a mere substitute for steam power.” (“Ch. Empl. Comm. V, Rep. 1866;” p. 114, n. 6.) As to the fatal consequences of “this system of slavery,” as the official report styles it, see l.c., p. 114 sqq.

221. l.c., p. 3, n. 24.

222. l.c., P. 7, n. 60.

223. “In some parts of the Highlands of Scotland, not many years ago, every peasant, according to the Statistical Account, made his own shoes of leather tanned by himself. Many a shepherd and cottar too, with his wife and children, appeared at Church in clothes which had been touched by no hands but their own, since they were shorn from the sheep and sown in the flaxfield. In the preparation of these. it is added, scarcely a single article had been purchased, except the awl, needle, thimble, and a very few parts of the iron-work employed in the weaving. The dyes, toci, were chiefly extracted by the women from trees, shrubs and herbs.” (Dugald Stewart’s “Works,” Hamilton’s Ed., Vol. viii., pp. 327-328.)

224. In the celebrated “Livre des métiers” of Etienne Boileau, we find it prescribed that a journeyman on being admitted among the masters had to swear “to love his brethren with brotherly love, to support them in their respective trades, not wilfully to betray the secrets of the trade, and besides, in the interests of all, not to recommend his own wares by calling the attention of the buyer to defects in the articles made by others.”

225. “The bourgeoisie cannot exist without continually revolutionising the instruments of production, and thereby the relations of production and all the social relations. Conservation, in an unaltered form, of the

old modes of production was on the contrary the first condition of existence for all earlier industrial classes. Constant revolution in production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation, distinguish the bourgeois epoch from all earlier ones. All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new formed ones become antiquated before they can ossify. All that is solid melts into air, all that is holy is profaned, and man is at last compelled to face with sober senses his real conditions of life, and his relations with his kind." (F. Engels und Karl Marx: "Manifest der Kommunistischen Partei." Lond. 1848, p. 5.)

226.

> "You take my life
> When you do take the means whereby I live."
> Shakespeare.

227. A French workman, on his return from San-Francisco, writes as follows: "I never could have believed, that I was capable of working at the various occupations I was employed on in California. I was firmly convinced that I was fit for nothing but letter-press printing.... Once in the midst of this world of adventurers, who change their occupation as often as they do their shirt, egad, I did as the others. As mining did not turn out remunerative enough, I left it for the town, where in succession I became typographer, slater, plumber, &c. In consequence of thus finding out that I am fit to any sort of work, I feel less of a mollusk and more of a man." (A. Corbon, "De l'enseignement professionnel," 2ème ed., p. 50.)

228. John Bellers, a very phenomenon in the history of Political Economy, saw most clearly at the end of the 17th century, the necessity for abolishing the present system of education and division of labour, which beget hypertrophy and atrophy at the two opposite extremities of society. Amongst other things he says this: "An idle learning being little better than the learning of idleness.... Bodily labour, it's a primitive institution of God.... Labour being as proper for the bodies' health as eating is for its living; for what pains a man saves by ease, he will find in disease.... Labour adds oil to the lamp of life, when thinking inflames it.... A childish silly employ" (a warning this, by presentiment, against the Basedows and their modern imitators) "leaves the children's minds silly," ("Proposals for Raising a Colledge of Industry of all Useful Trades and Husbandry." Lond., 1696, pp. 12, 14, 18.)

229. This sort of labour goes on mostly in small workshops, as we have seen in the lacemaking and straw-plaiting trades, and as could be shown more in detail from the metal trades of Sheffield, Birmingham, &c.

230. "Ch. Empl. Comm., V. Rep.," p. xxv., n. 162, and II. Rep., p. xxxviii., n, 285, 289, p. xxv., xxvi., n. 191.

231. "Factory labour may be as pure and as excellent as domestic labour, and perhaps more so." ("Rep. Insp. of Fact., 31st October, 1865," p. 129.)

232. "Rep. Insp. of Fact., 31st October, 1865," pp. 27-32.

233. Numerous instances will be found in "Rep. of Insp. of Fact."

234. "Ch. Empl. Comm., V. Rep.," p. x., n. 35.

235. "Ch. Empl. Comm., V. Rep.," p. ix., n. 28.

236. l.c., p. xxv., n. 165-167. As to the advantages of large scale, compared with small scale, industries, see "Ch. Empl. Comm., III. Rep.," p. 13, n. 144, p. 25, n. 121, p. 26, n. 125, p. 27, n. 140, &c.

237. The trades proposed to be brought under the Act were the following: Lace-making, stocking-weaving, straw-plaiting, the manufacture of wearing apparel with its numerous sub-divisions, artificial flower-making, shoemaking, hat-making, glove-making, tailoring, all metal works, from blast furnaces down to needleworks, &c., paper-mills, glassworks, tobacco factories, India-rubber works, braid-making (for weaving), hand-carpetmaking, umbrella and parasol making, the manufacture of spindles and spools, letterpress printing, book-binding, manufacture of stationery (including paper bags, cards, coloured paper, &c.), rope-making, manufacture of jet ornaments, brick-making, silk manufacture by hand, Coventry weaving, salt works, tallow chandlers, cement works, sugar refineries, biscuit-making, various industries connected with timber, and other mixed trades.

238. l.c., p. xxv., n. 169.

239. Here (from "The Tory Cabinet..... to "Nassau W. Senior") the English text has been altered in

conformity with the 4th German edition. — Ed.

240. The Factory Acts Extension Act was passed on August 12, 1867. It regulates all foundries, smithies, and metal manufactories, including machine shops; furthermore glass-works, paper mills, gutta-percha and India-rubber works, tobacco manufactories, letter-press printing and book-binding works, and, lastly, all workshops in which more than 50 persons are employed. The Hours of Labour Regulation Act, passed on August 17, 1867, regulates the smaller workshops and the so-called domestic industries.

I shall revert to these Acts and to the new Mining Act of 1872 in Volume II.

241. Senior, "Social Science Congress," pp. 55-58.

242. The "personnel" of this staff consisted of 2 inspectors, 2 assistant inspectors and 41 sub-inspectors. Eight additional sub-inspectors were appointed in 1871. The total cost of administering the Acts in England, Scotland, and Ireland amounted for the year 1871-72 to no more than £25,347, inclusive of the law expenses incurred by prosecutions of offending masters.

243. Robert Owen, the father of Co-operative Factories and Stores, but who, as before remarked, in no way shared the illusions of his followers with regard to the bearing of these isolated elements of transformation, not only practically made the factory system the sole foundation of his experiments, but also declared that system to be theoretically the starting-point of the social revolution. Herr Vissering, Professor of Political Economy in the University of Leyden, appears to have a suspicion of this when, in his "Handboek van Practische Staatshuishoudkunde, 1860-62," which reproduces all the platitudes of vulgar economy, he strongly supports handicrafts against the factory system.

> **[*Added in the 4th German edition*** — The "hopelessly bewildering tangle of contradictory enactments" (S. 314) (present volume, p. 284) which English legislation called into life by means of the mutually conflicting Factory Acts, the Factory Acts Extension Act and the Workshops' Act, finally became intolerable, and thus all legislative enactments on this subject were codified in the Factory and Workshop Act of 1878. Of course no detailed critique of this English industrial code now in effect can be presented here. The following remarks will have to suffice. The Act comprises:
>
> 1) **Textile Mills**. Here everything remains about as it was: children more than 10 years of age may work 5½ hours a day; or 6 hours and Saturday off; young persons and women, 10 hours on 5 days, and at most 6½ on Saturday.
>
> 2) **Non-Textile Factories**. Here the regulations are brought closer than before to those of No. 1, but there are still several exceptions which favour the capitalists and which in certain cases may be expanded by special permission of the Home Secretary.
>
> 3) **Workshops**, defined approximately as in the former Act; as for the children, young workers and women employed there, the workshops are about on a par with the non-textile factories, but again conditions are easier in details.
>
> 4) **Workshops** in which no children or young workers are employed, but only persons of both sexes above the age of 18; this category enjoy still easier conditions.
>
> 5) **Domestic Workshops**, where only members of the family are employed, in the family dwelling: still more elastic regulations and simultaneously the restriction that the inspector may, without special permission of the ministry or a court, enter only rooms not used also for dwelling purposes; and lastly unrestricted freedom for straw-plaiting and lace and glove-making by members of the family. With all its defects this Act, together with the Swiss Federal Factory Law of March 23, 1877, is still by far the best piece of legislation in this field. A comparison of it with the said Swiss federal law is of particular interest because it clearly demonstrates the merits and demerits of the two legislative methods — the English, "historical" method, which intervenes when occasion requires, and the continental method, which is built up on the traditions of the French Revolution and generalises more. Unfortunately, due to insufficient inspection personnel, the English code is still largely a dead letter with regard to its application to workshops. — *F. E.*]

244. "You divide the people into two hostile camps of clownish boors and emasculated dwarfs. Good heavens! a nation divided into agricultural and commercial interests, calling itself sane; nay, styling itself

enlightened and civilised, not only in spite of, but in consequence of this monstrous and unnatural division." (David Urquhart, l.c., p. 119.) This passage shows, at one and the same time, the strength and the weakness of that kind of criticism which knows how to judge and condemn the present, but not how to comprehend it.

245. See Liebig: "Die Chemie in ihrer Anwendung auf Agricultur und Physiologie," 7. Auflage, 1862, and especially the "Einleitung in die Naturgesetze des Feldbaus," in the 1st Volume. To have developed from the point of view of natural science, the negative, i.e., destructive side of modern agriculture, is one of Liebig's immortal merits. His summary, too, of the history of agriculture, although not free from gross errors, contains flashes of light. It is, however, to be regretted that he ventures on such haphazard assertions as the following: "By greater pulverising and more frequent ploughing, the circulation of air in the interior of porous soil is aided, and the surface exposed to the action of the atmosphere is increased and renewed; but it is easily seen that the increased yield of the land cannot be proportional to the labour spent on that land, but increases in a much smaller proportion. This law," adds Liebig, "was first enunciated by John Stuart Mill in his 'Principles of Pol. Econ.,' Vol. 1, p. 17, as follows: 'That the produce of land increases, *caeteris paribus*, in a diminishing ratio to the increase of the labourers employed' (Mill here introduces in an erroneous form the law enunciated by Ricardo's school, for since the 'decrease of the labourers employed,' kept even pace in England with the advance of agriculture, the law discovered in, and applied to, England, could have no application to that country, at all events), 'is the universal law of agricultural industry.' This is very remarkable, since Mill was ignorant of the reason for this law." (Liebig, l.c., Bd. I., p. 143 and Note.) Apart from Liebig's wrong interpretation of the word "labour," by which word he understands something quite different from what Political Economy does, it is, in any case, "very remarkable" that he should make Mr. John Stuart Mill the first propounder of a theory which was first published by James Anderson in A. Smith's days, and was repeated in various works down to the beginning of the 19th century; a theory which Malthus, that master in plagiarism (the whole of his population theory is a shameless plagiarism), appropriated to himself in 1815; which West developed at the same time as, and independently of, Anderson; which in the year 1817 was connected by Ricardo with the general theory of value, then made the round of the world as Ricardo's theory, and in 1820 was vulgarised by James Mill, the father of John Stuart Mill; and which, finally, was reproduced by John Stuart Mill and others, as a dogma already quite commonplace, and known to every schoolboy. It cannot be denied that John Stuart Mill owes his, at all events, "remarkable" authority almost entirely to such *quid-pro-quos*.

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Next: Chapter Sixteen: Absolute and Relative Surplus-Value

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