INTRODUCTORY

Occupation and health: how to secure the one and maintain the other are questions which concern most of us. Before proceeding to discuss the influence of harmful trades upon man and his surroundings it might be well to pass in rapid review the origin and rise of commerce and manufacture and the interposition of the State in regard to persons employed in manufacture and industry.

There was nothing in the industrial life of the old nations akin to the factory system of to-day. Next to hunting and fishing, man's earliest occupation so long as he followed a nomadic life, must have been that of herding and rearing cattle, while to woman fell the task of looking after the family and the immediate wants of the home. Tilling of the soil was man's first settled occupation. Thus is it that agriculture is the oldest industry. Although Great Britain has long ceased to be agricultural, yet even in this country agriculture is a more important industry than most people imagine. The total number of occupied persons in the United Kingdom in 1901 was 15,388,501 (viz. 12,134,259 males and 3,254,242 females). Of this number the largest percentage 12·66 were employed in agriculture, 11·39 in commerce, 8·2 in conveyance, 7·89 in metals and machinery, 6·92 in textile fabrics, 6·77 in building and construction, and 5 per cent. in mines and quarries—that is to say, the number of persons employed in agriculture was, in 1901, nearly equal to the combined number of persons employed in the iron and metal industries and in the mines and quarries.

If there is one important difference in the industries of older nations compared with those of modern times, it is that the bulk of their work was done by slaves. It is stated that in the best days of Greece there were in Athens alone 100,000

slaves, and when Rome was reaching the height of her power, slaves formed a large proportion of the population. At this period new forces were coming to birth within the Empire. Trade and commerce had arisen, and while these were regarded with disfavour by the landed proprietors, the trading classes were gradually rising to power through the wealth they were accumulating. As Rome grew so did capitalism rise in influence. With the rise of capitalism agriculture lessened and the smaller peasantry disappeared. Slave labour supplanted that of free men on the land. Although ceasing to be a producer, Rome yet became the market of the world, and, like London to-day, the centre of Exchange. Flourishing on business she had not created, finance and banking became the features of Roman life and activity. With the rise of capitalism a new class was created, a class conscious of its power through the wealth it held, and as this class felt itself capable of directing the affairs of Empire, from it were taken its able men to fill the offices of State. In this epitome of Rome we see how trade, commerce and capitalism preceded manufacture.

Something akin to this has taken place in Great Britain. Land is still regarded as the main source of national wealth. With the rise of capitalism the commercial classes have competed with the aristocracy for power, while from their ranks the nobility has been recruited. For the last century the capitalist and commercial classes have made the largest numbers of our laws but within recent years a new power, political and social, has arisen which would hardly have been possible had it not been for the modern factory system.

With the invention of machinery and the utilization of water power, Great Britain broke loose from old methods and started on a career of her own which the introduction of steam and the wealth of her coal fields enabled her to embark upon. People also migrated into the towns where labour was cheap and abundant.

As a consequence of this industrial evolution handicrafts disappeared. The cottage method of production in which members of one family joined together for a common end was replaced by a combined system under which there was a

directing head as in modern factory management. In isolated handicrafts, the result of a man's labour was his own, but in the factory system this can never be, for a workman is a unit among hundreds and is in consequence of the division of labour only a part contributor to the finished product. In the industrial handicraft of bygone years a workman impressed his personality upon the product, but in modern factory work this is impossible, for not only is production partitioned, but the work is so organized that whether the individual goes to the factory or not, the machinery runs all the same and manufacture proceeds independently of him. It would be erroneous to say that machinery has quite supplanted the brain and hands, and destroyed entirely the individuality of the worker, for some men and women can get out of machinery more than others, but although deft hands and subtle brains are still required of factory operatives, it cannot be denied that the monotony of modern factory life has dwarfed individuality, developed a kind of fatigue unknown to the working classes of two centuries ago and a longing for excitement and recreation as a counterpoise to the depressing effects of work.

The fatigue experienced by the modern factory hand is not that which follows hard muscular work in the open air; its causation is different: into it there enter greater mental strain, the influence of work carried on in over-heated, moist and imperfectly ventilated rooms, also the noise of machinery. At first it was believed that machinery would lighten human labour. To such an extent in the early years of last century did this appear to be the case, since it seemed as if machinery could be so easily tended, that it drew into the factory not only a large amount of unskilled labour but also that of women and children as well. The first effect of machinery is to displace labour: fewer hands are required, but as man's wants keep increasing, and machine made goods cost less and do not wear so well, production is in the end stimulated so that in the end a larger number of persons find employment. With the introduction of machinery has come unregulated competition to which, and to over-production, many of our modern industrial troubles are attributed.

In the early part of the 19th century England awoke to a realisation of the injustice and the injury which were being done to child life by over-work in the mills, the unwholesome conditions under which work was carried on, the equally wretched conditions under which the apprenticed children were housed and fed, to say nothing of the uncalled for cruelty of their masters. The bringing of a man named Jouvaux to justice in 1801 for ill-treating and over-working his 16 apprentices, of providing these unhappy children with only two beds, of keeping them when at work in such attitudes that the children ran the risk of becoming deformed and disabled for life, wrung from the Judge on the bench remarks which find an echo in our heart to-day, that if trade cannot be carried on without children's lives being sacrificed to Moloch, men and women being slowly done to death or ruined in life and body, then such trade must be abolished.

The intentions of those who passed the Elizabethan Poor Law of 1601 may have been good, since the law directed that destitute children and orphans should be apprenticed to some trade. In establishing homes of industry wherein children should be instructed in spinning and weaving, charity found an outlet for her energy, but the system agreed upon was open to abuse. Under well conditioned circumstances life could have been made not only bearable, but pleasurable for the children, but the long hours 6 to 6 in summer and 7 to 5 in winter, with compulsory attendance at evening classes when the day's work was done, robbed childhood of all that belonged to it and was hardly likely to be followed by a sturdy manhood and strong womanhood. The treatment of pauper children, the disregard of child life and of its claims to protection, the evils of compulsory apprenticeship, overcrowding and the want of education, form the dark side of the "Industrial Revolution." When events became more widely known and it was felt that masters and overseers had failed in their duty towards child labour and treatment of the young, the public conscience was awakened and a new mental attitude was assumed towards industrial questions which could only be calmed by legislation. It was in 1802 that the first Act which regulated labour in

factories was passed. This, known as the "Factory Health and Morals Act" of 1802, and spoken of as the elder Sir Robert Peel's Act, was rather an extension of the old Poor Law than an attempt to assume control over industry.

This Act limited the power of work for apprentices to 12 hours per day: night work was to be gradually dropped: the children were to receive a certain amount of education and were to be given one suit of clothes yearly: better sleeping accommodation was to be provided: attendance at church once a month was compulsory: a form of inspection by the local authority was instituted and factories were to be registered. Subsequently as factory owners began to find inspection irksome, free children's labour was introduced and it gradually replaced that of the apprentices who had been drawn from the workhouses and industrial homes.

What those dark days of apprenticeship meant imagination alone can supply. The cry of the children however had been heard, but it was not till 1819 that an Act was passed which limited the age to 9, at which work should begin in the factories. No young person under the age of 16 was to be employed more than 12 hours a day, exclusive of meal time. The principal point in the Act was the prohibition of child labour under 9. It still left the inspection of the factories and of the children in the hands of local Justices although experience of the previous Act had shown how impracticable the whole system was. The Act of 1819 was followed by a short amending Act which allowed time lost by such an accident as water failure to be made up by working overtime or in the night, also, by doing away with a fixed time for dinner so that this meal became a moveable feast to be partaken of at any time between 11 a.m. and 4 p.m. instead of 11 and 2. As Miss Hutchins says in her admirable *History of Factory Legislation*, from which I have freely quoted, this was a retrograde step. The Act of 1825 reduced the working day by 1½ hours: it fixed the dinner hour between 11 and 2, and it limited Saturday labour to 9 hours. To enable some factories to close earlier on Saturday work had to be begun at 5 o'clock in the morning.

In 1831 when Michael Sadler introduced into Parliament his Ten Hours' Bill, factory life was anything but satisfactory. The hours were long, the atmosphere of the rooms was overheated, children were still subjected to indignity and cruelty, no opportunity was given for education nor time for play and recreation. Many of the young workers under 18 years of age were not employed directly by the owners of the factory but by the operatives themselves. There was a tendency therefore for a father to employ his own children and to exploit them for profit. The Factory Act of 1833 was in advance of its predecessors, for it prohibited in cotton mills and other factories night work to all persons under 18 years of age, while child labour under 9 was abolished. No child under 11 years of age could be employed for more than 9 hours a day. During meal hours, children were not allowed to remain in the room with the machinery. Four factory inspectors were appointed with power to enter factories at any time, to examine the children and to make any enquiry they thought necessary.

From 1841–1847 women's labour was the subject of discussion. The increasing employment of women in factories had become a source of uneasiness to many of the social reformers who were of the opinion that in the home lay the true vocation of woman. Those men therefore were disposed to limit the number of female operatives and to prohibit married women working in the mills so long as their husbands were alive and earning an income.

A 10 hours' day had been secured for the working classes by the Act of 1847. From that date onward to 1860 little was effected in the way of factory legislation. Although it was for the textile trades that most of the legislation had been passed, yet by degrees other industries were brought within the law. Children of tender years were being employed in potteries—their hours were long and the work was irregular. In consequence of the nature of the employment and the high temperature to which the workers were exposed, 120° to 140° F., it was apparent that there was occurring among the workers a physical degeneracy, each succeeding generation it

was said had become more dwarfed and less robust than its predecessor.

The Act of 1864 gave better definition of a factory and required that factories were to be kept clean and that gases detrimental to health were to be removed. By the Workshops' Regulation Act of 1867 the Local Authorities were made responsible for the administration of the law in workshops, but this Act was a failure. Under the Act neither a Medical Officer of Health nor an Inspector under the Local Authority could enter a workshop without an order from a Justice empowering him to do so within 48 hours after the date of issue of the order. There were no sanitary provisions contained in the Act; these followed in the Sanitary Act of 1896.

Space will not permit of the various items of Factory Legislation being dealt with in detail. The aims and objects of recent factory legislation are closely associated with the spirit and practice of the Employers' Liability Act and the Workmen's Compensation Act, so that employers and employed are brought frequently into opposition. There has been a growing conviction that each industry should bear the burden of the misfortunes it creates. It is hardly fair that a fatal accident occurring in the course of employment, and which deprives a family of its bread winner, should be allowed to bring absolute poverty into a home and deprive wife and children of the means of subsistence. It has only been by degrees that certain diseases caused through occupation, and which are consequences of it, have come to be regarded in the same light as accidents and entitling to compensation. Much of the recent factory and social legislation has been anticipated by the work done by Departmental Committees and Commissions.

Factory legislation will always be objected to by many persons on the grounds that it is an interference with the liberty of the subject, but as the social organization has become more complete, the units composing it have become more and more interdependent. Man does not live to himself alone. In all dangerous occupations, workpeople cannot be left entirely to their own devices, nor can they be allowed to take

chances. It was thus that at its inception factory legislation dealt with child labour since children are unable to take care of themselves: subsequently it concerned itself with women's work owing to the absence of labour organization and the fact that it was to women as possible mothers that reformers looked for the perpetuation of a race worthy of the country in which its units are born. Factory employment has been both a gain and a loss to the nation. The gains are generally admitted to outweigh the losses. One of the drawbacks to it is the withdrawal into its service of a large army of young women whose life might be spent at home with greater benefit to the race and with more influence for good upon the family. Factory legislation is, in its objects, humane. It recognizes that life and limb must be protected and that in the case of death or accident employment carries with it financial responsibilities over and above the wages given for services rendered.

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CHAPTER I

THE AIR WE BREATHE IN TOWN AND COUNTRY. AIR IN THE NEIGHBOURHOOD OF FACTORIES. INFLUENCE OF SMOKE. DUST, TRAFFIC AND MICRO-ORGANISMS

Statistics show that the healthiest life man can lead is that spent in the open air. The longevity of the agricultural classes is some compensation for their exclusion from the excitement incidental to living in towns. Rural depopulation and the rise of large towns are the inevitable consequences of the changes which have taken place in our industrial methods. Factories have changed environment, some of the quiet country

towns of a century ago are to-day hives of industry. Coal mines and iron works have altered localities. Travelling by rail one passes from pastoral and wooded scenery into districts where the stunted trees and scanty vegetation give evidence of the struggle nature has had with the unhealthy influences created by the industrial activity of man. Some modern trade developments poison the atmosphere, while the refuse of dye works and the washing of mineral ores pollute the rivers and kill the fish. In the vicinity of chemical works vegetation is well nigh impossible. Exposed to chemical emanations the tops of trees decay. In the immediate neighbourhood of coke ovens trees become blighted and cease to put on leaf. Animals grazing near lead smelting works have died from plumbism, and birds which have eaten berries grown in the neighbourhood of lead smelting works have shared a similar fate. Last year (1914) while visiting a large zinc and lead smelting works on the continent, the manager informed me that the ducks which used to swim in the canal adjoining the works had become paralysed in their legs and could no longer paddle. A few months after my visit to the Trabonelli sulphur mine in Sicily, an explosion occurred in the mine—several lives were lost. For several months afterwards the gases which escaped from the mine were of such a poisonous nature that birds flying over the plant fell down dead.

The death of two horses on a farm near Swansea in December 1912, also of another since, and which formed the subject of a special enquiry, was found to have been the result of the animals having grazed where fumes from spelter works had become deposited. In the stomach of the animals the county analyst found 0·16 grain of lead, 0·009 grain of arsenic and 1·0 grain of zinc. Cattle grazing in the immediate neighbourhood of the Broken Hill mines in Australia died from lead poisoning, fowls could not be reared, and in one instance a child died from plumbism due to having sucked flowers upon some of which was found lead. Cases such as these show the risks which man and animals are exposed to in eating uncooked and unwashed vegetables grown in the neighbourhood of spelter and lead smelting works, also of the necessity

of capturing by some means or other the fumes so that they shall not escape into the open air and poison man and beast. It is just possible that some of the ill-health of persons living in the immediate neighbourhood of large smelting works may be due to minute metallic particles being inhaled or swallowed with the food. It is a mistake to have dwelling houses too near slag and furnace refuse heaps for on several occasions poisonous gases, chiefly carbon monoxide, have penetrated the soil and reaching the cottages have caused death of some of the inmates.

Excess of coal smoke is a cause of a high death rate from acute diseases of the respiratory organs. To this subject Dr Louis Ascher of Königsberg has given attention. He found that while the mortality from tuberculosis among coal miners was low both in Prussia and England, he was surprised to find that the mortality from acute lung diseases, other than those of a tuberculous nature, was high. In manufacturing countries the highest mortality from acute lung disease is found in those districts where coal smoke is most abundant. Smoke not only tends to produce pulmonary disease but it hastens the course of tuberculosis. Ascher's experiments on this point are of interest. He caused (1) rabbits to inhale coal smoke and then infected them by getting the animals to breathe such an organism as *aspergillus fumigatus*: (2) other rabbits were infected by *aspergillus fumigatus* without breathing coal smoke: (3) rabbits were infected with tubercle and inhaled coal smoke, while (4) others were similarly infected but not exposed to coal smoke. The infected animals which inhaled coal smoke died on an average 53 days after the commencement of the experiment, whereas the infected animals which did not inhale smoke lived for 90 days. It is not for the moment maintained that in industrial districts coal smoke is the only adverse factor in causing a high death rate from acute respiratory disease. There are such additional circumstances as climate, nature of occupation, home life and surroundings, infection, e.g. influenza, also alcohol which cannot be ignored. That fine particles of mineral and other forms of dust predispose to pneumonia, allusion need only be made to the high