



INDUSTRIAL MEDICINE  
AND  
HYGIENE

*Edited by*

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*With a Foreword by*

**THE LORD HORDER**

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**VOLUME 1**

**BUTTERWORTH & CO. (PUBLISHERS) LTD.  
LONDON**

1954

PRINTED AND BOUND IN GREAT BRITAIN BY  
LOVE AND MALCOMSON, LTD., REDHILL, SURREY

## FOREWORD

THE APPEARANCE of a new work on Industrial Health is timely. During the past quarter of a century Industrial Medicine, or, as it is now more frequently called, Occupational Medicine has become recognized as a speciality of steadily increasing importance. The subject is a composite one, making use of many sources of expert knowledge and experience in addition to those that are purely medical.

An intensified public conscience concerning the health, safety and welfare of the worker in his daily environment, together with the manifold achievements of industrial research in the last decade, have greatly stimulated the work of those who make this branch of Medicine their speciality. New processes, new materials and new hazards bring new problems of protection, and make further demands on those with responsibilities in this wide social field.

As I have said, Industrial Health problems are by no means wholly medical in character: their solution must be tackled by teams of workers including not only medical men, but also engineers, chemists, physicists, personnel managers, and so on. Ultimately, of course, protection is a managerial responsibility and a comprehensive work like the present is essential for every member of the team both for reference and as a guide for developing preventive industrial health services and coping with problems as they arise.

Dr. Merewether has brought together an impressive team to provide a balanced view of the whole field. The approach in each subject is dogmatic and practical so as to meet the needs of all, from director to foreman, who have responsibilities in industry.

A glance at the contents list will indicate the wide range covered by the work of the individual contributors. The first volume embodies the legislative and statistical aspects; the organization and operation of industrial medical and nursing services; the medical aspects of coal mining, shops and offices and inland transport, and sections on the young worker, the disabled worker and canteen services in industry.

The second volume embraces sections on occupational diseases of the skin and eye, occupational psychology, work with compressed air, compressed air illness and its prevention; electrical accidents, explosives, heating and ventilation; lighting, glare and efficiency: intense sound and ultra-sound, effects of ionizing radiations and protection against ionizing radiations.

The third volume is devoted solely to silicosis and other fibrotic pneumoconioses, pneumoconiosis without fibrosis, and toxicology.

Dr. Merewether is to be congratulated on so sound a work of collating British opinion in this field.

HORDER

## INTRODUCTION

THERE IS little left for the Editor to say except that Lord Horder was the inspiration of this work and my old friends the contributors have clothed his inspiration with something which is elegant and, with additions and amendments made from time to time as knowledge progresses, should be enduring.

Furthermore, its publication has been made possible by the enthusiasm and drive of the publishers, and not a little by their sympathy and patience with the hazards which invariably arise in the preparation of such a work.

For all this, and to all these helpers, including my Secretary, Miss P. A. Thompson, I express my deep gratitude.

E. R. A. MEREWETHER

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## CHAPTER I

### WORK OF THE FACTORY DEPARTMENT

SIR GEORGE BARNETT

LEGISLATION about safety, health and welfare for factories in Great Britain has developed gradually since early in the nineteenth century, when, after the invention of power-driven machinery, factories were increasing in number and size, and owners, in dealing with the novel problems of industrial management which arose, tended to give more attention to the machines that were used and the goods being manufactured than to the workers they employed. At that time women, juveniles and even young children had to work for very long hours, often in unsuitable and unhealthy places, and the regulation by law of working conditions and hours of employment became an urgent necessity, if the health and safety of the working population were to be safeguarded. Even then it took some time for the social reformers to convince Parliament of this, and the first Factory Act providing for Government inspection of factories was not passed until 1833. The Act was "to Regulate the Labour of Children and Young Persons in Mills and Factories".

With the exception of clauses referring to lime-washing and the posting up of a summary of legal requirements, the Act dealt only with restrictions on the employment of boys and girls under 18 years of age. It introduced the principle of requiring certificates of fitness for employment of children.

#### APPOINTMENT OF INSPECTORS

##### Early appointments by the Crown

Four Factory Inspectors were then appointed by the King under His Sign Manual. These original inspectors had not only executive, but also legislative and judicial powers.

Although the scope of the inspectors' functions appeared narrow, they proved to be multifarious, partly because at that time the only State social service was the Poor Law. The registration of births was not made compulsory in England until 1837; hence, for some years after their appointment, inspectors spent much time in devising means of finding out the correct age of children. There was then no compulsory State-provided education, and the work of the voluntary societies was in the early stages of its development. Consequently, the inspectors had to procure the establishment of schools and to inspect all schools which the factory children attended.



### Appointments under Acts of Parliament

Then followed a long series of Acts, both extending the scope and raising the standard of legal requirements in factories (including "workshops" or factories not using mechanical power), until in 1878 a consolidating Act was passed. Development of factory legislation continued in line with (or slightly behind) growth and developments in industry, the way being shown by the example of progressive firms, and numerous Acts were passed as the need arose.

#### *Appointment of medical inspectors under Act of 1895*

In 1893 women inspectors were appointed for the first time, and in 1896 a significant stage in the development of the medical work of the Factory Department of the Home Office was reached in the appointment of Dr. B. A. Whitelegge (afterwards Sir Arthur Whitelegge) as Chief Inspector. In the previous year an important section of the Act of 1895 required every medical practitioner to notify to the Chief Inspector of Factories cases of poisoning from lead, phosphorus or arsenic and of anthrax contracted in any factory or workshop. Dr. Whitelegge's first report contained particulars of such notifications, showing that there were in all 1,050, of which 1,030 related to lead poisoning. The importance of health questions and the necessity for special consideration of the medical problems involved resulted in the appointment, 2 years later, of Dr. Legge (afterwards Sir Thomas Legge) as Medical Inspector. The medical work continued to increase, particularly after the passing of the consolidating Act of 1901, and additional medical inspectors were appointed from time to time, until at the present time the Medical Branch comprises a Senior Medical Inspector, 2 Deputy Senior Medical Inspectors and 10 others, attached to different divisions but reporting directly to the head of the Medical Branch in London. (Doctors had, however, been officially appointed by the Factory Inspectorate since 1844, to assist in the administration of the Acts.)

#### *Other specialist appointments*

Other specialist branches of the Inspectorate (engineering, electrical and chemical) followed.

#### *Re-organization*

In 1921 the Factory Department was re-organized and the men's and women's sides of the Inspectorate, hitherto separate, were amalgamated into a single organization, and women inspectors were given the same duties as the men inspectors.

#### *The Inspectorate under the Factory Acts of 1901, 1937 and 1948*

Landmarks in consolidating and amending Acts are the important Factory and Workshop Act of 1901 and the Factories Act of 1937 which latter, although amended on points of detail by the Factories Act of 1948, remains the principal Act today. This comprehensive Act of 160 sections is a

remarkable example of what can be achieved through consultation with industry in the early stages. The 1901 Act was admittedly out of date, an immense advance both in public opinion and general practice having taken place since it was passed; its amendment was long overdue, but, on account of the inevitable length of such a measure, successive Governments had failed to get their Factory Bills through Parliament, owing to lack of time. In this case conferences and consultations were held on all new matters between the Department and representatives of employers' federations and the trade unions concerned, before the Bill which became the Act of 1937 was presented to Parliament, so that although in Parliament various amendments were suggested and some were adopted, the Bill was passed virtually as an agreed measure on 30 July of the same year, and came into force a year later, on 1 July, 1938. Never before had so much interest been shown in any new factory legislation. The 1937 Act and information upon it were circulated widely by employers' federations to their member firms, with advice to take immediate steps to prepare for the fulfilment of the new requirements, and wide publicity was also given to it by the trade unions and in the Press.

#### **Scope of the Factories Acts**

The Factories Acts lay down Statutory requirements for securing a minimum standard of safety, health and welfare in factories, and also for regulating the hours of work, intervals for meals and rest and, to some extent, the holidays of women and young people employed in them.

General safety provisions, applicable to any factory, make employers responsible for such matters as the following: (1) the proper fencing of all dangerous machinery and of vessels containing dangerous liquids into which persons might fall; (2) sound construction and proper fencing and provision of safety devices for lifts and hoists and their regular examination; (3) precautions where dangerous fumes or explosive or inflammable dust, gas or vapour are likely to be present; (4) precautions as to steam boilers or receivers and gas holders and their regular examination; (5) the provision and maintenance of means of escape in case of fire. The cleaning by women and young persons of dangerous machinery in motion is prohibited, and the training and supervision of young people working on some especially dangerous machines is required. Provision must also be made for the protection of the eyes of workers in certain processes by suitable goggles or other means, and a worker under 18 years of age may not be employed to lift or move any load so heavy as to be likely to injure him.

The general health measures include cleanliness of all work-rooms and the provision and maintenance of proper means of ventilation, warming and lighting and of adequate sanitary conveniences.

General welfare provisions applicable to all factories lay on the employer the responsibility for providing and maintaining washing facilities, cloak-rooms or other clothing accommodation, facilities for sitting, first-aid arrangements and drinking-water.

In addition, the scope of the Factories Acts extends to many warehouses and to building operations and civil engineering as well as to shipbuilding and ship-repairing and the work of loading, unloading and coaling of ships in dock. Provision is also made for compulsory notification and investigation of industrial accidents and disease.

Special enactments are still in force regarding the employment of women and of young workers (*see* Chapters 2 and 10 of this volume).

#### *Regulations and Orders under the Acts*

In addition, however, to laying down various general requirements, the Acts give very wide and important powers to the Minister of Labour to make Regulations and Orders imposing other and more detailed safety, health or welfare requirements for particular kinds of factory, plant, process or work, as the need for them has been discovered or arises through greater knowledge of industrial risks or changes in methods of production. A large number of codes of Special Regulations have been made to safeguard workers employed in dangerous or hazardous industries or processes in which specially dangerous machinery, poisonous substances or those likely to produce dangerous fumes are used (*see* Chapter 2 of this volume).

#### **Powers of the Inspectors**

Power is given to the Minister to appoint inspectors to execute and to carry out the powers and duties of inspection under the Acts. These powers include power of entry into factories (and other premises under the Acts) by day and by night, for the purpose of inspection, investigation and inquiry into matters coming under the Acts, and it is an offence to delay or obstruct an inspector in his duty. Inspectors are also authorized by the Minister to conduct or defend proceedings under the Factories Acts before a Court of Summary Jurisdiction. In the case of an inspector who is a duly qualified medical practitioner, he is empowered to carry out such medical examinations as may be necessary for the purpose of his duties under the Act.

#### **Duties of employees**

The principle of workers' co-operation is, to a considerable extent, recognized and laid down in the law. A worker who actually commits a breach of the Factories Acts or Regulations for which the employer is liable may be prosecuted and fined, the employer being also liable to a fine if he did not take proper steps with a view to securing observance of the Acts and Regulations in his factory. Moreover, some legal obligations are placed directly and expressly on employees—for instance, (1) to use health or safety appliances provided for their use under the Acts, (2) not wilfully to interfere with or misuse safety, health or welfare equipment (ventilating plant or washing facilities, for instance) and (3) more generally, not wilfully and without reasonable cause to do anything likely to endanger themselves or others. At the same time it is recognized that the avoidance of dangerous or

unhealthy practices by workers is largely a matter of education, through Safety Committees or otherwise, although prosecution may be called for in cases of serious disregard of safety rules or warnings.

#### **Transfer to the Ministry of Labour**

The administration of the Factories Acts has been one of the functions of the Ministry of Labour and National Service since June, 1940, when a Factory and Welfare Department (since named Safety, Health and Welfare Department) was established; the Factory Department (Inspectorate) was then seconded from the Home Office, and was attached to it in order that the Ministry's comprehensive schemes for ensuring a high standard of welfare and working conditions for the vast number of factory workers needed for the war effort should be co-ordinated. The temporary transfer of the Factory Department to the Ministry under the Emergency Powers Defence Act, 1924, was made permanent in 1946, and the Minister of Labour then assumed permanently the functions of the Secretary of State under the Factories Act.

### **THE FACTORY INSPECTORATE TODAY**

Working in connexion with the administrative Branch of Safety, Health and Welfare Department responsible for policy, the Factory Department (Factory Inspectorate) consists of a Chief Inspector and 5 Deputy Chief Inspectors (at the present time 4 men and 1 woman), all of whom have been promoted from the Inspectorate, to assist at headquarters.

The organization of the Department is on a centralized basis, Great Britain being divided into 13 "Divisions", each with a Superintending Inspector in charge, who is responsible to the Chief Inspector. Each division is divided into districts, with a District Inspector in charge of each and a staff of inspectors according to its size. The District Inspector is responsible for the administration of the Acts in his district. The principle of specialist inspectors, referred to above, has been extended, and at present highly qualified medical, engineering, chemical and electrical inspectors visit factories and are available to give expert advice. Factory-canteen advisers are also attached to the Factory Department, to advise firms on matters connected with feeding arrangements at factories and other premises (such as docks and buildings) which are subject to the Factories Act.

#### **Duties of the Factory Inspector**

##### *Inspection*

The primary object of State inspection of factories is the enforcement of the requirements as to safety, health and welfare laid down by Statute, and the appointment of inspectors for that purpose is made to ensure uniform observance by occupiers and workers of the Acts, Regulations and Orders, relating to factories, which are administered by the Factory Department. In

controlling the detailed work of the staff, it is the aim of the Chief Inspector, subject to the direction of the Minister, to obtain uniformity of practice in administration of the law throughout Great Britain, and instructions from headquarters, in accordance with established policy, are issued to this end.

The main work of the factory inspector is to pay surprise visits to factories in order to see things as they are in the day-to-day conduct of industry. It is his duty to draw attention to any failure to comply with the law and, when necessary, to institute legal proceedings against defaulters. In the course of this active work within the factories, he will act as the eyes and ears of the service, carefully noting and reporting on any new developments affecting the health, safety or welfare of workers, for the information of the Department.

#### *Advice to employers*

The inspector's work is, however, two-fold, for, apart from his inspectorial duties, he also acts as adviser, having always in mind the main object of the Factories Act, which is to promote the safety, health and welfare of workers by the prevention of accidents and industrial diseases, or of ill health or fatigue due to long hours or dangerous or unhealthy conditions. Undoubtedly some of the most important preventive work is done in the advisory field, and there is a marked and growing tendency for firms to call in the Factory Inspector to advise when planning any new project, or when they desire to improve existing conditions or to experiment in the development of safety devices or of means of ensuring healthier arrangements.

#### **Co-operation with industry and labour: joint committees**

There is an increasing recognition of the need for co-operation in connexion with the wider application of new or improved safety or health measures, which have been successfully tried out in particular factories. The extension of existing health or safety requirements, particularly by the making of further Special Regulations, has largely been by development upon agreed lines, and usually follows conference with representatives of industry. The Factories Act lays down that, before Special Regulations are made, steps shall be taken to inform persons affected, and that a period of 21 days shall elapse after the publication of the draft (which is circulated to firms, employers' federations and trade unions concerned), so as to give opportunity for objections to be made and, if necessary, for an inquiry to be held, before the Regulations become law.

The development of closer co-operation with industry—with a view to solving outstanding problems, particularly with regard to accident prevention and the avoidance of industrial diseases, and thereby paving the way for improved methods which might or might not be incorporated in later legislation—dates from 1911, when a Departmental Committee on Factory Accidents suggested that it would probably be beneficial if joint committees,

consisting of employers and **workers** in an industry, together with representatives of the Factory Inspectorate, met to consider problems of accident prevention and to promulgate agreed methods which might be adopted to deal with them. The recommendation was primarily taken up in the textile industries—first in cotton and then in wool—and, for both these industries, agreements as to the methods of fencing of the dangerous parts of the machinery in the much-mechanized mill processes were drawn up. Valuable as were these committees in initiating this close liaison between the Inspectorate and representatives of a particular industry, no steps were taken in the early years for a review of the methods suggested, and there was no machinery for dealing with new developments and new processes.

Later, in 1926, conferences were convened on a similar basis, and this defect was remedied by establishing a Joint Standing Committee, the function of which was to keep the whole matter under review; and with this end in view to meet regularly every 6 months.

#### *Inquiries by joint committees*

The work of the Factory Inspectorate, in fostering and encouraging such committees, has resulted in the setting up of a considerable number of committees of this type, dealing not only with safety, but with problems in the wide field of health and welfare. Health risks arising from dust of a siliceous nature were considered by two representative committees, one in the pottery industry (which reported in 1943) and the other in the steel industry (which reported in 1944). The former recommended efficient safeguards to prevent the inhalation of dust in the making of tiles and other articles from finely-ground flint. These comprised, *inter alia*, major alterations in production methods and the introduction of automatic presses and fettling machines in substitution for the older hand-fed methods. The second committee, which dealt with the problems of dust in steel foundries, (1) made recommendations for the elimination of uncombined silica in some processes in which it had been normally used, by substituting less harmful substances, and (2) specified means for controlling and removing the dust at a variety of processes in which such substitution was not deemed practicable. This committee was later reconstituted as a Joint Standing Committee, with extended terms of reference, with a view to keeping some of the more intractable problems in this field under review, and to encourage the industry to pursue likely lines on which they might ultimately be solved.

#### **Research by the specialized branches**

Although the Factories Acts provide no statutory basis for research work on the part of the Factory Inspectorate, a good deal of *ad hoc* experimental work is carried out by the specialized branches. In so far as health problems are concerned, the Medical Inspectorate carries out special investigations in connexion with industrial health and hygiene. Although, for example, medical inspectors are assigned to specific areas, they may be required to

undertake work in connexion with some of these special investigations or research outside their own areas. Normally, the Department has a much wider interest than the purely medical, and these investigations give scope for team-work involving other specialist branches—for example, physicists, chemists and engineers of the Engineering and Chemical Branch, as well as from the District Inspectorate—and the assistance of outside research workers, such as those of the Medical Research Council. Two examples of recent date will demonstrate this aspect of the work of the Factory Inspectorate.

*Silicosis among fettlers in the steel industry.*—About 1930, the attention of the Medical Inspectorate was drawn to the increasing number of fettlers of steel castings who were found to be suffering from silicosis, and in 1943 a special chemical and radiographic examination of the workers in one steel foundry indicated that, whereas there was a high incidence of severe lung trouble among the fettlers employed there, the lungs of the moulders were little affected. It was then arranged that the Medical Inspectorate of the Department should initiate a special investigation into the incidence and severity of lung affections amongst workers engaged in different occupations and in various processes, in both iron and steel foundries. In order to carry this into effect, the Medical Inspector who was entrusted with the work enlisted the assistance of other inspectors and research workers. His comprehensive report (McLaughlin, 1950) is, perhaps, one of the best examples of co-ordinated team-work in one small section of industrial health, and it illustrates the parts played in such investigations by the doctor, the engineer, the physicist, the chemist or metallurgist and statisticians.

*The health of welders.*—Another instance of the collaboration between the Medical Inspector and the Engineering Inspector was the inquiry into the health of welders, on which a report (by Doig and Duguid) was issued in 1951. The main part of the work, as in the previous instance, was undertaken by the Medical Inspector, who had the assistance of other doctors, both within and without the Department; but the usefulness of such an inquiry, as a means of indicating the practical conclusions to be drawn therefrom, depends upon collaboration with the engineer and the scientist, as represented in the other branches of the Inspectorate. The importance of this combined team-work and very close liaison between the doctors, the scientists and the engineers within a single department cannot be over-emphasized. Any suggestion that such a team should be split—by the assignment, for example, of the medical side to another Ministry or Department—shows lack of appreciation of the essentials for success of a Government Department responsible for the safety and health of the industrial worker of today.

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## CHAPTER 2

### FACTORY LEGISLATION

T. W. McCULLOUGH

THIS chapter has been written for that ever-increasing number of persons who find it necessary in their day-to-day work to have some knowledge of the Factories Acts and Regulations. It attempts to illustrate those principles of which some grasp is essential to create such a mental picture.

It is hoped, therefore, that it will prove of interest to the factory owner or occupier, the management, the factory medical staff, the personnel and welfare officers, the trade-union official and the worker himself. The sociologist, the aspirant inspector and the student should find it of some value in helping to an appreciation of modern factory legislation.

It must be emphasized, however, that the chapter is not written for the expert but for the man in the street. For the actual wording of the Acts and Regulations it will, of course, be necessary to go to the source. Detailed information of this kind, and especially on case law, is always available from the text-books, notably *Redgrave's Factories, Truck and Shops Acts* (1952). The reference numbers, unless otherwise stated, apply to the Factories Act of 1937; some are from the amending Act of 1948.

#### THE FACTORIES ACTS, 1937 AND 1948

##### Early legislation

The Factories Act of 1937, as amended by the brief Act of 1948, is the most modern form of legal edifice, the foundations of which were laid as far back as 1802 by the passing of an Act in that year "to Preserve the Health and Morals of Apprentices". The first real Factory Act was passed in 1833. It was designed to remedy some of the bad conditions in those "manufactories", which had come into being as a result of the developments in motive power and machinery during the Industrial Revolution. The architects of this early legislation included such famous reformers as Shaftesbury, Sadleir, Oastler and Owen. The skeleton-like structure, originally created by Parliament as a result of their efforts, has been periodically demolished and re-built on ever more spacious plans during the past 120 years, so that it should always be consonant with the developing needs of the times and the increasingly enlightened outlook on industrial conditions.

##### Purposes of the current Acts

In a few words, the Acts of 1937 and 1948 deal with the "safety, health