ANNUAL REPORT

OF THE

CHIEF INSPECTOR

OF

FACTORIES AND WORKSHOPS

For the Year 1914.

Presented to both Houses of Parliament by Command of His Majesty.

LONDON:
PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON AND SONS, 45-47, ST. MARTIN'S LANE, W.C.,
PRINTERS IN ORDINARY TO HIS MAJESTY.

To be purchased, either directly or through any Bookseller, from
WYMAN AND SONS, LIMITED, 29, BREAMS BUILDINGS, FETTER LANE, E.C., and
28, ABINGDON STREET, S.W., and 54, ST. MARY STREET, CARDIFF; or
H.M. STATIONERY OFFICE (SCOTTISH BRANCH), 23, FORTH STREET, EDINBURGH; or
E. PONSONBY, LIMITED, 116, GRAFTON STREET, DUBLIN;
or from the Agencies in the British Colonies and Dependencies,
the United States of America and other Foreign Countries of
T. FISHER UNWIN, LIMITED, LONDON, W.C.

1915.

[Cd. 8051] *Price* 1*s.* 2*d.*

CONTENTS.

(B 91) Wt. 9670—F.D. 5 1500 11/15 H & S 15/88

ANNUAL REPORT

OF THE

Chief Inspector of Factories and Workshops

FOR THE YEAR 1914.

TO THE RIGHT HONOURABLE SIR JOHN SIMON, K.C.V.O., K.C., M.P., HIS MAJESTY'S PRINCIPAL SECRETARY OF STATE FOR THE HOME DEPARTMENT.

Home Office,
September, 1915.

SIR,

I have the honour to submit the following report for the year 1914.

During the war the whole work of the Factory Department has undergone a great change. Much of the ordinary routine has had to give place to new emergency duties, and the available staff has for the time been greatly reduced; but the effect of these disturbing influences was less felt in 1914 than in the current year, and the standard of inspection, as shown by the number of visits and of notices issued, was fairly maintained. Many of the inspectors and several of the clerical staff joined the forces, and many more have been lent to other Departments for special services. It has been necessary to re-adjust the remaining staff from time to time, and to determine in what way their services could be employed to best advantage.

At the outset several industries were brought almost to a standstill, and as a serious degree of unemployment was apprehended, extensive enquiries were made as to the actual conditions and prospects. Very soon, in consequence of the War Office and Admiralty demands for supplies of all kinds, applications for special latitude (as to hours, &c.), under s. 150 began to pour in not only from works normally concerned (directly or indirectly) with such supplies, but also from others which, in emergency, had been pressed into the service. It will be seen from a later part of this Report that close and repeated inspection has been needed in order to determine what latitude was necessary and reasonable, under what conditions, and to see that it was not improperly used. In this connection the question of *fatigue* assumed great importance as bearing upon production, and reference to this is made in Chapter V. Returns of overtime and output were obtained from a large number of works, but owing to the complex and variable conditions these did not lend themselves to statistical treatment.

Later on it fell to the Department to make extensive enquiries as to the means of increasing the supply of arms and munitions: particulars were obtained of the output of armament factories, and of metal-working machinery available in other factories. Mr. Graves rendered great service in the formation of the first Armament Committees in Newcastle and Glasgow, and several of the Inspectors have served upon local Committees of the kind. Shortage of certain surgical dressings was another matter in which the assistance of the Department was needed. The Inspectors have been further charged with the duty of reporting to the Ministry of Munitions upon the work done in "controlled" factories, and upon applications for release of War Munition Volunteers already serving in factories engaged in other manufactures of national importance. In each area in which Army clothing is being manufactured the Local Authorities have been reminded of the importance of supervision of homework conditions.

In the great manufacturing industries, as in other branches of employment, it became necessary to consider what arrangements could be made to set free men of military age for recruiting purposes, and especially how far this object could be promoted by allowing such special relaxation of the ordinary requirements of the Factory Acts as to admit of the temporary substitution of women and young persons for men. To this end the Department organized many conferences with representatives of the employers and operatives.

The manufacture of aeroplanes, which suddenly assumed large dimensions in 1914, was found to be attended with serious danger of poisoning by the " dope " or varnish used. Dr. Legge made a special study of this, and the outcome is reported in Chapter XII. Assistance was given to the Board of Control in connection with canteens for Munition factories, and many of the Inspectors have served on Committees dealing with other matters of war emergency.

Apart from all this, thirty-five Inspectors and Assistants, and six Clerks from the Central Office, have been lent to other Departments for war emergency services of various kinds. Thus, eleven Factory Inspectors are employed by the Admiralty in inspection of naval ordnance under construction by contractors, three in the designing branch of the Royal Naval Aircraft Service, and one Assistant as an engineering draughtsman.

Lastly, thirty Inspectors and Assistants are serving with the Forces, and so also are fourteen Clerks from the Central Office and eighteen from branch offices. As regards Certifying Surgeons the data are not complete, but at the end of 1914, long special leave for military service had been allowed to eighty-seven.

There was no important legislation concerning the Factory Department in 1914; nor were any important Orders issued apart from those concerned with war emergency to which reference is made elsewhere. Applications were received, from individual firms, for Orders allowing overtime under s. 49 in net-making, and nightwork of boys (s. 54) in dairy work; but both were refused. A draft Order under s. 116 to consolidate several earlier Orders and to extend the requirement of particulars to works in which articles of metal (not being machinery) are made, was issued in May. Eighteen minor Orders were made under s. 5, 1907, concerning institution factories and workshops, and one under the Docks Regulations allowing exemption for certain Irish harbours. The Annual Volume of Factory Orders was issued early in 1914, but omitted in the current year.

Bye-laws under s. 15, with regard to means of escape from fire in works in which not more than 40 persons are employed, were made by nine local Authorities, and are now in force in forty-four districts in the United Kingdom.

Regulations for shipbuilding were made and issued in May, and a Welsh translation has been provided. During the war action with regard to other intended codes has been deferred, but draft Regulations for the Manufacture and Storage of Celluloid were issued in May, and for the Casting of Iron and Steel in June. Both of these industries were certified under s. 73 as dangerous.

The enquiries by Departmental Committees as to House Painting, Coach Painting, Lighting of Factories, and Woolsorting and Woolcombing were continued in 1914. The Committee on Flax Spinning and Linen Weaving reported in May, and their recommendations have been issued as an informal draft of (amended) Regulations.

A Preliminary Report by Professor Kent on Industrial Fatigue, and a Memorandum by Mr. G. S. Taylor on Chains and Lifting Gear, will shortly be published.

Trade Conferences with regard to (i) Iron and Steel Foundries, (ii) The Tinplate Industry, and (iii) Cotton Bleaching, Dyeing and Printing, begun in 1913, were completed in 1914, and reports setting out the agreements reached were published in the usual course. As regards foundries, Regulations (for the casting of iron and steel) were issued in draft, but it was agreed to defer any action of the kind in respect of the tinplate manufacture.

Leaflets of instructions as to Emery Wheels and Dough Machinery were issued to occupiers concerned; and a third on the Notification of Industrial Diseases, for the guidance of medical practitioners. The General Register was revised and brought into accordance with present requirements.

In the earlier part of the year active progress was made with the Industrial Museum, and the arrangements for this are practically complete, but this matter stands deferred owing to the war, especially as the building, in Horseferry Road, may be required temporarily for emergency purposes.

The authorised staff was increased to 222 by the addition of one Lady Inspector and four other Inspectors, but as already explained the number actually available for inspection

was greatly reduced. A new District comprising Oxfordshire and Berkshire, with centre at Reading, was formed in May; and from January 1st, 1914, certain works in the Leeds and Bradford Districts were constituted a special District under the charge of a Lady Inspector, with centre at Leeds.

Telephones have been provided for all branch offices.

The present Report differs in plan from those of earlier years, being arranged in chapters which are intended to record the year's work in a form more convenient for reference. The statistical Tables at the end are as before, except that (for reasons already stated) it has been necessary to omit certain of the less important data, the compilation of which was not required for immediate administrative purposes.

The following comparative figures for 1913 and 1914 may be cited:—

	1913.	1914.
Registered Factories and Workshops (at end of year)	274,569	276,855
Accidents reported to—		
Certifying Surgeons—		
Fatal	1,309	1,287
Non-fatal	56,870	51,276
Inspectors only	119,982	107,309
Poisoning (Reports from Certifying Surgeons)—		
Lead	535	445
Mercury	14	10
Arsenic	6	2
Anthrax	70	54
Effective Visits to Factories and Workshops	406,436	426,434
Prosecutions	3,872	2,852
Contravention Notices to Occupiers	195,712	192,001

The reported accidents fell off at the beginning of the war, but increased later with the pressure upon the engineering and other trades in which the liability to accident is always marked.

I am, Sir,

Your obedient Servant,

Arthur Whitelegge,

Chief Inspector of Factories.

CHAPTER I.

SANITATION.

By J. H. Rogers, *H.M. Superintending Inspector.*

The note running through the Inspectors' reports on the administration of the sanitation clauses of the Acts is one of slow but certain progress. Every year shows a small advance upon its predecessor, and last year was no exception. Though some projected improvements of an expensive kind were deferred when the war broke out, the usual standard of compliance has been obtained, except in the few cases where immediate compliance would have delayed emergency work on supplies for the Army or Navy. It is fully recognised that any substantial failure to comply with the requirements of the Acts must result in impaired health and lessened efficiency. These sanitary requirements are mostly expressed in general terms which allow of wide variations in the standards obtained. The absence of a legally defined standard on many points causes action to depend largely on the suggestions or instructions issued by the Inspectors at their visits, though the example of the numerous employers who take a close, personal interest in the health and comfort of their workpeople is most valuable. These examples and the steady pressure exercised at the periodical visits, ensure a gradual raising of the standard. The improvement is largely due, in some districts and trades where labour is scarce, to the competition for workers. Some of the old and dingy factories have difficulty in keeping their workpeople, who flock to the newer works as they are opened. As a natural result of the improvements in education and general status during recent years, many of the workers now expect a much higher degree of comfort and sanitation than formerly, in the rooms where such a large part of their waking life is spent. The commencement of a modern factory, with bright and cheerful rooms, has often the effect of raising the standard in the locality. The Inspectors' main difficulty lies in securing a reasonable degree of compliance in the older buildings, some of which appear now almost unsuitable for use as factories or workshops. Very many of them are converted dwelling-houses, in which little, if anything, has been done to adapt them structurally to their new purposes. While compliance with the minimum requirements of the Acts can usually be secured, it is very difficult to obtain good hygienic conditions in these places. When real danger to health can be proved, action can be taken under section 18 of the 1901 Act. The powers in this section are often used by Inspectors indirectly, and many improvements have been obtained, like the provision of additional shelter from the weather and the remedying of damp walls and leaky roofs and other defects not covered by any specific requirement of the Acts.

Some indication of the amount of work done under the sanitary provisions last year is given by the number of written contravention notices for breaches of these provisions issued to the occupiers of factories and workshops. There were 26,448 such notices. These do not cover all the defects noted. There was a very large number of verbal instructions issued for minor irregularities. Some details of the conditions found and the work done are given under separate headings below.

Cleanliness.—The periodical limewashing of the inside walls and tops of factories is well done, as a rule, but the wider requirement of the Acts that all factories and workshops must be kept in a cleanly state is not well observed. While there are many works which are kept beautifully clean and the rooms are bright and cheerful, there are some where the standard of general cleanliness is low and the workrooms are dingy. The constant attention of the Inspectors is applied to raising the average idea of the meaning which should be attached to the expression "cleanly state." Some occupiers have, in the past, done hardly anything in the way of cleaning besides the required limewashing every fourteen months, and even that is sometimes left to be directed at the Inspector's visit. In many factories, trade refuse and dirt are allowed to collect on the floors, benches, and ledges, with the result that much dust is being constantly thrown into the air of the workrooms by the movement of machinery and workers, and by the opening of doors and windows. The inhalation of this dust is attended with obvious dangers. Several

of the Inspectors' reports deal with this question of general cleanliness. Mr. Neely (N.E. London) states that he has usually found a higher standard of cleanliness in the factories where the employers themselves spend much time in the workrooms. The actual supervision of these rooms is often left to foremen who are very fully occupied with their business of maintaining, and, as far as possible, increasing the output of machines and workers. The only voluntary cleansing done in some works appears to be the removal of matter which obstructs floors or benches, or reduces the efficiency of tools and machines. Mr. Verney (N.W. London) draws attention to the special danger of allowing dust to accumulate in workrooms, where lead or other poisonous substances are used. Cases of lead poisoning have been attributed to the want of cleanliness in letterpress printing and stereotyping works. Dust which contains an appreciable amount of lead collects in type-cases, and on ledges, beams, and other places. The cleaning in such works should be done much oftener than is customary in many cases, and done by a method which prevents the dispersal of dust into the air of the rooms. The use of the vacuum cleaner is being constantly urged by the Inspectors for this work. This system and damp methods of cleaning are being increasingly used.

The dilapidated and otherwise unsuitable condition of many of the floors and other parts of works, makes it difficult to reach a high standard of cleanliness in them. The surfaces of walls, ceilings and floors must be reasonably smooth and firm, or they cannot be kept in a cleanly state. Too often the floors are very uneven, being constructed of soft and permeable material, apparently quite unsuited for the purpose. The cleansing is usually limited to sweeping. Concrete floors are often found cracked or broken up. Mr. Bremner Davis (Kent) has made some inquiry as to the reason for this. He reports :—

> In addition to the obvious reason that builders often use too much sand in proportion to the cement, an insufficient thickness and bad foundations, there are others due to ignorance when the intention is good. Mixtures of sand and cement expand when they are wet, and contract as they dry, and within limits, the greater the proportion of cement, the greater the expansion and contraction. A common practice is to put down a first layer of material with a small proportion of cement, to let this dry, and then put on top of it a thin layer with a large proportion of cement. This top part thus remains a separate layer instead of bonding with the lower part as it would have done had it been put on at once on the still unset lower portion, while, being richer in cement, it expands and contracts more than the lower part. In result it may be rapidly broken up. For large surfaces, however good the work and material, the expansion and contraction is almost certain to produce cracking, unless the work is divided up vertically into sections with thin strips of wood between them.

Earthen floors still remain in many of the older factories and workshops, and Mr. Wilson (Glasgow) mentions that some rural bakehouses in his district have such floors. Mr. Seal (Manchester) and Mr. Hilditch (Swansea) report improved floors in dyeworks and tinplate factories. In these and the fish-curing trades, the Conferences which have recently been held between Associations of employers and workmen and Inspectors, resulted in Agreements that various improvements, including better floors, should be provided. Mr. T. C. Taylor (Norwich) reports that the floors round the gutting troughs of the Yarmouth fish-curing works have been paved, the drainage improved, and a fresh-water supply provided recently. Improved drainage of wet floors has also been obtained in other trades during the year. Mr. D. Walmsley (Oldham) and other Inspectors point out that the private roads and yards of factories are often unpaved and sometimes not drained at all, with the result that, in wet weather, mud is carried into the works and increases the difficulty of keeping the floors clean.

The standard of cleanliness in food manufactories has been considerably raised during recent years. This is partly due to the modern tendency to increase the size of works and introduce machinery. Many of these works are models of cleanliness and hygienic efficiency. Mr. Clark (W. London) refers to the excellent condition of some in his district, where the floors, walls, and benches are of material and design best adapted for securing cleanliness, and the workers are provided with lavatories and overalls. By the use of machinery, the handling of food materials and the production of waste to litter the floors are much diminished. There are, however, many smaller works, especially bakehouses, still remaining, where the standard is low. This is largely due to structural deficiencies. Mr. Parkes (N. London) and other Inspectors refer to the primitive and makeshift bakehouses found in many back-yards, often near sanitary conveniences and stables, and to the undesirable practice of using cellar workrooms for the preparation of food. Sausages are often made in basement rooms. Underground bakehouses are diminishing. Only those which were in use in 1901 are allowed to remain, and these must be certified by the Local Authority. The necessity for close inspection of these places is very clear. The plague of flies which infests many bakehouses in summer is referred to in several reports. The worst instance is given by Mr. Bennett (Londonderry), who in reporting on a factory bakehouse, states :—

> The room was filled with numbers or flies, which thickly covered everything in the place; the excuse given in answer to my remonstrance was that they came from a manure heap close by, and could not be exterminated. The machines, benches, boards, trays, windows and floors of the place were very dirty, and no methodical attempt was made to produce cleanliness.

Some Inspectors report a high degree of cleanliness in many cases, even in small works. Many bakehouses are limewashed much oftener than every six months, which is the statutory limit. Mr. Allhusen (Cork) states that the bakehouses in one of the towns in his district are limewashed every month.

Instances are given in the reports of disgusting practices in a few works, showing the necessity for closer supervision. The frequent use of the mouth for the removal of sugar from small utensils, which are afterwards applied to food materials in confectionery works, and the replacing of these materials in the machine from the unclean floor on which they had dropped, are instances which have been noticed. In referring to cases of personal uncleanliness in some food works, Mr. Bremner Davis (Kent) remarks that it is fortunate that many foods are exposed to high cooking temperatures after and not before their principal handling.

Last year over 14,000 written notices were issued respecting limewashing and general cleanliness to factory occupiers, and many prosecutions were taken in bad cases. There were also 3,391 dirty workshops referred for action to the local authorities.

Lighting.—The importance of adequate lighting, both natural and artificial, is being appreciated more every year, and though the Inspectors have no statutory power to require lighting generally, the suggestions they have made at their visits have resulted in the remedying of conditions which must have caused injury, not only to eyesight, but to general health. Though the more modern works have usually enough lighting force, the arrangement of the lights is often bad. Mr. Shinner (Bristol) refers to the injurious use of metallic filament lamps close to the eyes of the workers. Such lamps are often in clear bulbs with very small shades. He has recommended large, opaque shades. He adds:—

> Very little attention appears to be given to providing good, or rather well-arranged, artificial lighting. I think it is largely left to any contractor who puts up the lights, and in regard to electric lighting the number of "points" affects the cost and tends to handicap proper distribution. 'Points' is a term used by contractors and means places to which the branch wires or mains are taken and where they are terminated for the lights or groups of lights to be fed therefrom.

The improvement of lighting produced by frequent limewashing is pointed out by Mr. Lauder (Newcastle) and other Inspectors, who also report that great improvements have recently been made in artificial lighting by the substitution of electricity or pressure gas for ordinary gas lighting. Mr. John Law (Sheffield) refers to the defective lighting of the grinders' shops in that town, some of which are very gloomy places.

Mess-rooms, &c.—Mess-rooms, lavatories, cloakrooms, drinking water and similar amenities are not required by law, except in a few special trades. Progress is reported in other trades, but at a very slow rate, and mostly in the large or new factories. The progress is partly due to suggestions at the Inspectors' visits, but mainly through the example of public-spirited employers, whose action cannot be too highly commended. Only a small proportion of our works are, however, yet supplied with these conveniences. Where they are provided and properly supervised and maintained, they appear to be quite successful and certainly beneficial, and the employers seem very satisfied that the cost has been justified by the improved health and efficiency of the workers. A large proportion of workpeople live so far from the factories that they cannot go home for meals, which have to be taken in any place available and often with dirty hands, for in many works—even in dusty trades—there are no means of washing. Excellent mess-rooms and restaurants where cheap and good meals can be obtained, as described in previous reports, are found in an increasing number of the larger factories, but the cases are not yet very numerous. Factories were noticed last year where a cup of tea is provided daily at a cost to the worker of 1*d.* or 2*d.* a week. In other cases no charge is made for tea or cocoa provided, and in one of these, bread and butter is added free as a reward for punctuality. Mr. Fotheringham (Glasgow) in reporting on the mess-rooms and restaurants at two large engineering works in that district, draws attention to the advantage of associating the workers with the management of such places, which is usually done. In one of the two places, the restaurant is largely controlled by a committee of workmen, and it is very popular. In the other, the employers manage the restaurant themselves and the men make very little use of it, though the food is said to be as good and cheap and the rooms as convenient as at the other works, which is in the same locality. In some factories where night employment has been allowed recently on emergency work for the Army or Navy, mess-rooms and other conveniences have been specially provided.

Mr. John Law refers to the difficulties in Sheffield, where the metal-trade polishers are, by law, excluded from their workrooms during mealtimes, and the employers, who often occupy only one or two dusty rooms in a tenement factory, do not usually provide a mess-room. A restaurant club has recently been opened in the factory quarter, accommodating 400 of these girls, and has proved a great boon to them.

Several reports mention the dirty condition in which lavatories and mess-rooms are often found. The workers are frequently supposed to be jointly responsible for the cleanliness of these places, the employer thinking that, as he has voluntarily made the provision, sometimes at considerable expense, he can justly expect the users to keep the place clean. Experience proves that cleaning, like everything else, to be successful must be organized. Several Inspectors quote the proverb, "Everybody's business is nobody's business." There are untidy or dirty persons in most works, and steps should be taken to ensure that the decent majority are given the benefit of the conveniences provided. It is usually possible for the cleaning to be done by the workers in turn, but the arrangement should be made by the employer or manager, who should exercise some control or supervision himself or appoint some one to do this.

Sanitary Accommodation.—The degree of compliance varies enormously in different parts of the country and depends largely on the varying standards accepted, and the degree of activity displayed, by the hundreds of local authorities who are charged with the duty of enforcing the provision of suitable and sufficient accommodation in the great majority of factories and workshops. The reports show a gradually rising standard, especially in the larger and newer works. The efforts of the Inspectors are constantly devoted to this important subject, and during 1914 no fewer than 4,734 notices of defective or inadequate sanitary accommodation were sent to the various local authorities, besides 2,831 notices sent direct to the occupiers of works in the areas subject to the direct requirements of section 9 of the 1901 Act. Where the local drainage system allows of water closets, the structural conditions are, as a rule, satisfactory. There are exceptions in districts where connection to the sewers has not been enforced. In country places the conveniences are usually midden or pan closets, which become dangerous nuisances unless adequately supervised and kept in order. The absence of supervision largely accounts for the unclean and defective condition so frequently reported in all types of closets. Mr. Price (Cardiff) says that often, when drawing attention to dirty or choked closets, the factory manager has admitted that he has never seen the places himself and that it is nobody's duty to examine them or even to clean them at any definite time. Someone is supposed to do the cleaning, but the want of system causes disgraceful conditions, resulting in much hardship in many cases. The grosser defects which were frequently met with some years ago, are not often found now, but very bad structural conditions are still found occasionally, as the following note from Mr. Owner (Bolton) shows. He is referring to one of the largest cotton mills in his district :—

> The closets on the upper floors consisted of pans leading into a main soil pipe. This latter delivered into a pit dug in the ground at the floor level, outside, but close against the mill wall. No flushing apparatus was provided, and, as a result, the condition of the pan, soil pipe and pit was almost indescribable. The women's conveniences were, if possible, even more insanitary. Here, a row of seats was placed almost immediately over the receiving pit. At each of my visits the conditions were shocking and, after a conference with officers of the local Authority, an undertaking was given by the firm to re-drain the whole premises.

Cases where the conveniences are insufficient in number are frequently noticed. It is not uncommon for the sanitary accommodation to be forgotten when extensions to works are made. In one case, only a single closet was provided for 90 women. Many cases of inadequate screening of the closets and their approaches, and of incomplete separation for the sexes, have been found and remedied. Another frequent cause of complaint is the failure to ensure adequate structural separation of the closet from the workroom, by the provision of an intervening ventilated space. Several Inspectors refer to the absence of artificial lighting. This is important in winter, when much work after dark is done.

Mr. Kirkwood (Lanarkshire) describes a novel form of sanitary convenience which has been adopted in his district. It is said to be widely used abroad. The arrangement consists of a suitably-shaped hole, with or without raised edges, in the floor of the usual cubicle. There is no sitting or resting accommodation. A water trough or movable pan is below the floor, on which slightly raised footholds or treads are provided. The floor, pans and troughs are of smooth cement or glazed ware, and the whole can easily be sluiced from a bucket or hose pipe. Mr. Williams, the Superintending Inspector, has seen the new conveniences, which he strongly recommends. He claims the following advantages for them : (1) a high standard of cleanliness can easily be maintained, and, even if not

kept clean, the closet would still be usable; (2) removal of the risk of contagion from seats; (3) possible physiological advantages—it is considered by some authorities that seats in sanitary conveniences are generally undesirable owing to the effect on the abdominal muscles.

Sanitary Authorities.—The District and Borough Councils are responsible for the enforcement of cleanliness, ventilation and certain other sanitary requirements of the Acts in workshops, as well as for the provision of sanitary conveniences in the factories referred to previously. Many of the more important local authorities have appointed special inspectors for the execution of these duties, and very good work is done by them generally; but the numerous small authorities have no separate staffs for workshop inspection, and the sanitary inspector or surveyor is usually made responsible. The boundary between the factory inspector's responsibilities and those of the district council is clearly defined. Frequent interviews are held with the local officials and co-operation is further ensured by the requirement of the Act that the Inspector shall notify to the Council any sanitary defects he notices in the course of the visits which he has to pay to all factories and workshops for other than sanitation purposes. During 1914 the various Councils were notified of 10,805 such defects, mostly in workshops. The Inspectors must also inform the Councils of all new workshops notified to them by the occupiers, and the local Medical Officers of Health are required to notify the Inspectors of all workshops found without the prescribed Abstract of the Acts affixed. Last year the Inspectors sent 13,261, but received only 1,690 such notices. Obviously the latter figure should have been much higher.

Many Inspectors comment on the varying standards and methods adopted by the different authorities which, as Mr. Bremner Davis (Kent District) points out, bring complaints from occupiers of being hardly treated because they are required to put in more expensive apparatus than their competitors in other parts of the district. Some authorities consider midden or pan closets suitable, while others in the same locality insist on water closets. The recently-increased activity against consumption on the part of the local authorities has caused more attention to be paid to the inspection of workshops, and much action has been taken to reduce dust and prevent spitting in workrooms and to raise the standard of sanitation generally.

Temperature.—The constant attention of the Inspectors is required for the enforcement of the provisions of the Act requiring adequate measures to be taken for securing and maintaining a reasonable temperature in all workrooms. The interpretation of the words "adequate" and "reasonable" have caused the usual crop of difficulties owing to the varying conditions which have had to be dealt with. In workrooms where considerable numbers of persons are employed in sedentary occupations not involving much physical exertion, occupiers have been recommended to act upon the suggestions made by the Ventilation Committee in their 1902 Report (Cd. 1302, p. 5), viz., that heating arrangements capable of maintaining, in case of necessity, a temperature of at least 25° F. above the outside air, in the absence of lights and employees, but along with adequate ventilation, should be provided. It is in the numerous processes which involve some amount of muscular exercise that difficulty has been experienced in persuading employers that proper means of warming must be provided. Even in large factories, inadequate warming arrangements are still found, and the Inspector is sometimes met with the suggestion that the necessary warmth can be obtained by the wearing of extra clothing, to be provided by the workers, or by the exercise of a greater amount of activity in their work. It has not been customary in the past, in many works, to warm joiners' shops. Mr. Dunolly (Southampton) states that he has received many complaints of cold from joiners working in shipyards. These men work for a greater part of their time in enclosed rooms, and no means of warming is usually provided. The manufacturers affected have now promised to instal the necessary appliances. The initial cost of a heating plant for a large works is often very high, especially where the product is bulky, requiring high shops and large doors which have to be frequently opened, but this expense is counterbalanced by the greater efficiency of the workers which inevitably results. The reason why the early morning hours have not been as productive in some factories as later hours is, apparently, attributable to the want of warmth, as much as to the more usually ascribed reason of want of food. Very few manufacturers now fail to perceive that the maintenance of a reasonable temperature is essential to the performance of efficient work. Mr. Clark (W. London) mentions one of the cases of insufficient heating dealt with by him last year, when an engineering factory was provided with an efficient steam heating system at a cost of £1,000. Mr. G. A. Taylor (Bradford) reports that all the wool-sorting workshops in his district are now provided with means for securing a reasonable temperature. This

is a trade which has caused much difficulty in the past. Progress in the heating of large engineering works is reported from several districts. Mr. Buchanan (Lanarkshire) states that several firms of engineers in that district have recently adopted the plenum system in which air is blown over steam heated tubes, and Mr. Harston reports another installation of the same kind in the Birmingham district.

Mr. Beverley (S.W. London) refers to complaints of fumes from coke burnt in open buckets (making a rough form of brazier), which are still often found in spacious workrooms. This method is only suitable for open air work in shipbuilding yards and similar places. It is gradually being replaced by the methods referred to above, and by steam pipes, or separate stoves provided with flues. The warming of workrooms by any means which interferes with the purity of the air is prohibited by the Act; thus, stoves without flues are not admissible for that purpose. Many gas-supply authorities now refuse to fit these stoves in places under the Acts, and nearly all makers of stoves now provide flues. Mr. Shinner (Bristol) reports that one firm in his district have recently altered the design of their stove, and provided a system of flues which convey the burnt gases in a horizontal direction through the room and thence to the open air. By this means the heat of these gases which forms a considerable part of the thermal efficiency of heating by ordinary gas stoves is largely utilized without the gases being poured into and contaminating the air of the rooms. Mr. Beverley mentions cases where the gas companies had fixed stoves of the flueless type which they have replaced by ventilated stoves, without extra cost, on the Inspector drawing attention to the matter. Mr. May (Dublin) and others refer to the increasing use of electric-radiators, but the cost of this form of heating is still very high.

While the greater part of the efforts of the Inspectors, and most of the complaints from workers, are directed against too low temperatures, there are many industries which produce excessive heat, and care has to be taken to ensure that all practicable means are adopted to keep the working places at a reasonable degree of heat. Recent conferences in the cotton spinning and tinplate trades have resulted in agreements aimed at the reduction of excessive temperatures. Mr. Seal (Manchester) reports that few irregularities have been observed in cotton spinning mills, and the conference agreements have been generally observed. Mr. Joseph Law (Blackburn) also mentions improvements in the same trade. Mr. Hilditch (Swansea) reports that blowing fans are now installed in nearly all hot rolling mills in his district, and these make the working conditions much more tolerable, but the heat is so great that work has occasionally to be suspended on the hottest summer days, even where fans are provided. He adds that high temperatures are often found (sometimes above 120° F.) in the chambers under furnaces. These chambers have to be entered for clearing out and for reconstruction. It is essential that such places should be well flushed with fresh air and allowed to cool for a certain time before being entered. Great discomfort is also experienced by foundry workers in hot weather, especially in rooms which are not well designed for hot processes. Mr. Good (Coventry) reports that men in a foundry in his district, obtained their employers' permission to change the working hours last July, by commencing at 3 a.m. and finishing at 1 p.m. Similar changes have been made in other works. Mr. Good also refers to further reductions in the temperature of rooms in electric lamp factories, where much gas is burnt in the process. The number of gas jets used has been reduced without any loss of output, and there is efficient plenum and exhaust ventilation. Mr. Roos (S.W. London), in reporting on the same trade, describes improvements which have resulted through applying the exhaust below the burners, thus removing the hot, gaseous products immediately they are formed. Various other applications of fan ventilation in the reduction of temperature are described in the reports. Structural alterations and changes in the processes are often made with the same object. Mr. Eraut (Belfast) mentions the conditions in the stentering process of bleaching and finishing factories where the cloth passes through chambers at a temperature of 150° F. or more, and the workers sit just outside these chambers to feed and receive the cloth. In one factory, a new stentering room has just been built, and in two others, the working places have been set back and additional partitions arranged to provide a sort of insulating lobby between the workers and the hot chambers. Mr. Clark (W. London), in referring to the special provisions for the prevention of excessive heat in laundries, criticizes the use of uncovered galvanized iron for the screens used for the stoves in ironing rooms. He points out that zinc-coated iron is a fairly good conductor of heat, and the whole screen soon becomes hot and offers a large radiating surface which gives off heat into the room. He adds that a more suitable substance is the asbestos mill-board supplied by laundry engineers for the purpose.

Ventilation.—(1) General.—The question of ventilation is closely connected with that of warming, and some large works are heated by blowing in fresh air which can be warmed in the winter, as explained in the previous section of this report. In summer the

arrangement effects ventilation only. The ventilation of the larger workrooms by the use of power-driven fans is increasing, but unless means are provided for warming the air introduced by the fans, they are often found out of use in winter when they are most required, as windows and ventilators are then often kept closed. In many workrooms the windows are the only designed means of ventilation. The opening of these and the doors usually keeps the air conditions good in summer, but during the colder months, when the windows are kept closed most of the time, many workrooms are stuffy and unwholesome, often because the warming arrangements are inadequate or the windows are so placed as to cause direct draughts if they are opened in cold weather. Much progress has been made in obtaining ventilators which can be kept open without draught, as well as getting improved warming. The difficulties to be surmounted are increased by the varying preferences of the workers, most of whom consider a high degree of warmth and an absence of draught as essential necessities, and fresh air is often treated as a negligible luxury. In the smaller workrooms provided with a fireplace of adequate size which is kept well plenished, there is usually little difficulty as to ventilation, for, while the open fire is not an economical warming agent, it is an excellent ventilator. The provision of flues to gas stoves has a certain ventilating effect, though as indicated previously, it diminishes their heating value.

The analyst's reports on the air samples taken by the Inspectors have proved of great service in obtaining better ventilation. Mr. Clark (W. London) refers to cases of inadequate ventilation remedied by the provision of fans. Before the improvement was made the air samples showed in three rooms 20, 23, and 26 vol. CO_2 per 10,000 vol. respectively, and afterwards the same rooms gave only 6·4, 4·6, and 5·7 vol. respectively.

The provision of sufficient air space is necessary in order to allow of adequate ventilation, without causing serious draughts. No difficulty is found in securing compliance with the general standard laid down by the Acts (250 cubic feet per head), and very few contraventions were found last year, when only 313 notices were necessary. Most of these being in workshops, had to be referred to the local authorities.

(2) Local.—Much progress can again be reported in the application of localized exhaust ventilation to the interception and removal of dust given off in manufacturing processes. Last year 2,574 notices were sent by the Inspectors to occupiers, requiring them to provide or improve mechanical ventilation. The trades affected were very numerous. Some are referred to in detail below, and among others in which improvements were made during 1914, the following are the most important: various metal processes from the rough dressing of castings on emery wheels, to the final polishing of plate and jewellery, cutting and sand-papering of wood, ivory, &c., rag chopping in paper mills, stone dressing, chaffcutting, and miscellaneous processes in the manufacture of boots, tobacco, dry soap, and artificial manure. The amount of exhaust ventilation required in some branches of the engineering trade is increased by the recent development in the use of grinding machines for high precision work, and for other processes.

The greater attention which is now being paid to this branch of industrial hygiene is due, in part, to the wider knowledge of the close connection between the inhalation of dust and respiratory diseases, and this knowledge has greatly helped the work of the Inspectors. The recently-increased demand for exhaust appliances has called into being a new class of ventilating engineers who may be said to have sprung up within the past few years. Until very recently, there were few skilled engineers who specialized in ventilating and heating work, and the usual plan adopted by occupiers who had to provide exhaust was to purchase a fan and get the local joiner to fix it somehow. The result was that the dust was often blown about the room, and much of it inhaled. Now, there are many engineers ready to supply expert assistance to manufacturers. The importance of proper design has been emphasized in many previous reports. Serious defects, due to improper fitting, which enormously reduce the efficiency of the plant, are, however, frequently noticed by the Inspectors. These defects often consist of the hoods or ducts being too small, or badly placed in relation to main ducts or the fan. Many well designed plants are allowed to become inefficient through the want of periodical examination and cleaning, which are quite essential to good working.

The various metal trades call for most attention on the part of the Inspectors, and valuable improvements are being made in them. Mr. Crampton, in reporting on the grinding, dressing and fitting shops of the iron foundries in the Stirling district, says that at least eleven separate dust-extracting plants have been completed recently, and others are in hand. Mr. Thomas (Walsall) states that several good plants have been recently installed in that district, and others are now being fitted. He expresses the hope that, within a year or less, all the unsatisfactory places will have been dealt with. Mr. Evans (Plymouth) reported recently that all the factories in his district where dry grinding or mop polishing is done are now provided with exhaust. Mr. Good (Coventry)

reports progress in fitting exhaust to the small grinding wheels in tool rooms of motor and other engineering works. He also describes as follows, a new installation for cycle-rim polishing, a process which has caused much difficulty in the past :—

> Polishing of rims is usually done by hand on an ordinary polishing spindle, and as each rim is polished internally and externally, it is difficult to construct an efficient hood which does not foul the rim during the process. In the installation referred to, the rim is mounted on rollers which press it against the emery bob while rotating it slowly, and the hood has just sufficient opening to allow the rim to come into contact with the bob, which is entirely enclosed. The duct leading from the hood is a flexible metallic tube, 4 inches diameter, and the velocity of the exhaust draught exceeds 2,000 feet per minute.

Mr. Verney, in reporting on the action taken in the N.W. London district, states that persistent neglect on the part of five occupiers was followed by prosecution in each case, when, beside the cost of the apparatus, the manufacturers had to pay the Court fines or costs. He adds a note as to sand polishing of brass, &c., a process in which exhaust has not been usually required :—

> Too much weight appears to have been allowed to the objection of occupiers that exhaust draught would involve the loss of the sand which the addition of oil had rendered valuable. It is also said that the oiled sand is too heavy to spread far enough to be inhaled. This is probably true as regards the bulk of it, but the finer and therefore inhalable particles do, and can be seen to escape in considerable quantity, and it is just these (perhaps 5 per cent. of the whole) and nothing else, which a properly disposed exhaust draught would remove. Sanding is the dirtiest job in a polishing shop. The clothes and caps of the men engaged in it are covered and their faces and arms are black with dust.

Of the textile processes, the first in importance referred to in the Inspectors' reports on this subject, is that of cotton carding, in which very great improvements have been made during recent years. The exhaust arrangements appear now to be working very well, and proving of great benefit to the employees. Mechanical ventilation was also successfully applied last year to the woollen carding engines in the Bradford district, and to various processes in silk, flax, felt, hair and fibre mills. Mr. Seymour (Leicester) sends the following description of an exhaust system in a large hosiery factory in his district :—

> A main trunk extends throughout the rooms, and at convenient intervals a joint allows for the attachment of a flexible pipe with a nozzle similar to that of the ordinary vacuum cleaner; this can be rapidly passed over all parts of a machine, thereby removing all the dust and fluff without interfering with the work. The firm using this states that the cost has already been repaid by saving stoppages of machines and cleaner work, and it is proposed to extend the principle largely.

Mr. Jackson (N.W. Division) says that little change can be reported in the dusty cotton waste factories. The attention of the trade has been called to the need for early improvement, and the matter is being followed up.

Mr. Verney (N.W. London) reports as follows on the process of aerographing, which is being increasingly used for colouring, enamelling, and lacquering articles of various kinds :—

> An emulsion of the colouring matter in water, spirit, or other suitable medium is projected by means of compressed air in the form of a jet of extremely finely-divided spray on to the article under treatment. Much of the spray escapes in an easily inhalable form and may occasion injury to health. In most cases the occupier is advised to space out the work-bench top into compartments, each wide enough for a single worker, by means of vertical partitions. These compartments should be roofed with a glass pane sloping down from back to front of the bench. The manipulation of the article and aerograph takes place under the glass, the worker looking through it with head and shoulders above the glass and out of reach of the spray. An opening at the back of the cabinet communicates with an exhaust fan.

Much useful work is done in preventing the inhalation of dust by making changes in the processes. Often wet grinding is substituted for dry, and in foundry work, instead of grinding or fettling on a wheel or brushing at all, the work can sometimes be done in enclosed chambers by sand-blasting or by shaking-barrels. The Inspectors report several instances of this kind. The question of dust is also being considered by machine makers. Several types of emery wheel grinders are now available with a fan attachment, and the same principle has also been noticed on chaff-cutting machines. Often the partial enclosure of a dusty wheel and the provision of a water tray below it obviates the use of a fan. Mr. Harding (Bristol) reports as follows on the use of the draught at the mouth of lead smelting furnaces to carry away the dust caused in raking-out the furnaces :—

> A screen made of strong sheet iron is placed upon the floor around the space upon which the dross is to be raked. This has side pieces, the tops of which rest against the furnace at a point immediately below the bottom of the furnace door. The screen takes an oblique position at about the line of the pile of dust which will be formed behind it. The side pieces do not touch the furnace except at the top, and so leave space on each side for the entry of air behind the screen. The dust arising from the pile is thus guided upwards towards the mouth of the furnace, where it is picked up by the furnace draught and removed. In addition, a flat-topped hood, with short side pieces, is hung over the top of the furnace door. Both screen and hood can easily be moved to any furnace being raked out.

Many exhaust installations have been provided during the year to collect and remove fumes. Improvements are reported in the following among other trades and processes: type casting, scrap-lead melting, galvanizing, coppersmelting, soldering, and in laundries. The alterations have usually taken the form of hoods over the fuming area and connection to an upcast shaft or fan, or of structural alterations in the workroom.

Mr. Harston (Birmingham) refers to complaints from the workers, of the dense fumes given off in casting brass in the shops exempt from the Brass Regulations by reason of the large air-space provided. He reports that a powerful fan has been fitted with good results in one of the worst of these casting shops. A few of the other exempted shops are provided with fans, but many more remain to be dealt with. It has been explained in previous reports that exemption from the Regulations does not exempt from the requirements of the Act as to exhaust ventilation, when this can be shown to be necessary.

Little progress can be reported in tinplate factories, though improvements are referred to by Mr. Hilditch (Swansea) in the ventilation of tinning pots, and the covering of cleaning machines. The Agreements at the recent Conferences are being discussed with manufacturers at the Inspectors' visits. This trade was very seriously affected by the war, which followed upon a period of bad trade.

The question of free steam in dye-works has closely engaged the attention of Inspectors in the districts concerned, and further improvements are expected as a result of the Agreement on the subject at the recent Conference in this trade. Mr. Mudford (Worcester) reports that the use of enclosed dye-vats is increasing in the Kidderminster district.

Mr. Bennett (Londonderry) mentions an excellent exhaust for removing burnt gas fumes from 28 ironing machines in a collar factory, and Mr. Ringrose (S. London) refers to greatly improved air conditions in a laundry by the connection of the ironing tables to an exhaust fan acting through a grating, under the ironing blankets.

The disposal of the dust and fumes collected by the fans in town factories often raises difficult problems. Often these waste products are blown into the air outside the works, and in the case of country factories, there is usually no objection to this, so long as steps are taken to prevent the dust, &c., returning to the workrooms. The case is different in towns, however. Some of the local authorities have wisely objected to such air contamination, and it is now becoming customary to provide some method of confining the extracted dust. Various systems are adopted. Some of these are described by Mr. John Law (Sheffield) who reports:—

> The cyclone separator for metallic and emery dust has proved not quite satisfactory, being soon worn out by the scouring action of the dust; and hence new plants now laid down are often in conjunction with large unused cellars in which the dust is discharged, there being a flue above each building to allow the air to escape when freed from dust. A disused large mill chimney is excellent for the purpose. Coke boxes with water are also used.

Mr. Good (Coventry) also mentions difficulty in the sand blasting process. If the fine sand extracted by the fans is blown into the open air at a high level, it collects on the roof and stops up the gutters. He describes a collector used in one of the factories. This consists of a large pit into which the dust and a cloud of steam are blown at the same time. Most of the dust settles as sludge, the rest is allowed to escape at a point above the roof. Greater difficulties have been experienced with fumes, and the Inspectors have usually suggested discharging them at a point where the least nuisance would be caused to outsiders. The following note from Mr. Harston (Birmingham) on electrical deposition suggests a way out of these difficulties, as well as a better method of dealing with dust than any of those commonly used:—

> The idea of depositing fume and dust by means of electricity resulted from observations made by Sir Oliver Lodge over 30 years ago. At that time, however, there were no convenient means of producing the high-tension current needed and the problems of adequate insulation as well as other difficulties had not been solved. The method adopted is to pass the dust or fume-laden air through a depositing chamber in which are hung a series of earthed plates interleaved with the discharging grid. The particles of dust or fume in passing near the electrodes become highly charged. The small particles coalesce into larger ones like snow and are deposited on to the surface of the plates, from whence they fall into a hopper or other vessel for collecting the deposited matter. Any kind of dust or liquid particles can be dealt with, however fine, and non-conducting particles can be dealt with as well as metallic particles. The method is applicable to separating acid vapours from waste gases, as, for instance, in the manufacture of sulphuric acid in the process of concentration. The water that is driven off in the form of steam from the weak acid carries with it a considerable quantity of acid. This acid can be separated from the steam completely, no acid escaping and the steam passes through the chamber freely. It is claimed that nitric acid fumes in the manufacture of explosives can be dealt with in the same way. The separation efficiency is said to be 98 per cent. The current is obtained from the supply mains or from a dynamo of low voltage and transformed up to the pressure required (about 100,000 volts) by the special transformer and rectifying plant. The power required is extremely small, for, although the voltage is high, a very small current is sufficient, and so the danger from accidental shocks is therefore not so great as might be expected. It is doubtful if the process could be employed with advantage where carbonaceous dusts are dealt with. The inventors state that many plants of varying sizes have been installed in America for dealing with all kinds of fume and dust.

CHAPTER II.

SAFETY.

By W. S. SMITH, *H.M. Inspector for Dangerous Trades.*

General.—Much attention has been given by the Inspectors to the efficient fencing of machinery by the makers. Numerous interviews with these have resulted in definite promises to supply improved safeguards before machines are delivered. There is still more work to be done in this direction, especially as regards the cheaper classes of machine tools. The difference in the initial cost of a guard which, for example, completely encloses a train of gear wheels, coupled with the greater security gained by a guard of this type, is small when compared with an incomplete band of sheet iron, which leaves the sides of the gearing exposed, often at their most dangerous points. A certain class of occupier, however, will always buy in the cheapest market, preferring to save a few shillings on the initial cost of a machine, on the chance that the cost of fencing required by an Inspector at a later date will be less, though it is usually more and seldom so satisfactory as a guard forming part of the original design of the machine.

As a result of these efforts it has been noted that a large proportion of the new plant, installed since the outbreak of war for the manufacture of munitions and equipment, has been supplied with well-designed guards sold with, and forming part of, the machines. In many instances, too, it has been observed that necessary safeguards for prime movers, motors and transmission machinery have been fitted to new plant, rapidly assembled and erected to meet the urgent requirements of the war, before the first visit of the Inspector. There are still, however, numerous occupiers who await the Inspector's visit before attempting to guard obvious danger points.

Accidents.—Reported accidents were considerably less during 1914 in the majority of districts. Compared with 1913, the machinery accidents during 1914 for the United Kingdom, in premises under the Factory Acts, were 9·6 per cent. less, though the fatalities were 7 more (427); all accidents were 10·5 per cent. less and the total number of fatalities was 22 less (1,287). Approximately the toll contributed by peaceful industry in the factories and workshops of the country consisted of 159,000 casualties.

Many of the Inspectors comment on the decreases noted in their areas, which are surprising considering the abnormal activity during the latter part of the year of many trades which were working exceptional overtime and night shifts to supply the necessary equipments for the war. The decreases varied from 3 per cent. (Nottingham) to 34 per cent. (Manchester). Slight increases were noted in a few of the Southern English districts, and in Dublin, Londonderry and Cork. In Norwich the decrease (10 per cent.) occurred during the last four months of the year; in Ipswich the decrease (25 per cent.) was not wholly due to the war as a diminution of 14 per cent. was noticed up to July 31. In the Birmingham district, with a decrease of 5 per cent., it is interesting to observe that the few industries which have been depressed owing to the war have always exceedingly low accident rates, whilst those trades which normally contribute the largest number of accidents have been exceptionally busy since the outbreak of war, working much overtime and double shifts wherever possible. Sheffield shows a decrease of 15 per cent., and here, too, all the factories from which the bulk of the accidents are reported have been working almost continuously, night and day, at the highest pressure for the past five months. From Hull a decrease of 15 per cent. is noted, of which 8 per cent. occurred before August and 26 per cent. since; these figures furnish an index of the reduction in the shipping industry at this port. In Lincolnshire the decrease (10 per cent.) is attributed entirely to the effect of the war, owing to the smaller amount of shipping; a large fall was observed in the number of accidents reported from the docks during August and September, and for the last quarter of the year the number was below normal. From Newcastle a decrease of 7 per cent. is noted, though the fatalities have risen from 75 to 85, largely due to the employment of men, unaccustomed to the dangers of shipbuilding yards and engineering shops, who have taken the places of those who have joined the Army and Navy. Notwithstanding the enormous influx of workers into Barrow-in-Furness since July, the constant and heavy overtime and employment of double shifts in many departments, the increase in the number of reportable accidents was less than 3 per cent. for the important armament and shipbuilding works there. The large decrease (34 per cent.) in the Manchester district is attributed partly to shortage of employment following the outbreak of war, but increased efficiency of fencing is also considered an important factor. Decreases of over 20 per cent. were noted in the Oldham and Burnley districts, partly owing to the same causes, but a similar decrease in Dundee, distributed equally between both textile and non-textile industries, could not be ascribed to slackness of trade, which

was insufficient to account for the whole of the diminution. It is considered that part of this decrease may be explained by the fact that the numerous new workers attracted to the various industries during the trade boom of 1912 and 1913 have become more experienced and accustomed to machinery.

Instances are given by the Inspectors to show that many minor accidents are still unreported, though the standard of notification is improving. Several prosecutions were taken for neglect of this requirement.

Neglect and indifference by workers in using or maintaining guards are among the chief factors in the causation of accidents. Increased care and regard for safety on the part of the operatives would undoubtedly result in a large reduction in the number of accidents. In the Southampton district more than 30 per cent. of the accidents investigated were found to be due to carelessness or lack of ordinary precautions by the workers; in Lincolnshire 18 per cent. were due to carelessness, while 25 per cent. were ascribed to insufficient fencing, lack of proper adjustment of guards, or failure to maintain efficient safeguards. The Inspectors in the Liverpool, Warrington and Wigan districts report that respectively 20, 37 and 25 per cent. of the accidents investigated neither revealed want of fencing nor need for improvement of guards; many of the others were due to carelessness or disregard of danger. Cleaning machinery in motion, faulty adjustment of guards, lack of adequate supervision, frequent indifference of workers, and neglect to use safeguards provided are found to be the chief causes of accidents in the Manchester district.

In the textile districts of Lancashire, cleaning machinery in motion is a fruitful source of accident, and no satisfactory decrease from this cause can be expected until occupiers and workers agree that cleaning shall be done only while the machines are stopped. In Oldham it is computed that about 75 per cent. of the cleaning is done with the machinery in motion, the major portion by young persons and sometimes by children, illegally. Several prosecutions followed where children had been injured whilst cleaning machinery in motion: one defendant (an operative minder) naively admitted that children were of no use in the mule room unless they could do such cleaning. Production being the first consideration, accidents must ensue if cleaning be continued under the present system. Though in every mill there are numbers of notices prohibiting cleaning of machinery in motion, these are more honoured in the breach than in observance. If attention is drawn to such a notice after an accident in the mill the usual reply is, "Well, she wer'n't cleaning, she were only wiping."

In all branches of the textile trades—cotton, wool, flax, hemp and jute—strong remarks are made by the Inspectors as to the dangerous practice of cleaning machinery in motion. This habit, which seems to be deeply ingrained in textile workers, would be regarded by non-textile operatives as madness if they were invited to clean such quick-running complicated mechanism in motion. In some of the textile districts, upwards of 16 per cent. of the total reported machinery accidents, many very serious, are due to this practice.

Accident Prevention and Safety Committees.—Several of the Inspectors refer to the remarks under this heading in the Annual Report for 1913 (p. 18), referring to the formation in factories of small safety committees composed of workmen to investigate accidents and prevent their recurrence. At one large works where the system has been followed for the past seven years, comparatively few accidents now occur owing to the increased attention given to fencing; few of these become serious, as the greatest care is paid to first treatment of the slightest injuries. The safety committees at this factory systematically inspect the machinery and plant in their respective departments, and report as to proper maintenance of the safeguards. They hold a kind of court-martial into every accident to investigate the cause and apportion the blame, if any; their findings are duly posted in the works. At another factory, where all machines and safeguards are inspected thrice daily by skilled workmen, who report immediately to the manager on any defects found or repairs needed, a marked diminution of accidents has been noted since this plan was instituted.

Blast Furnaces.—The question of "slips" and "scaffolds" in blast furnaces still engages attention owing to the number of accidents from this condition of the furnace. Two men were killed by an explosion at a furnace in the Leeds district. As soon as it was found that a "scaffold" had formed and the burden was hanging to the sides, steps were taken to "jump" the furnace, *i.e.*, to turn the blast off and on suddenly, but the explosion occurred before this had been done. Though the explosion doors on the "down comers" were forced open by the explosion, the hopper was shifted, and the men were buried in brickwork which was displaced from the coping round the furnace top.

Scaffolding, the condition prior to slipping, appears to be more common in Scotland than in England, probably owing to the greater use of coal in the North and the increase

in the quantity of small ore. Fine ore is usually briquetted or formed into hard lumps in a nodulising plant, and such methods may help to prevent the formation of scaffolds within the furnace. As an explosion following a slip usually involves serious, if not fatal, injuries to the chargers at the furnace top, the question of protection for these men has to be considered, and nothing short of automatic charging plant appears to be the solution of this problem from the safety standpoint.

Blood poisoning.—Reports show that some progress has been made in the reduction of cases, but fatalities still occur and prolonged invalidity often ensues in consequence of slight injuries received in works where excellent first-aid requisites are provided, but not utilised except for more serious accidents. The following is a selection from the Inspector's reports :—In a London bakehouse a baker grazed his knuckle on a bucket, took no notice of it, and died 7 days later from septic conditions. A large London firm, employing 3,000 workers, had 107 cases of blood poisoning following slight wounds during the year, though good medical appliances are kept on the premises and generally made use of. In Northamptonshire two of the five fatalities reported during 1914 were due to blood poisoning following trivial injuries, and complaint is made by the Inspector that very slight accidents are not reported and are often neglected till septic conditions arise. In Coventry one of the four fatalities reported was due to blood poisoning after a cut so slight that the deceased did not trouble to have it dressed. A similar fatality occurred at an iron foundry in Stirlingshire. In the Norwich district 34 non-fatal cases of blood poisoning were recorded as against 40 during 1913. In the Cardiff district seven of the 52 fatalities were due to blood poisoning and one to tetanus following slight accidents. In Leicester the cases rose from 45 to 78, notwithstanding persistent and systematic efforts to keep the subject of first-aid treatment before occupiers and workmen. In Dundee the numbers fell from 157 in 1913 to 108 during 1914 ; there are means in almost all the Dundee factories for treating injuries, but slight wounds are unfortunately seldom taken to be dressed until septic conditions develop. Throughout the country many occupiers have been instructed as to the value of 10 per cent. iodine solution and the need for immediate treatment of the smallest wound, however slight. It is reported that workmen with First-aid certificates were among the first to volunteer for the war, and it is feared that the presence of many of these in the army may lead to an increase in the number of cases of septic poisoning at home.

Celluloid.—Several works in this trade have had to stop owing to the impossibility of obtaining supplies of material from abroad. Further improvements as to means of escape and provision of receptacles for inflammable materials have been effected in others. Two firms who occupied dangerous premises in the congested London area have moved out into excellent modern buildings. A fire involving celluloid has since occurred in one of these ; this was not serious, but in the old premises it would probably have been disastrous.

Cranes.—Overhead electric cranes were again responsible for a number of fatal and serious accidents. The importance of adequate sound signals has been impressed upon occupiers. In numerous instances the means of access for the crane driver have been improved. In one works repeated accidents occurred, after conversion of the overhead cranes from rope drive to electric control, due to men being crushed between the crane framing and fixed vertical columns when leaving or approaching the cranes ; various devices were tried unsuccessfully, but no accident has happened since the installation of electric glow lamps, both near and at the top of the ladders leading to the crane tracks. These are automatically lighted as the crane approaches within a few yards of each ladder head. In Sheffield several fatalities were due to the fact that the crane driver had not been warned that workmen were on the track. The following notice has been adopted and found useful in preventing accidents of this nature in some of the large Newcastle shops and foundries :—

WARNING.

Any workman who has occasion to go on the overhead craneway, or do any work near the crane rails, must, before doing so, personally warn both crane drivers and slingers.

Crane drivers and slingers must not on any account allow their cranes to run near to any part of the rails where any workman is, or has been, working until that workman has notified them that the line is clear.

Dangerous Occurrences.—Except from Sheffield few reports of fractures of lifting gear, or revolving vessels, wheels and grindstones have been received. The majority of the notices refer to fires, and the Inspector, by noting the daily papers, can generally check and trace unreported cases. With respect to chain fractures, it has been noted in one large foundry that the posting of lists of safe loads for chains of different diameters and

the stencilling of weights of heavy castings has led to a considerable reduction in the number of these occurrences. In Sheffield the number of reported chain fractures is less for the year, due chiefly to a reduction of notices from one firm who now have far less breakages owing to careful supervision and examination and the use of stronger chains. In Newcastle the number of reported occurrences has risen from 300 in 1913 to 578 in 1914, probably owing to circulars of instruction sent to the occupiers of large works in the district. In Liverpool only 15 chain fractures were reported, notwithstanding circular letters and personal instructions by the staff to occupiers and stevedores. It should be noted, however, that wire ropes are extensively used in Liverpool, and the lifting gear is closely supervised; also should a fracture occur, personal injuries generally result owing to proximity of the workers to the lifting gear.

Dough Machinery.—Much work has been done to improve the fencing of these machines. Objection is repeatedly made to the expense of the full automatic cover for dough mixers; this is often a serious matter for the baker in a small way of business, whilst there are difficulties in the fitting of standard safeguards to the older types of machines, which also add to the expense. To encourage the invention and improvement of efficient safety devices which can be fitted at a reasonable cost to this class of machinery, the Employers' Mutual Insurance Association has placed the sum of £200 at the disposal of a representative committee which includes members of the National, Scottish and Irish Associations of Master Bakers and officials of the Factory Department. It was decided to hold a competitive exhibition for bakehouse safety appliances during 1914, but this was deferred on account of the war. A competition will, however, take place during the present year. The committee propose to award diplomas or medals for all exhibits which meet with their approval, and in distributing the awards will take into consideration the price at which the appliance is sold, its efficiency as a safeguard, and its general adaptability to various types of machines.

Few of the Inspectors are able to report much progress as to provision of automatic covers for mixers. An automatic guard of a certain type which may be excellent for the particular class of machine for which it was designed may be useless for dough mixers of other designs. A number of the standard safeguards were the invention of Continental firms and cannot at present be obtained. Many occupiers are willing to provide automatic covers, but are at a loss to know where to find engineering firms willing to undertake the work. Some occupiers seem more inclined to purchase new types of machines than to fit guards to old machines. A number of cylindrical drum mixers have, in consequence, been installed in place of old open trough mixers. A few of the larger firms and Co-operative Societies are, however, obtaining automatic guards and having them fixed as soon as the work allows; others are devising new types of guards suitable for their existing machinery, and some progress in this direction is reported. It is hoped that several efficient and cheap appliances will soon be perfected. In the Norwich district an excellent guard has been made locally and fitted to a dough brake for less than £2 complete.

Comments on 10 accidents during the year from dough mixers were received, including a serious one involving the loss of a man's leg in the knives. A fatality occurred in the Cardiff district at the rolls of a large dough brake used for the manufacture of ship's biscuits. A guard of the non-automatic type was provided, and the machine was also equipped with the usual four handles for immediate reversal of the rolls. The accident was mainly due to the fact that the deceased (a novice at the machine) was engaged and set to work on it at a period of great pressure. Accidents continue to happen on dough brakes in Liverpool, notwithstanding the provision of guards. In most cases they are due to the workmen cleaning the rollers in motion after lifting the guards.

Explosions of Dust, Gas, &c.—Additional samples of carbonaceous dusts have been examined by Dr. Wheeler at Eskmeals. Several of the samples from paper tube works were found to be not very dangerous owing to the high proportion of mineral matter which the paper contained. The ash contents varied from 24 to 54 per cent.; samples with less than 32 per cent. were classified as dangerous. Similar results were obtained with samples from rag chopping and sorting rooms of paper mills where the ash contents varied from 27 to 77 per cent. Owing to the fluffy nature of some of these dusts it was difficult to produce dust clouds, experimentally, of sufficient density to propagate flame. Tapioca dust from Java manioc root was not found to be dangerous, though the ash content was only 2 per cent.; the failure of this dust to propagate flame was due to the fact that the gases evolved by destructive distillation contained about 30 per cent. of carbon dioxide which greatly hindered ignition of the inflammable gases with which it was mixed. Samples

from mixing and spice rooms of a cattle-food factory and from the grinding room of a provender mill proved to be dangerous dusts.

Reports were also obtained, in consequence of fatal explosions, as to pitch dust and diazo-dye substances. Pitch dust was found to be a more highly inflammable material than coal dust of the same degree of fineness, and almost as dangerous as sugar dust. Pitch, however, is not very brittle, except in cold weather, and so does not form fine dust readily. Some of the diazo-dye substances with aniline and naphthalene bases, though they cannot be strictly classed as dangerous dusts, appear to undergo molecular change when heated. Two explosions have been recently recorded in different works where such compounds were being dry ground in drum grinders of the enclosed revolving type. It is suggested that frictional heat generated in the grinding process might be sufficient to start chemical action which, in a closed space, might become so violent as to burst the machine.

Owing to a serious explosion of coal dust at a cement works in South Wales, considerable attention has been given to the coal-grinding plants of cement factories, some of which were found unsatisfactory owing to dusty conditions. Previous explosions, due to ignition of coal dust used as fuel in modern rotary cement kilns, have been recorded in past Annual Reports. In the present case, two men were fatally burnt and four others injured in attempting to escape from the working platform of the kiln. Difficulty had been experienced in closing a large valve at the bottom of a coal dust storage hopper, and the cover of the valve box was removed, contrary to instructions, before the valve was closed. A large quantity of coal dust escaped, and fell over the edge of the working platform on to the rotary kiln below, where it immediately ignited. The Inspectors have urged the adoption of the following precautions in such works :—

(1) Provision of outside iron ladders with suitable means of escape from each floor or platform of the kiln house.

(2) Installation of screens below the coal dust shutes to remove foreign material liable to cause obstruction in conveyors, valves, &c.

(3) Padlocking valve covers to prevent opening by unauthorised persons.

(4) Complete separation, by concrete partitions, of the coal-grinding plant and feeding plant from the rotary kiln.

A disastrous explosion of picric acid dust in the Huddersfield district resulted in the loss of eight lives and injuries to many other persons, in addition to much destruction of property. Dry picric acid was being ground in a small hand-grinding mill in a room which was impregnated with fine dust. It was presumed that a spark generated in the grinding process ignited the dust in the confined space, and caused an explosion which was rapidly propagated through the room, and wrecked the building.

Several dust explosions have again occurred in the rag and flock factories of the Huddersfield district; one of considerable violence resulted in serious injury to four workers. These explosions generally occur in the rag shakers and are due to sparks generated by the rapidly-revolving beaters in contact with buttons, nails or other foreign material. The risk of explosion is now being satisfactorily overcome by passing the rags first through a slow-running machine, known as a "Winsey." The speed is too slow to produce sparks, and the rags, after leaving this machine, do not contain sufficient dust to cause an explosion in the shaking machines. Improved dust-extracting plants are being installed in the flock factories to reduce risk of explosion.

Improvement in the conditions of the oil and cake mills is reported from Liverpool, as the result of installations of mechanical ventilation plant and the employment of regular sets of sweepers.

An explosion of pitch dust occurred at the Glasgow Docks when a ship was being loaded with pitch. Waggons containing the pitch were being tipped into the hold of the ship, and the atmosphere of the hold became charged with fine dust, due to pulverising of the pitch. Four men were in the hold trimming the material, and working by the light of naked candles, hung by wires from the beams, when a violent explosion took place, owing to ignition of the dust by the lighted candles. Two men were seriously burnt, one fatally.

Compressed gas.—An explosion in Kent, fortunately without personal injuries, partially wrecked a Diesel engine. Cylinders containing compressed air were being used to start the engine; one of these was found to have held oxygen, though sent out with others containing air only, and similarly marked. It is suggested that different gases should be stored in differently coloured cylinders, according to a standardised scheme, but in a report on the "Mauretania" explosion, which occurred in the Liverpool Docks,

Mr. Buchan shows the inadequacy of colour only as a distinguishing mark for compressed gas cylinders. A serious explosion on this steamship early in the year, involving the death of four men and serious injuries to five others, was due to the use of a compressed gas cylinder, which accidentally contained a mixture of coal gas and oxygen. A turbine on the steamer was being rebladed and a burner supplied with compressed air and coal gas from two cylinders was being used. The coal gas cylinder was painted red and fitted with left-hand screw connections; the air and oxygen cylinders were painted black and fitted with right-hand screws. A new cylinder of coal gas was required to replace an exhausted one, and the workman, when he proceeded to make the necessary connection, found that the new cylinder had a right-hand screw instead of a left-hand thread, but the red colour of the cylinder and the smell of the contents indicated the presence of coal gas. An adapter was made and fitted to the connection on the cylinder which was then connected with the gas burner, but the flame was unsatisfactory and the cylinder soon exploded. Inquiry afterwards showed that the cylinder had contained not pure coal gas, but an explosive mixture of coal gas and oxygen. It appeared that the cylinder had been previously sent out from the compressed gas factory, painted black, and containing oxygen. For some reason unknown the customer of the gas company painted the cylinder red, and thus it got amongst the red cylinders when returned to the gas factory, was treated as a coal-gas cylinder, and subsequently charged with this gas; although it had a left-hand screwed connection, the filler, as the thread was somewhat worn, managed to make the necessary connections with the compressing machine, and charged it. Mr. Buchan makes the following suggestions:—

(1) Removal of residual gas or air in cylinders on their return to the works for re-charging.

(2) Numbering and registering of the cylinders.

(3) Use of different shaped cylinders for different gases.

(4) Use of screwed connections differing in diameter as well as in direction of thread.

Air compressors.—In Staffordshire two men were killed owing to an explosion of an air receiver connected with a power-driven air compressor used for the starting of three large gas engines. After careful inquiry, it appeared that the explosion was due to ignition of a mixture of air and finely-divided lubricating oil. This oil was of high flash-point, specially made for compressors, and the compressor was effectively water cooled, but it had been run for an exceptionally long time, and had probably become hotter than usual. The explosion apparently originated at the point where the discharge pipe joined the compressor, and this pipe was liable to get very hot. An explosion of an air receiver, reported from Leeds, was also due to ignition of oil vapour.

Gas works purifiers.—Explosions are reported from Liverpool and Staffordshire, with injuries to several workmen in each of the three cases recorded. The cause of the explosions appeared to be ignition of accumulations of gas, in imperfectly ventilated purifier boxes, by sparks from the workmen's shovels when removing layers of oxide of iron from the boxes.

Naphtha, &c.—Several explosions, with three fatalities, were reported from Glasgow, two being due to lamp explosions and one to the throwing of naphtha on a smouldering fire. Examination of the exploded lamps showed that the reservoir had been partially enveloped by flames for some time prior to the explosion. If the lamps were properly constructed, this should never be possible, but in the ordinary naphtha lamp, largely used by iron workers, a slight leak may lead to this dangerous condition at any moment.

A few slight explosions have been reported from dry cleaning works, but the measures now generally provided were sufficient for dealing quickly with the fires that followed. Among the causes were sparking, due to frictional electricity, and bringing a naked light too near an underground spirit store.

Explosions of old oil drums and petrol tanks have occurred during repairs owing to presence of residual vapour, which was ignited by hot soldering irons or by oxyacetylene flames.

Great care is needed in dealing with old drums and tanks which may have contained acids, chemicals or inflammable spirits. Several explosions are reported from the Swansea district. A man was killed by the explosion of a drum which had contained sulphuric acid; he was piercing a number of such drums with a pick prior to charging them into a steel furnace. The drum contained hydrogen, which was ignited either by a spark from the pick or by the red-hot peel of the charging machine which was near.

Fire, means of escape.—The provision of adequate means of escape is still a serious matter in the London districts, and much work has been necessary by the Inspectors in this direction. In the West London district, 85 cases have been referred to the Local Authorities, the commonest defect being absence of communication between the top floor of high buildings and the roof; in the North London district, 252 notices were served on the Authorities.

Special attention has been paid to premises in which inflammable material, such as celluloid, is manufactured. In several cases, processes carried on in unsuitable workshops have been given up and removed to the outskirts of London and other cities, owing to pressure brought to bear by the Department. A serious outbreak of fire occurred in a celluloid film workshop in North London; a young person was burnt and rescued only with great difficulty. The workers were employed on the ground floor, which was provided with sufficient exits, but, notwithstanding these, the workers were instantly cut off by the rapid generation of flames. The ceiling was low, and this was an important factor in holding down the flames on the workers. In a loftier room the flames would probably have expended themselves without directly touching the persons employed. At a works in Derbyshire, where an inflammable celluloid paste was freely used, a serious burning accident occurred, indirectly due to the fact that the rooms were heated by ordinary open coal fires. Instalment of an efficient hot-water system is being required. A serious fire in the N.W. Division originated in a store of powdered celluloid, spreading to heaps of scrap celluloid on the open ground, and thence to barrels of inflammable spirit, and to adjacent outbuildings. The main buildings were, however, practically unaffected, and work was resumed in them on the following day. Had the fire occurred in an ordinary town factory the result would probably have been disastrous. The stores here were entirely separate from the main buildings, but less damage would have ensued if the whole of the scrap celluloid and inflammable spirit had been properly stored, as a store containing spirit, protected by a sunken floor and earthen embankment, though in the track of the fire was unaffected.

Many instances of obstruction of stairways, landings and passages in factories and workshops have been discovered during the year. A prosecution for such obstruction was taken against a large firm of rag sorters in the Newcastle district and the full penalty obtained. A case was noted in London of a building with two staircases, one used by the factory workers and the other by the office. The factory staircase roof exit was kept locked by the manager, as he was in the habit of playing tennis with other occupiers of the building on the flat roof, regardless of the fact that the alternative exit in case of fire was not thus available. The tennis court was made accessible to all after threat of immediate prosecution.

Complaints are made of the lack of support by some of the smaller urban authorities in Yorkshire. In the Huddersfield district, a case of a woollen mill, employing over 40 workers, with four storeys above the ground floor and only one staircase, has so far resulted in no improvement, though two references have been made to the Local Authority, and the Inspector is proceeding to take action in default. In Londonderry there is also difficulty with the Local Authorities. Plans for new premises are submitted for halls, warehouses or stores, and passed without provision of fire escapes; they are afterwards occupied in whole or part as factory premises and the Inspector characterises in strong language these repeated attempts to evade statutory obligations.

Grindstones and emery wheels.—A marked reduction in the number of grindstone fractures is reported. Accidents fell from 27, including 2 fatalities, in 1913, to 25, including 1 fatality, in 1914; the reported dangerous occurrences due to fracture without personal injury fell from 89 to 46. The fatalities from bursting emery wheels, on the other hand, increased from 2 in 1913 to 7 in 1914, though the total accidents show a reduction of 17 per cent. (93 in 1913, compared with 77 in 1914). Reported dangerous occurrences due to fractured emery wheels without personal injury rose from 52 to 62.

The majority of grindstone fractures occur in the Sheffield district, where the speed is often much too high, and the grinders frequently show lamentable ignorance of the subject. Accident reports from Sheffield for last year show surface velocities of 4,125, 5,070, and 7,115 linear feet per minute, while 20 out of 34 fractured grindstones burst at velocities between 3,000 and 4,000 linear feet per minute, and 11 between 4,000 and 4,500 linear feet. Many of the Sheffield grinders stick to an old rule-of-thumb of "diameter of driving pulley equals half the height of the stone," regardless of the fact that the speeds of the shafting vary considerably in different tenement factories, and even in "hulls" in the same tenement. One old foreman grinder could only with difficulty be persuaded that the fracture of a stone was due to excessive velocity (5,070 linear feet per minute), and that his other stones were being run too fast. He had removed from one tenement where

the shafting was running at 140 revolutions per minute to another where the speed was 190 revolutions per minute, with 4 feet driving drums in each case. It was found in another tenement, where the speeds of the shafting were taken in 10 "hulls," that the stones in one shop were running at velocities 25 per cent. higher than similar stones in another shop. Natural grindstones should not be allowed to run beyond a surface speed of 3,000 linear feet per minute unless provided with an efficient guard. The grindstones of grinders in the textile machinery factories and other similar shops are rarely found to exceed speeds of 3,000 linear feet per minute, and cases of fracture are exceedingly rare.

A memorandum on safety precautions for emery wheels was issued during the year; these include instructions to Inspectors and occupiers as to construction and material for guards, speeds of emery wheels, mounting, rests, and exhaust appliances for grinding on dry wheels. Special attention has since been given to this matter by the Inspectors, and reports show that occupiers have generally welcomed information on the subject as they are alive to the danger of fracture and the need for adequate precautionary measures. Speeds as high as 9,000 and 11,690 linear feet per minute have been discovered, and guards made of such unsuitable materials as plate glass, thin sheet iron, tin plate, wood, and cast iron have been met with. In one factory in Sheffield four heavy emery wheels 26 inches in diameter and 5 inches wide were fenced with wood guards $\frac{5}{8}$ inch thick; one of the wheels burst, and the so-called guard was smashed to atoms. Several accidents were due to failure of cast-iron guards. This material is most unsuitable for the purpose of fencing emery wheels, but some of the machine makers still persist in supplying such guards. An attempt has also been made to substitute guards of malleable cast iron under the name of steel alloy castings, but these guards have not been sanctioned. The best guards should consist of strong plates or forgings of wrought iron or steel, firmly secured to the machines and protecting the periphery of the wheel as far as practicable.

Hoists.—There is little new to be said on this subject, as the main causes of accidents are well known; similar casualties occur year after year with remarkable regularity, in spite of the efforts of the Inspectors to secure better conditions of safety.

Accidents show a slight decrease (702 in 1913, 669 in 1914), but the fatalities are higher (42 in 1913, 46 in 1914). The more modern hoists are usually provided with automatic appliances, which prevent opening the doors protecting the hoist well landings until the cage is level with the respective floors, and make it impossible for movement of the cage until the doors are closed and secured. Reconstruction of many of the older hoists will be necessary to bring the fencing up to these ideal standards, and the cost of efficient interlocking devices is heavy, but not out of proportion to the serious annual losses involved by the payment of compensation for fatalities and severe injuries sustained. The majority of accidents are due to crushes between the cage and the openings and structure of the hoist well. Fencing of the cage with a gate seems equally as necessary as fencing of the openings into the hoist well. Experience shows that the expedients of bevelled boards under projections and openings, whilst lessening the severity of the crushes to feet and shoulders, does not always prevent such accidents. Out of 23 hoist accidents in the Huddersfield district, 19 were due to crushes of the body between the cage and some portion of the well; over 20 accidents occurred in Dundee, many of which happened at places where projections had been bevelled. In Bradford, where there are a large number of hoists, the usual method of fencing is by automatic gates and the number of hoist accidents is remarkably few. The dangerous single-bar guard to the well openings caused a fatality in Birmingham, and serious accidents elsewhere. In addition to automatic safeguards, discipline is also necessary as to maintenance, and use of hoists by unauthorised persons. Operatives are inclined to take too many risks: the habits of jumping in and out of the cage as it passes a landing, riding in hoists the use of which is forbidden, except for the transit of goods, propping gates open, and tampering with automatic locks and other fastenings, are much too prevalent. Proper hoist attendants of mature age seem very necessary, unless the hoists are completely automatic. Of 20 hoist accidents in the Liverpool district, 10 occurred at hoists without authorised attendants. A serious accident, in which 12 people were involved, occurred in Glasgow at a hoist in a building where some women were working late; instead of using the staircase after finishing work, they attempted, with the aid of the forewoman, to descend in the hoist from the top floor. The hoist was overloaded, as 10 cwt. was the maximum load, and descended rapidly; attempts were made to reverse it, the rope broke, and the women fell 20 feet. A notice was posted outside, forbidding passengers to use it. The employer of the injured persons was a temporary occupier at the top of the building, and the hoist was the property of the owner of the building, and should have been used only by his servants.

The importance of covering the top of the cage was illustrated by a fatal accident in Preston. A wheeled bogie fell down the hoist well and struck a man in the cage, killing him instantly. Of course, effective automatic gates would have prevented any such article gaining access to the well.

Two fatalities in Manchester were due to absence of rope grips. These appliances would have stopped the gradual creeping up of the cages, which was due to the hydraulic power not being properly shut off. Absence of such a recognised safeguard was also the cause of fatalities in the Wigan district.

Several fatal and severe accidents were due to failure to put the hoist out of action during the execution of necessary repairs. Some of these could not have happened had the balance weight guides been fenced off to a height of 6 or 7 feet.

Hydro-extractors.—A serious accident due to the bursting of the cage of a hydro-extractor was reported from the Leeds district; the radial arms carrying the cage fractured when the machine was running at 500 revolutions per minute, carrying its usual load of wool. Guards for the tops of the machines are being supplied in the textile mills and dye works in Yorkshire. Accidents due to contact with the revolving cages are now becoming less frequent.

Iron foundries.—In view of the suggestions of the recent Conference Report, protectors for the feet have been provided by employers in a number of foundries, but complaints are general that the workers do not like them; it is often urged that they hamper movements, and should a splash of molten metal enter the boot it takes longer to remove the footgear. Reports, however, show that the wearing of these safeguards on suitable boots has considerably reduced the number of burning accidents. During 1914, 295 cases were reported in the Wolverhampton district, the majority of which were preventable; in consequence of the attention given to the subject a number of appliances have been introduced in this district, and the employers have asked the Inspectors to co-operate with them in inducing the workers to wear the proper stout boots or spats provided. At a foundry in the Wrexham district, the molten metal is now conveyed from the cupola in bogies instead of hand ladles, and the number of accidents from splashes has been considerably reduced in consequence. Close observation has been kept on this class of accident in the Stirlingshire iron foundries; 67 per cent. of the casualties consisted of burns on the feet, 18 per cent. were burns of the eye and eyelid, and 15 per cent. were on other parts of the body. Of the injured persons, 82 per cent. were moulders, 13 per cent. furnacemen, and only 5 per cent. labourers. Nearly 40 per cent. occurred during actual pouring of the metal from the ladle into the mould, 30 per cent. during transit or transfer of metal from the cupola to the moulds by bogies or hand ladles, and only 14 per cent. during tapping operations at the cupola. The Inspector attributes the majority of these accidents as due to want of reasonable care on the part of the injured person or his fellow workmen, and thinks that little reduction can be expected until the wearing of some efficient form of boot protector by the worker becomes a statutory obligation.

Laundry machinery.—Reports show that the standard of fencing is generally good, and that accidents are few. Irregularities usually consist in the fixing of guards too high. Automatic guards for calenders and ironing machines require frequent attention as to correct adjustment and to ensure perfect working order; otherwise they create a false sense of security. Unfortunately, in many cases the only person available for this duty is the "engineer," who tends the engine and boiler, and looks after the washing machines. His knowledge of mechanism is often limited, and when an automatic guard gets out of order, it is apt to remain in this condition until an accident calls attention to the defect. An accident in the Southampton district at a calender machine, provided with a good type of automatic guard, was due to lack of proper adjustment.

Machine tools.—Drills.—Drilling machines are responsible for numbers of accidents, almost as many as lathes. Unfortunately, one of the dangerous portions, the drill, cannot be guarded, or the function of the machine would cease. Many accidents are due to the drill or boring tool binding in the hole, and causing the work to swing round against the hands. Much drilling is done in jigs to secure accuracy of position of the holes in repetition work. The jigs are rarely fastened to the table by bolts and nuts, but they can be prevented from swinging round and causing injury by the simple expedient of fixing metal strips on the table on either side of the jig.

Another source of accident is the projecting set-screw used for fixing the drill into the spindle or chuck. In many cases, the spindle head is not large enough in diameter to allow countersinking of the screw-head. A ring of sufficient thickness should be shrunk on the spindle in such cases, and a hole cut in the ring large enough to allow use of a box spanner.

A fatality in the Swansea district was due to a portable electric driven machine. The drill spindle was temporarily fixed for horizontal work, about 2½ feet from the ground; the deceased's trousers became entangled on the spindle. Fencing of such spindles is very difficult, as they are telescopic, and worked at different angles; guards are now being tried.

Lathes.—Several fatalities are reported from Birmingham, and one from Cardiff, due to accidental contact of the worker's clothing with projecting bars from the hollow spindles of turret lathe headstocks. Guards are now generally provided—a movable tube on legs being often preferred—but this does not seem sufficient, judging by some of the accidents. In the Cardiff fatality, the bar which was being turned was in excess of the length authorised by the management, and, therefore, projected beyond the guard. Serious accidents, due to the same cause, are reported from Wolverhampton and other districts. It is essential that the guard should extend over the whole length of the bar, and protect the end, which is often ragged. The risk is the same as that of low, unfenced shafting; the diameter of the bar is often 2 inches or more, and the length exposed at a height of about 3½ feet may be 8 feet or more, with a speed of over 100 revolutions per minute. Much machinery of this kind has been lately installed for the manufacture of munitions, shells, fuses, adapters, &c., from the bar. Simple and efficient automatic guards have been provided in some instances; the guard consists of a long U-shaped sheet of metal, hinged and so interlocked with the driving clutch of the lathe that the bar cannot be rotated unless the guard is in position. In another type, the guard is so arranged that the clutch holding the bar in the lathe cannot be closed if the guard is open. Some such interlocking device seems necessary to ensure safety as the majority of accidents are due to temporary removal or non-maintenance of the guards.

More accidents are caused by lathes than any other class of individual machine, but the number has fallen by 8 per cent., though the fatalities have risen from 6 to 9. It should be remembered that all classes of lathes are largely required in the manufacture of shells and other munitions of war, and the number of these installed in the engineering shops has been greatly increased since August. Both fencing and construction have been improved of late; many of the new lathes assembled during the past few months were found to be well fenced by the makers. Not many lathe accidents are now due to unguarded cog wheels. From Birmingham 326 accidents were reported during 1914, a decrease of 10 per cent. compared with the previous year, but only 13 were due to gear wheels.

The bulk of the accidents are caused by (1) traps between the work and tool; (2) flying cuttings or turnings; (3) projections on face plates and chucks; (4) driving dogs and carriers; and (5) shifting belts on cone pulleys. Many of these accidents would not occur if the workers were more careful, realised the danger of wearing loose or ragged clothing, especially loose sleeves, and had no objection to using plain goggles as a protection to the eyes against flying hot cuttings. The large number of accidents due to driving dogs can be eliminated by the use of safety dogs and carriers free from projections, whilst the provision of simple mechanical belt shifting appliances should prevent accidents due to crushes of the hand or arm between belt and cone pulleys.

The modern type of lathe is a much safer machine than the old-fashioned screw cutting lathe with its cone pulleys, exposed back gearing, change wheels, and other cog wheels. The cone pulleys are dispensed with and all changes of speed and movement of the tool are effected through enclosed gear boxes, free from danger. The war should have at least one good effect in modernising many of the less up-to-date engineering factories by the introduction of newer and safer machine tools.

Milling Machines.—Accidents still occur, but these are now mainly on cutters with badly adjusted guards, or due to contributory negligence on the part of the workers who still persist in sweeping away the swarf with their fingers instead of using the brushes generally provided. Practically every one of the 34 accidents on milling cutters in the Coventry district was so caused; similar reports are to hand from Birmingham, Kent, Lincoln, Nottingham, Wolverhampton and other districts. Severe disciplinary measures, including dismissal of the offenders, have been taken in some factories to stop the practice. A number of accidents which fencing would scarcely have prevented happened in North London on very small cutters; they were chiefly due to employment of more or less unskilled labour following the outbreak of the war. The work often acts as a guard to some extent, but care is needed in removing small articles from jigs if the latter are near the cutters. In Liverpool five accidents out of nine reported were due to want of fencing; in one case a guard was provided but not used. From Lanarkshire it is reported that freedom from accidents hitherto has prevented the general adoption of guards. In the

largest engineering works there, employing 3,000 men, milling cutter accidents rarely happen and guards would seldom act as a preventative in these cases. Milling work is only slightly standardised; the machines do little repetition work and are chiefly engaged on machining of a very varied character.

Power Presses.—Many of the Inspectors have devoted considerable time to the problems involved in securing efficient guards for the different types of these machines now in use. Considering the increased output of stamped metal work required in the manufacture of munitions and other equipment for the troops, it is satisfactory to note that the total number of accidents for all types of presses (including punches) for metal, leather, cardboard, paper, bricks, tiles, &c., has increased by less than 8 per cent. (1,113 in 1913 to 1,199 in 1914). In Birmingham, the chief centre of the metal stamping industry, notwithstanding the great increase in the number of presses at work during the latter part of the year, the accidents have fallen from 126 in 1913 to 107 in 1914, whilst a marked reduction in the severity of the injuries has been recorded. This may be entirely attributed to the efforts of the Inspectors there in raising the standards of guarding. Detailed investigation on uniform lines has been made of every press accident, and careful data have been collected as to type of press, method of operation, description of guard, nature of work done, system of feeding, kind of clutch, length of stroke, number of strokes per minute, and other particulars. From such an investigation relating to 83 accidents on metal stamping presses, it was found that 24 of the presses were fitted with double-hand levers, showing that such safety contrivances, though they lessen the danger, are inadequate to afford complete protection in all cases. At least 22 of the accidents were due to presses repeating, a circumstance against which double-hand levers afford no protection at all. Again it has generally been held that power press accidents occur mainly amongst piece workers who are prepared to take more risks than day workers in their efforts to earn maximum wages, but 39 of these 83 accidents occurred to workers who were paid by the day. The Birmingham Inspectors have come to the conclusion that, in many cases, the only satisfactory solution of the problem is to be found in the adoption of efficient automatic guards. Great progress has been made during the year in the design of guards of this nature, which cannot be readily put out of action by the workers. Several of these guards are now on the market; they come into action and withdraw the worker's hand from the danger zone whenever the plunger ram is depressed, either intentionally in the manufacturing process, or accidentally as in the case of repeating.

In some districts few occupiers have advanced beyond the stage of the old wire cage type of fixed guard. Many of the accidents are due to these guards being adjusted too high; others are caused by the workers putting their hands behind the guards at the back of the die. These can be prevented by more careful adjustment of the guards and extensions at the sides so as to enclose the greater portion of the moving parts.

Some of the Inspectors comment on the inadequacy of double-hand levers as the sole protection. An accident occurred in the Swansea district on a press which had been fitted with these appliances. The operator, a woman, finding the handles impeded her work, contrived to attach the disconnected treadle to the starting lever, leaving her right hand free; soon afterwards her fingers were trapped. Double-hand levers are useless on slow moving presses. An accident on such a press in the Wolverhampton district is instructive. The plunger took six seconds to descend, and the operator after starting the press by depressing the two handles, tried to readjust the metal sheet under the descending tool and lost part of the hand. Several accidents in the Walsall district on double-handled presses were due to other workers, when talking to the operator, accidentally leaning on one of the handles causing the plunger to descend unexpectedly. In Edinburgh four accidents were reported from presses fitted with this device. In each case the operator started the press by putting his leg over one lever, thus having one hand free to insert the sheet of metal under the plunger with the result that fingers were crushed.

Automatic feeds are being adopted in many cases by the larger firms, but presses with such arrangements are often expensive, though the output is considerably increased. Accidents should be impossible on these machines. Probably the near future will witness a great advance in the introduction of automatic machinery for the metal stamping industry. Several ingenious types of automatic machines have been recently devised for the manufacture of military equipments.

Automatic guards have been adopted on drop presses in the Norwich district with great success, and accidents which formerly occurred with systematic regularity have been eliminated in factories where these guards are installed. From Walsall and Wolverhampton, too, favourable reports are to hand as to automatic guards. Improvements have been recently made in the automatic guards for cardboard box corner staying machines.

In a Liverpool factory, mirrors are used to throw a strong reflected light on the dies of the power presses. This is considered an excellent precaution which might be followed with advantage elsewhere.

Steam Boilers.—Except in a few country districts the majority of steam boilers are insured and examined periodically by the inspectors of the Insurance Companies. An instance is given from Derbyshire of a large works with 25 boilers which had for years been examined by one of the firm's engineers. As the competency of this person was called into question by the Inspector, the boilers were insured. The first reports issued by the Insurance company were a revelation; the extensive repairs necessary disclosed the difference between inspection by trained boiler experts and the ordinary works engineer. At another Derbyshire factory the person signing the boiler examination report gave his qualification as "engine wright." Inquiry by the Inspector showed that he was engine driver at a local mill and was paid two shillings for cleaning and examining the boiler and signing the report, which had previously been filled in by the occupier himself.

In Kent the Inspector found a boiler in charge of a youth of 16, who had jammed down the safety valve with a solid block of wood because it had been troublesome in blowing off. A disastrous explosion of a Rastrick boiler at an iron works in Yorkshire, which involved the loss of 8 lives and injuries to a number of workers, was, however, due to the carelessness of the skilled works engineer who thoughtlessly overloaded the safety valve with extra weights of 120 lbs. to stop the steam blowing off. As the boiler had been recently cleaned, he concluded some foreign matter had got between the valve and its seat. The fact was that the steam stop valve was tightly closed down and neither the engineer nor the boiler tenter thought of examining the stop valve or noting the pressure on the steam gauge. The permissible working pressure was 60 lbs., the extra weights had the effect of loading the boiler to a working pressure of 145 lbs. and steam was raised continuously until the boiler burst from over pressure an hour after the weights were added.

Attention is called by several Inspectors to the risk of relying solely on box keys and guard covers for blow-off cocks on a range of boilers with a common blow-off main. The key and guard are so constructed that the key can be removed only when the cock is closed. The arrangement is quite satisfactory where only one box key is kept. In one factory with a battery of seven boilers the Inspector found three or four keys in use, and in Coventry a man engaged in scaling a boiler had a narrow escape of being scalded to death by the blow-off from an adjoining boiler owing to two keys being available for the two blow-off cocks. In another similar scalding accident in the Stockport district, involving two men, the "snug" on the box key had been broken and never repaired. This defect allowed the key to be removed from one boiler to another whether the blow-off valves were open or closed. Non-return valves should be provided for boilers in a range with common steam and blow-off pipes. An entirely separate blow-off pipe will also obviate the risk of these occurrences.

Instances are given of very old boilers found at work. From Derbyshire it is reported that two boilers which had been in general use for 55 years were found under steam at 40 lbs. pressure. In some parts of Ireland the steam boiler is supposed to be part of the plant which will last almost for ever, or be capable of entail in perpetuity. A case is mentioned from Glasgow where a boiler, installed secondhand in a distillery 46 years ago, and condemned and discarded in 1880 after the boiler inspector had knocked a hole in the bottom, was bought by a small occupier, repaired and used regularly for 34 years till last year, when an inspector again knocked a hole in the bottom during the periodical examination. The occupier proposed to have the hole patched up and the boiler set to work again, but he was cautioned and stopped from so doing.

The explosion of a Beesley boiler in 1913 at a Leeds steel works was responsible for the death of 9 persons and injuries to 18 others. This type is similar to a Lancashire boiler, but it has three flue tubes instead of two. The cause was attributed by the Commissioners to working the boiler in a dangerous condition with the large flue tube bulged and grooved, in addition to close pitting, corrosion and edge cracks in the plates. The Insurance Company were ordered to pay £500 and two of their officials, the assistant engineer and an inspector, were required to pay £50 each towards the cost of the Formal Investigation.

Textile Machinery.—Further progress has been made in bringing the machinery in cotton spinning mills up to the standard of the Conference Agreement, but the adverse state of the trade and the effect of the war on the cotton industry have retarded the work.

Scutching Machinery.—Locking motions for beater cover and door are in general use, but constant vigilance is necessary to ensure the benefit of this safeguard. If there is a means of "dodging" an automatic lock, the worker sooner or later finds it out, and occasionally receives an injury as the result of his misplaced cleverness. Complaints are numerous in the N.W. Division as to the number of cases where the operatives have tampered with these locks and names of such workers have been sent by the Superintending Inspector to the Secretary of the Trades Union asking for pressure to be put on the members in order to stop the practice. Failing this more severe measures will be proposed.

Carding Machinery.—Cylinder doors are fitted throughout with automatic locking motions, but occasionally in older types the mechanism has been found defective.

Speed Frames.—Very little progress has been made in adequate fencing of the bobbin skew gear wheels, occupiers preferring to prohibit the cleaning of spindles in motion—the alternative provided for by the agreement. Instances have been met, however, where cleaning still went on and fencing has been enforced in such cases.

Self-acting Mules.—The improved fencing of back shaft scrolls and carrier pulleys is proceeding slowly; expense is a serious item. Sample guards have been fitted in a number of mills, but many firms are waiting for a better state of trade and are disinclined to spend unproductive capital when their returns show an adverse balance, whilst others are waiting to see if the adoption of these new guards will be enforced. This waiting policy was aptly expressed by one manager who, when asked for an explanation why nothing had been done, said, "We will do it when you make us." Attention is called in the Bolton district to erection of new mules with a longer stretch than the old ones which are being replaced. In one mill there was a space of 8 inches between the carriage of the old mules and the pillars supporting the floors. The new mules had an extra stretch of 4 inches and this space was thus reduced to 4 inches. In another mill the mules of recent date ran to within 2 inches of the headstock of the adjoining mules. In a Manchester mill where the clearance between mule carriage and pillar was only 3 inches, and crushes to piecers were frequent, small hummocks of smooth cement have been placed in front of each pillar; accidents from this source have now been greatly reduced as the workers, backing in front of the advancing carriage, feel the slight obstruction to their feet and now step aside instinctively.

Ring Frames.—Tin roller nip guards are being slowly fitted, and the dangerous practice of banding the tin rollers in motion appears to be less prevalent.

It is reported that the agreement for women and girls to have their hair put up whilst working among machinery is little observed by females, who generally wear one or two long plaits down their back and appear oblivious to the danger. They smile and comply with Inspector's request at his visit, but promptly revert to their old habits on his departure.

Looms.—Progress has been made in complying with the items of the Weaving Agreement, but adverse trade and the war have militated against better results. Shuttle accidents have been fewer and less serious; close attention has been paid to maintenance of shuttle guards. A marked advance has been made during the year in the fitting of reliable duck bill guards, but complaints are received from Manchester and Preston that these are liable to frequent breakage, probably owing to inferior material and faulty construction. In Blackburn, however, where several thousands have been fixed, they are said to be working satisfactorily. The spacing of looms in new sheds of tenement factories in Keighley has required much attention. The owners try to let the space to the best advantage and charge so much per 87 inches of cross shaft; the tenants wish to install as many looms as their shafting will allow, whilst the Inspector endeavours to enforce a voluntary agreement between these two conflicting interests. The 30-inch alley space between the looms is the main difficulty; to secure this in every case would often entail the sacrifice of a full row of looms in a tenement. The provision of at least one main alley of the agreed width has always been secured in each tenement.

Woollen and Worsted Machinery.—In these trades, in spite of the excessive rush of work to meet the requirements of the Admiralty and War Office, there has been a remarkable absence of accidents. Good progress is reported in bringing up the guarding of machinery to the standards of the Conference Agreement, though the fencing has been sometimes badly designed and flimsy, the result of false ideas of economy. Shuttle guards have been well maintained and no serious accidents have been notified. Females still prefer to wear their hair loosely, and probably will continue to do so till fashion decrees otherwise. First-aid appliances are to be found in the larger mills, but little progress has been made as regards self-inspection, and this clause of the agreement is at present a dead

letter. The woollen manufacturers in the Inverness district have agreed to a similar standard of fencing as that adopted by the Yorkshire Conference.

Tinplate works.—The agreements of the recent Tinplate Conference are being brought into force, and the standards of fencing raised. Progress has been made with improved fencing for the feeding end of cleaning machines. The guard is so constructed that the hand cannot follow the plate through the narrow aperture through which it passes into the cleaning rolls. Some objections are made that the tinplate is liable to get marked, but in such cases the guard is not properly constructed.

Transmission machinery.—Accidents show an increase of 4 per cent.; while those due to shafting and belts were more numerous, those on pulleys were less. There were 39 shafting fatalities in 1914, compared with 47 in 1913; belting fatalities, however, rose from 12 in 1913 to 19 in 1914. Most of the inspectors give detailed accounts of fatal and serious mill gearing accidents which occurred in their districts; many of these were preventable, and would never happen if the workers would only realise the danger from shafting in motion. The risk of contact between loose clothing, or hair, and smooth shafting is not sufficiently appreciated; many occupiers, managers and workers cannot imagine how a plain polished shaft can cause accidents until the fact is brought home to them by a disaster in their works. The yearly records of the Department show only too clearly how great is the danger. The majority of accidents occur to persons oiling bearings, repairing and replacing belts, painting machinery, limewashing walls and ceilings, opening windows or doing other similar work in the vicinity of overhead moving shafting. A few are due to non-maintenance of guards on low shafting, insecure ladders, larking, or thoughtlessness.

Further progress is reported in the fencing of overhead shafting near loom jacquards in the weaving sheds of Lancashire, Yorkshire and North Ireland. In Belfast there has been no repetition of the succession of fatalities and serious accidents, due to shafting, recorded in 1913, and the year has passed without a single fatality. In the Wrexham district, where the number of accidents from transmission machinery is small, an increase was noted during the last few months of the year. On the other hand, in the Newcastle district, where the factories and shipyards have been abnormally busy with Government orders, the shafting accidents have fallen from 16 (including 2 fatal) in 1913 to 5 (including 1 fatal) during 1914. In this district most useful work has been done in more efficient safeguarding of the service platforms, adjacent overhead shafting, used by oilers, greasers and beltmen in the large engineering works, so as to prevent accidental contact with moving shafts, pulleys and belts in the course of their duties. In Sheffield, however, notwithstanding the efforts of the Inspectors to procure adequate fencing, a large amount of underbench shafting in the cutlery and silversmiths' shops is still running naked and unprotected. The employers hold that the position is such that the shafts are safe without fencing, and point to the record of accidents which is remarkably small. Several serious cases have, however, occurred recently, including three instances of scalping of girls, and proceedings were taken in two of these cases. A number of prosecutions have been successfully taken in other parts of the country, with infliction of substantial penalties, as the result of accidents on overhead unfenced mill gearing.

A great advance in guarding is noted in the new power-driven sewing machine benches which have the line shafting totally encased in steel tubing immediately below the bench. This dispenses with the low shafting near the floor, which was generally unsatisfactory as the guard rails needed constant attention to keep them in order, whilst their position involved difficulties in replacing driving bands and keeping the floor clean and free from accumulations of rubbish.

The Report on Transmission Machinery, published in 1913, has been found useful both to Inspectors and occupiers; many of the latter are reported to be using it as a guide for fencing and following the recommendations as to safety precautions.

Attention is called to the danger of allowing belts to ride loosely on revolving shafting; several fatalities were due to this practice. A well-designed belt perch is a convenient appliance for replacing belts on pulleys, as well as a shafting safeguard, and its use tends to economy by prolonging the life of the belt. In some districts such appliances have been little understood, or used, but the Inspectors are pressing for their adoption. Fencing of overhead belts, as a protection in case of breakage of the belt, has also received considerable attention. The danger to operatives through being struck by broken belts is illustrated by the fact that over 40 of these accidents, many serious, occurred during the year in the cotton mills of the N.W. Division; 21 of these were in connection with spinning mules and 14 on ring spinning frames.

The use of belt shippers has been urged, but so far these appliances have not been regarded with favour by the workers in the few factories where they have been installed. Old practices die hard, and belt shifting by hand will probably never be entirely stopped, yet 34 serious accidents occurred last year as the result of this practice in the cotton mills of Lancashire. Mechanical belt shippers of various types are, however, largely used abroad.

Woodworking Machinery.—Accidents from saws, planers and spindle moulders form a large proportion of the total number of machinery accidents. Many of those on circular saws are considered unpreventable and consist of cuts sustained by contact with the front of the saw. Others are, however, due to the facts that guards are not always so well adjusted as they might be and riving knives are sometimes missing or so badly designed and fitted as to be of little use. A very serious accident in East London resulted from an unfenced saw: a boy, reaching over the bench, to strike off a belt, fell on the moving saw and was terribly cut in the abdomen. The occupier was prosecuted and fined £25.

Provision of exhaust ventilation for circular saws is being adopted in some saw mills. The general adoption of such methods for removing sawdust should eliminate the number of accidents which occur to persons attempting to get sawdust from under the machines whilst the saws are running. Severe cuts on arms and legs are numerous as the result of such practice.

Reference is made to a large saw mill in Gloucestershire, employing over 100 persons, with 12 circular saw benches, a number of planing and moulding machines, and other woodworking plant. Not an accident has occurred in this factory since 1908, though the methods of fencing are no better than in other similar saw mills where accidents frequently occur. It is suggested that the fact that each worker, man or boy, when engaged, has to subscribe to a set of safety rules, with a certain amount of ceremony, may possibly contribute to this result. Each worker's signature to the rules is duly attested by a witness, and each person is made to feel that he is legally bound to comply with these rules and avoid any form of danger.

Planing machine accidents are chiefly due to neglect of the workers to use, to the best advantage and full extent, the safeguards provided. An increasing adoption of circular cutter blocks is noted in some districts, but progress is slow in many parts. Several instances are reported where these safety blocks have greatly reduced the severity of accidents. In one case an occupier who had received a slight cut, instead of losing all his fingers in all probability on the old block, stated that far more than the cost of the new block had been saved by him in his accident.

CHAPTER III.

EMPLOYMENT: PARTICULARS: TRUCK.

By W. WILLIAMS, *H.M. Superintending Inspector of Factories.*

With certain special exceptions, the hours of work of a woman or of a young person under 18 years of age may not exceed 55½ per week in a textile factory or 60 per week in a non-textile factory or workshop—the daily maxima being 10 and 10½ hours respectively—exclusive of meal times in all cases. From the Inspectors' reports, it is clear that the legal limits are generally observed, the principal exceptions being "time-cribbing" in textile factories (see below) and irregularly excessive hours in trades catering directly for the public, such as tailoring, dressmaking, etc., where customers sometimes insist upon unreasonably quick delivery of the finished article. Mr. Barringer (West London) is, however, of opinion that sometimes the late hours in tailoring are due to employers who unnecessarily delay the issue of work for no apparent reason. At 11 o'clock at night in a paper mill, Mr. Gates (Bristol) found work being done by boys who had commenced at 6 o'clock in the morning, and some of them intended to work on until 6 o'clock the following morning. The occupier of a box making factory was prosecuted by Mr. Taylor (Norwich) for the late employment of boys who, during the day, had worked in another factory.

Time-cribbing.—The practice of starting the machinery of a factory a few minutes before the proper starting times and of running it a few minutes beyond the proper stopping times is said to be declining. No Inspector outside Lancashire or Yorkshire refers to the subject, and in those counties, the reports appear to be entirely limited to the cotton trade. Mr. David Walmsley (Oldham), who notes a great reduction in time-cribbing during the year states:—

> Early in the year I met the mill managers in a conference and dealt with many factory matters, especially time-cribbing. The managers all agreed that the latter irregularity was unfair to the day wage earners, made wrong comparisons in the factory balance sheets against managers who observed correct running time, and, taken altogether, was no credit to the cotton spinning trade.

Mr. Owner (Bolton), however, found it necessary to take a number of prosecutions for "time-cribbing." These, he states, were dealt with satisfactorily at all the Courts except one, where the magistrates appeared to regard the offence as trivial. It is not usual to find time-cribbing in a tenement factory, but Mr. McCaghey (Keighley) prosecuted a tenant of such a factory for that offence, and a conviction followed in spite of an attempt to fix the responsibility on the owner's engineer.

Overtime.—In certain trades, women over 18 years of age may be employed overtime for 1½ hours, thus making up the total hours of work (exclusive of meal times) to 12 a day. Reports indicate a considerable reduction in the use of the overtime exception due to the disorganised state of trade following the outbreak of war. While as a rule the conditions respecting the use of overtime appear to have been fairly well observed, instances to the contrary are given, and Mr. Brown (Edinburgh) obtained a fine amounting to £40 for a gross case of illegal overtime, this being the highest penalty ever inflicted in Scotland for this offence. One of the great difficulties in the enforcement of the law is the frequent neglect of occupiers to comply with the requirements as to reporting and recording overtime, and this neglect adds difficulty to the task of checking the number of occasions on which overtime is worked. Mr. Seal (Manchester) and Mr. Clark (East London) both call attention to irregularities in the workshops of Jewish tailors.

Curtailment of hours of work.—One of the most striking features of the Inspectors' reports is the tendency to reduce the hours of work in factories and workshops. For many years it has been customary in a large number of establishments to keep these hours well under the legal limits, which, it may be observed, have not been materially modified within modern times. The tendency towards reduction is, however, displayed capriciously, for the same industry even in the same town sometimes furnishes instances of wide diversity in the regular hours of labour. As regards two trades the general trend towards shorter hours is not borne out by Mr. Verney (North West London), for he remarks:—

Infringement of the rules as to hours of work and meal times occurs chiefly in tailoring workshops and laundries. In these trades the period of employment is usually extended to the full extent permitted by the law, viz., 12 hours, and the intervals for meals and rest ordinarily amount to no more than the compulsory hour and a-half. The tailoring and other wearing apparel trades also avail themselves very largely of the special exception permitting the employment of women for 14 hours a day (less meal times) on not more than 30 days in 12 months, and practically every laundry occupier avails himself, either of a similar privilege, or of the right to employ women 13 hours a day (less meal times) for three days a week regularly throughout the year. The utmost vigilance is necessary to prevent these long hours from being exceeded.

Mr. Verney's remarks are a further exemplification of the variations of practice as regards hours of work, for in some other districts it is not the rule to work tailors or laundresses the full number of hours permitted by the law. Mr. Neely (North-East London), after noting the number of hours worked in various industries, concludes that " in the organised industries the workers are very much better off in the matter of hours than in the unorganised trades." Mr. Bremner-Davis (Kent), Mr. Butler (East London), and Mr. Clark (West London) detail the results of special enquiries into the hours of employment in many of the principal industries in their district, showing that, in practice, the legal limits are rarely reached, and that in many trades the ordinary working period is considerably less than that allowed by the law. Partly, perhaps, in the hope of attracting a better class of worker, many employers favour the postponement of commencing work until 8 a.m., or even later, so as to enable the worker to partake of breakfast before leaving home. In the textile trades in England and Ireland, no general move in this direction is reported, but in Scotland many textile mills have discontinued the practice of working before breakfast. The results appear to be satisfactory; Mr. Brown (Edinburgh) is of opinion that " employers and workers are satisfied with the change, and in the majority of cases the production has not been reduced on the shorter day," while Mr. Young (Dundee) states: " The reduction in output consequent on the reduction of hours is certainly very slight, and in spite of a slight reduction in wages workers would not go back to the old system."

Short day.—In factories and workshops the period of employment must, as a rule, be shortened on Saturdays, although in some industries another day may be substituted for Saturday. On the short day the authorised hours of work (exclusive of meal times) may extend to $5\frac{1}{2}$ in textile factories and to $7\frac{1}{2}$ in non-textile factories or workshops, so that in the latter class of works the popular title of " half-holiday " may not strictly be deserved. Inspectors, however, note a growing tendency to give a real half-holiday every week, a great stimulus in this direction having been given by the Shops Act, 1912, under which shop assistants commonly cease work at one o'clock on the early closing day. Many workplaces connected with shops have naturally shared in this movement. Mr. Bennett (Londonderry), however, has had to warn some employers not to treat their shops and workshops alike in every respect, as it was found that, in the latter, workers were being deprived of their short day just before or after an annual holiday. The Shops Act authorises this for shop assistants, but the same course cannot be applied to workshops. Mr. Wolfe (Wolverhampton) reports the unusual complaint of too many half-holidays in a picture-framing factory, where, owing to trade custom, the usual Saturday half-holiday was insisted upon by the workers. The employer, however, who occupied several retail shops which closed on Thursday, said " he could not lose his chance of a holiday by keeping his small factory open on Thursday afternoon," and insisted on closing the factory then, so the workers lost their wages for that afternoon also. The reports disclose few cases of illegal work on Saturday, the principal being in flax scutch mills in the North of Ireland, where the desire to utilise day light as far as possible is doubtless responsible for the irregularity.

Meal times.—In view of the length of the working day, it might have been thought that there was little temptation to encroach on meal times, which are supposed to be devoted to meals and rest, but in textile mills where piece-work is the rule, special efforts are necessary to ensure observance of the law. The following remarks by Mr. Mc Caghey (Keighley) are illuminating :—

Cotton weaving sheds are the principal source of trouble as regards hours. In the absence of meal room accommodation many workers take their meals in the sheds; the food is quickly consumed, the remainder of the interval furnishing piece-workers (as most of the workers are) with a good opportunity of doing work which will assist production when the looms resume running. Prohibitory notices are no deterrent, and if an employer, in his desire to obey the law, delegates a man to keep watch, the latter, if faithful to his duties, is not looked upon with favour by the workers. One such man had evidently tired of the job, for I discovered him outside the shed-door reading a paper, while inside a number of workers were taking full advantage of his remissness. In another flagrant case the defaulting workers all protested that it was their own fault; that they had read the notice; and that the tackler had warned them repeatedly. On being asked, however, what form the tackler's

warning took, one of them replied that he shouted "Stop that, t' d——d Inspector's about." I prosecuted the firm, and the defending solicitor argued that I should have charged the workers as the actual offenders. His principal witness was the managing director, but the defence collapsed when I elicited in cross-examination that one of the weavers found at work was his wife.

The importance of close supervision of cotton workers who are allowed to take their meals in their workplaces is insisted upon by several inspectors, none of whom, however, mentions an obviously weak point in the usual practice of delegating the duty to a "tackler" or "overlooker." This official is almost invariably paid a percentage of the weavers' earnings, so that, as meal-time work increases his own wages as well as those of the weavers, it is perhaps not surprising that his vigilance in repressing such work sometimes relaxes.

The cotton trade is not the only defaulter in respect of meal-times, for Mr. Law (Sheffield) complains of similar irregularities in cutlers' shops, and so does Mr. Sedgwick (Bradford) as regards bakehouses, while it appears from Mr. Phillips (Liverpool) that tailors and dressmakers, who are stated to be the worst offenders in this respect, were only saved from the same reproach by the slack state of trade.

Sunday employment.—Jewish women and young persons may be employed under certain conditions on Sundays. On the whole the reports do not show that the relaxation leads to abuse, and both Mr. Clark (West London) and Mr. Livesey (Leeds) expressly state that illegal work on Sunday is uncommon. In workplaces where both Christians and Jews are employed, difficulties not unnaturally arise, and Mr. Carter (North London) remarks :—

> Difficulty is still experienced where Jewish occupiers wish to avail themselves of Section 48. The necessity of closing the workshop on Saturday hits the Christian workers therein financially. Particularly is this so in the cabinet-making trade in Shoreditch. The occupier, a Jew, will employ Christian french-polishers, Jewish men as cabinet-makers, and a few Jewish young persons as apprentices or improvers. For the sake of employing these young persons on Sunday, which is invariably the short day (and then only for about five hours' work), the closing of the workshop on Saturday causes the non-Jewish men to lose time. Giving the Jewish boys Sunday as holiday, the Jewish men can work on Sunday and the Christian french-polishers on the Saturday. But in some cases, the apprenticeship indentures require the lads to be employed on Sunday, and hence the difficulty. An occupier of a large cabinet making workshop now opens his premises from Monday to Friday and closes both Saturday and Sunday. The men work the Trade Union hours, which are considerably less than the maximum period of employment for women and young persons permitted by the Acts, and content is general.

Night work.—Night work by women or young persons under 18 years of age is prohibited in the bulk of industries, but in a few trades the employment of lads at night is specially permitted subject to certain conditions. As regards these trades, the conditions appear to have been well observed on the whole, although Mr. Hilditch (Swansea) found it necessary to take legal proceedings for the illegal employment in an iron mill of a young person for more than six nights in two weeks. In 1913, upon a report by a Departmental Committee, Orders were made placing considerable restrictions on the night work of boys. The Inspectors' reports do not indicate that these restrictions gave rise to any difficulty in 1914 except in tube works in Scotland, where Mr Kirkwood (Lanarkshire) notes a difficulty in limiting the night work to those boys who are directly employed in connection with the furnaces.

Turning to trades in which night work of boys is illegal, Mr Pringle (Hull) states :—

> The conditions arising through enlistment of so many young men, have placed a premium on juvenile labour, and unauthorised employment of young persons on night shift has been discovered. A bad feature of these cases of illegal night employment is that in almost every case the workers declare themselves over 18, and only when required to produce birth certificates do they admit their true age.

In a bakery Mr. Bennett (Londonderry) found that a youth under 18 years of age was employed on Sunday nights after midnight until about mid-day Monday.

Boys over 16 years of age in lace mills may be employed under special conditions, respecting which Mr. Ward (Derby) reports :—

> Infractions of the special exception are somewhat difficult to check, as in most cases evidence of contravention depends entirely upon the declaration of the young person concerned. A number of prosecutions were taken in the earlier months of the year, when the trades had a slight rush of orders; in most instances the offence was employment before and after the "ordinary" period of employment on the same day, and the above difficulty as to the reliability of evidence was experienced in each case. The need for the special exception may probably disappear in the near future owing to the introduction of a new patent machine for threading bobbins, which when perfected will supersede threading by hand, the process to which the special exception is mainly applicable.

Certificates of fitness.—To qualify for employment in any factory (and also in certain classes of workshops) young persons under 16 years of age must obtain a certificate of fitness from the certifying Surgeon of the District, and, as a rule, this certificate must be

obtained within 7 days of first employment. On the whole, the requirements seem to be fairly well observed, although for some districts this statement must be qualified. Occupiers sometimes object to the cost of the certificate, or delay the medical examination until the completion of the worker's period of probation (commonly one month), or fail to see the necessity for a fresh certificate if the young person has already been certified for another factory, while some employers (particularly in country districts) consider that the certificate is unnecessary in the case of an apparently robust worker who is to be employed under healthy conditions. The following remarks by Mr. Hunt (Liverpool) suggest that many employers look upon the medical examination as a mere matter of form :—

> In a number of small works the employment of young persons refused by the Certifying Surgeon has been noted. What apparently occurs is that the occupier, being busy when the young person returns from the examining place, neglects to examine the entry in the General Register and assumes that the employee has been passed.

Education and juvenile employment.—Outside the textile industries, the employment of children in factories or workshops is uncommon, and in Scotland, even in the textile industries, it is extremely rare. Several cases of illegal employment are quoted, for instance Mr. Joseph Law (Blackburn) took two prosecutions for employing half-timers full time, and Mr Mead (Birmingham) notes :—

> Many cases of illegal employment of children out of school hours on cleaning and other light work are still found. The occupiers in such cases usually plead ignorance of the Act, and the employment is at once stopped when the irregularity is explained. It is frequently urged that such employment is less harmful than that of errand boys, who have to be out in all weathers and at all times, and without learning anything useful.

In some of the rural districts in Ireland the educational authorities are not always very strict in enforcing school attendance, as is shown by Mr Bennett (Londonderry) :—

> I have found a boy under 12 years of age working in a flax scutch mill just on the opposite side of the road to the school he should have been attending. Both employer and schoolmistress were aware that he should be at school.

Another instance of the undesirable employment of a boy is given by Mr. Good (Coventry) :—

> The scarcity of male adult labour after the outbreak of war was given by the manager of a brickworks as his reason for employing younger boys than is usual to tip the clay wagons into the mixer. This in turn led to the employment of boys of 13 years in the drying sheds. One such boy was found at work without any clothing from the waist upwards. He was frail looking, and the attention of the Certifying Surgeon was drawn to the case. The Surgeon visited the works a few days afterwards, and found that the boy was no longer employed.

Mr Taylor (Bradford) remarks on an improved standard in supervising the school attendance of children employed in mills. In Scotland Inspectors paid attention to the working of the requirements of school boards, who, as a condition of certificates exempting children from attending school, insisted upon attendance at continuation classes. Comparatively few failures were observed to give the necessary facilities for attendance at these schools.

Mr Price (Cardiff) reports :—

> Four prosecutions were taken under the Employment of Children Act, 1903, in respect of employment between 9 p.m. and 6 a.m. These concerned children not employed in ordinary factory processes. Two were van boys found assisting in sorting parcels and arranging them in hampers in a laundry after the factory hands had left, and two were engine cleaners in the locomotive sheds of an iron works.

Piece-work particulars.—The statutory obligation to furnish piece-workers with particulars of work and of wages so as to facilitate computation of the total amount of wages payable was originally limited to textile industries, but has now been extended by Orders to many other trades.

In the textile trades Mr. J. T. Birtwistle (Inspector of Textile Particulars) reports that the number of complaints (100) dropped by 42 as compared with the previous year, and that notices of contravention numbered 831, being 224 less than in 1913, from which it may be presumed that the observance of the law is becoming closer. As regards other trades, Inspectors found generally a satisfactory standard of compliance with the requirements as regards factory workers. The new Order respecting Iron and Steel Foundries naturally received considerable attention, although in many districts—particularly in the South of England—piecework in foundries is not common. In many cases careful instruction was necessary to secure compliance with the Order, as the employers did not always realise the form in which particulars should be given, but in nearly all cases the

difficulties appeared to have been overcome before the end of the year. Mr. Crampton (Stirling) reports :—

> The Order applies to a considerable number of factories in the Stirling district, and some little difficulty was at first experienced in obtaining compliance. A circular was sent to all the occupiers concerned, followed by a personal visit for explanation. The most general method of compliance now is the exhibition of a rates book, together with the issue of extended pay sheets, and as far as I am aware this method has removed any ground of complaint which may have existed prior to the issue of the Order.

The principal defaulters in respect of piecework particulars appear to belong to the clothing trades, more especially in the tailoring branch, where the neglect is frequently defended by employers on the ground that as the workers are employed in accordance with an agreement with the trades associations, the rates of pay are so well known as to render written particulars unnecessary.

Evidence is forthcoming that the legal obligation to furnish particulars to workers has sometimes been of benefit to the employers by disclosing laxity in methods of checking rates of pay and work.

Outworkers.—The generally satisfactory tenour of the reports does not extend to those workers who take their work home, though in these cases some signs of improvement are noted. Mr Ward (Derby) prosecuted two contractors and one factory occupier for failure to give the necessary particulars to outworkers in the "chevening" industry, respecting which Mr. Mottershead (Derby) reports :—

> Some time has been spent in dealing with the Particulars Order in relation to the hand embroidery of hose ("chevening"), particularly in the district to which the work is chiefly confined. In all, nearly 300 visits were paid to outworkers, and at first it was very exceptional to find a case where written particulars had been supplied. This work is principally done by married women, though there are many young people also employed in this way, and as it can be done conveniently at home there is a great demand for it, but the prices are very poor in many cases. In one instance I found that 3d. per dozen pairs of hose was paid for "chevening," whilst in another town not far away 1s. 5d. per dozen was paid for practically the same class of work.

The Inspectors' efforts are hampered in some districts by the laxity of employers who fail to keep the required lists of outworkers, and also by the timidity of the workers, who are afraid to complain of neglect of the law. In Ireland special notices have been issued to agents and others calling attention to the necessity for giving particulars to outworkers.

Truck.—Originally limited to the prohibition of payment of wages in kind, the Truck Acts now regulate a variety of matters affecting wages—such as disciplinary fines and deductions for materials, etc., supplied by the employers or for negligent work.

(*a*) Payment in kind.—The practice of paying wages in kind evidently still survives in bakehouses. Mr. Woodward (North London) remarks :—

> Of the contraventions with which I have had to deal, more than half have been cases of payment in kind in small bakehouses in which the employees received a definite quantity of bread and sometimes also of flour in addition to cash. The occupiers have usually pleaded ignorance that such a system of payment was illegal, but have been found willing to discontinue it on the facts as to its illegality being brought to their notice.

(*b*) Fines.—The reports show the value of the condition imposed by the Truck Acts that fines must be fair and reasonable, as many instances are given of attempts to levy penalties which appear excessive. In fixing the amount of a fine due regard is not always paid to the standing and wages of the worker concerned. Mr. Seal (Manchester), for example, points out that in one case "learners earning five shillings a week were fined at the same rate for being late as those earning up to twenty-five shillings." As a means for maintaining discipline the imposition of fines is probably diminishing in practice, but the following remarks by Mr. Pendock (North Staffordshire) indicate that there is still room for further progress in that direction :—

> There seems at last to be a falling off in the number of cases in which wholly unwarrantable exactions have been made from the scanty wages of workpeople on the grounds of maintaining discipline, saving the property of the employer and what not; but in some industries a long list of deductions is still found to exist, which doubtless survives from a past system of management, and is to some extent sanctioned by custom. Although it is possible here and there to whittle various items off the list, the system dies hard; and there still remain a number of vexatious deductions, retained in practice as a means of adjusting wages, which one would think could be simplified in such a way as to benefit employer and workman alike. Many of them are of such a complicated character as to render it extremely difficult for the average worker to check the employer's calculations of the weekly or fortnightly earnings. One inexcusable practice has been stopped wherever discovered, and that is the practice of employers, when paying small wage earners whose pay includes odd fractions of a penny (*e.g.*,

6s. 7¾d.) retaining the odd farthings on the ground that payment of fractions is inconvenient. These fractions are now allowed to accumulate on the wage sheet until even money is reached and are then paid to the worker in full. Full instructions have been given during the year with regard to deductions from wages for cleaning floors, &c., under the Pottery Regulations. As this duty is placed on the occupier, it is difficult to see how the worker should be made to pay for it, and this attitude has been taken up in all cases.

(c) Other deductions from wages.—Deductions on account of bad or negligent work must be fair and reasonable, and this requirement has in several cases warranted interference by Inspectors. Three striking instances leading to prosecution and (on the cases being dismissed by the justices) to a successful appeal to the High Court, are described as follows by Mr. Bennett (Londonderry) :—

A girl had 19s. 9d. deducted in a lump sum from her fortnight's earnings of 22s. 11½d. because she inadvertently stitched a large lot of collars ⅛ of an inch from the edges instead of closely thereto, owing to two tickets getting mixed up at the moment of starting work. Another girl had 12s. stopped by instalments of 2s. each for stamping on a bundle of collars a descriptive name slightly different from the right one. The total amount to be deducted, viz., 17s. 6d., was not disclosed to her until she agitated therefor on leaving the employment. A sum of 19s. 10½d. was attempted to be levied from a young girl (admittedly an indifferent worker) earning about 5s. per week, at the rate of 6d. per week, for stamping the wrong depth on a large bundle of collars.

As a rule workers seem reluctant to complain to Inspectors of contraventions of the Truck Acts, but (possibly as the result of the above cases) Mr. Bennett states that "It was safe to reckon that, if any seeming injustices occurred on pay days, I should hear of them within a few hours."

Deductions for materials or tools supplied by the employer must not exceed the cost of the articles. Inspectors have therefore been able to check attempts to make profit on needles and cotton, and Mr. Shinner states that "a firm was found to be charging double the cost price for needles, and were apparently unaware that they were not fully justified in doing so." Unfair charges for artificial lighting occasionally come to light, as noted by Mr. Pendock (North Staffordshire):—

Charges for gas appear to be still excessive in some cases. Custom has sanctioned a flat rate of 3d. per head, and this is charged indiscriminately without taking account of the amount of gas burnt. In one case seven girls were employed round one table lighted by two incandescent burners. This meant that the occupier was receiving 1s. 9d. per week for the gas burnt by two burners, a cost which worked out at about ½d. per hour per burner even in the darkest part of the winter. Deduction for gas has also to be carefully watched to prevent the charges being continued after gas is no longer required during factory hours. A prosecution was taken for such charges in April, and greater care has been exercised since.

In view of the irritation frequently caused by deductions, the following observations, by Mr. Clark (West London) are satisfactory. Speaking particularly of the boot trade he states :—

Deductions have now been largely dropped altogether. This is probably due to the increased use of machinery and the consequent lessening of piece work, but also in some measure to more advanced ideas on such matters. These deductions appertained to such matters as lighting, sweeping up, &c.

Lifting heavy weights.—Many instances of heavy weights being handled by young workers were noted, and although in some cases the employers were not to blame for this, in others the management appears to have been at fault. Mr. Hilditch (Swansea) speaking of tin plate works, states :—

Several instances have been found, during the year, of weights of 70–80 lbs. being carried by young girls of 15–17 years of age. It is a practice most difficult to prevent. Every effort is being made to get occupiers either to provide overhead carriers or trolleys for the purpose.

To emphasise the importance of the matter he adds details of six accidents occurring during 1914 to girls or women varying from 15 to 23 years of age caused by carrying or lifting plates. In connection with the cotton industry Mr. Law (Blackburn) reports :—

No cases of lifting heavy weights by persons under 16 years of age have been met with, but notices were received of accidents to 4 women, 3 young persons (female), and 3 male young persons, all caused by lifting loom weights, except one which was due to lifting a can of weft.

The mere weight of an article which has to be lifted is not always an accurate indication of the strain imposed on the worker, as it is necessary to take into account other factors such as the shape of the load, the height to which it must be lifted, etc. Mr Clark (West London) gives an instance of this :—

A girl of 15 years was observed carrying trays of soap, and, on weighing, a tray was found to scale 40 lbs. The shape of the tray made it impossible for the girl to walk upright, and she was consequently forced to carry the load in a bending position which caused much greater strain.

It is safe to conclude that many cases of undue strain arise simply from want of thought, as the Inspectors generally remark that remedial steps were taken immediately the attention of the occupiers was directed to the matter.

Welfare work.—The number of employers who look upon the payment of wages as a complete fulfilment of their responsibilities for the welfare of their operatives is probably smaller than is generally thought, and the reports afford evidence of an increasing desire on the part of factory occupiers to improve the general conditions of their workers.

One of the most pressing problems appears to be in connection with food, in respect of which it is thought that the general standard among workers of the poorer class is sometimes so low as to be incompatible with a full day's vigorous work.

> Mr. Neely (East London):—The problem of meals—dinner and tea chiefly—for workers in factory life is one worthy of attention, more especially in our large cities, where the situation of the factories and the residences of the workers are such as to prohibit the workers from going home to meals. In many cases there are no restaurants or eating houses in the neighbourhood, so workers are obliged to bring what is called "a piece" with them. The old-established custom of some years ago, of having a hot dinner brought to the worker by some member of the family, has been almost abolished owing to the distance workers are now obliged to live from their work.

Many instances are given of excellent dining rooms in connection with factories, and the success of some of these is so great that it is difficult to understand why more of them are not provided. Mr. Taylor (Norwich) reflects this view :—

> There appear to be no inherent difficulties in most workplaces in making cloak or rest-room accommodation with provision, on a moderate scale, for preparing and taking food, and it is difficult to know why something in this direction is not more general than it is at present. I was recently in a small factory, where some 20 women are employed, and where the occupier has set aside a small apartment for the double purpose of a cloak and mess-room. It was a warm, clean, well-lighted, and attractive place, with pegs for each worker's clothes, and contained a gas stove provided by the occupier, who also supplied the utensils for cooking the food of those who did not go home for meals. This shows what can be done, on a moderate scale, in a small place, and the workers themselves, in their clean and tidy appearance, reflected the advantages of the scheme, and the appreciation of the girls. In this district the want of proper cloak and mess-room accommodation has been felt among the workers in the herring pickling workshops in Lowestoft and Yarmouth. Work in many of these places is carried on in the open air and, in late years, at a considerable distance from the lodgings of the workers, who nearly all come from Scotland. Some of the girls I have spoken to take 35 minutes to walk to their temporary houses, and under these circumstances it would be a great advantage if proper cloak and meal-room accommodation could be provided.

Mr. Clark (West London) notes the provision by employers of rest rooms and gardens, social and athletic clubs, and even (in a rural district) of a picture house for workers. He was assured by one firm that such efforts need not be regarded as purely philanthropic, as from a business point of view they were productive. Speaking of elaborate systems of welfare work in his district, Mr. Taylor (Norwich) states :—

> These comprised, amongst others, schemes for pensions, amusements, meals, rest, lectures on various subjects, sick and benefit societies, instruction in the making of clothing and, in one place, educational training preparatory to the emigration of lads who had been employed in more or less blind alley occupations.

The evils of "blind alley" occupations are not, perhaps, always so keenly appreciated by the employers concerned as by others, so that the following remark by Mr. Beverley (South-West London) deserves record :—

> One firm who employ boys in bottling, recognising it is not to their interests to remain in such work too long, urge every boy after a few years to find better employment, and on obtaining such they are given £7 after 3 years, and £10 after 4 years' service.

That there is plenty of room for welfare work among workers in large cities is shown by Mr. Wilson (Glasgow), who forwarded an interesting contribution on the physique of indoor and outdoor workers, but the subject is one that can hardly be dealt with in this chapter.

CHAPTER IV.

WOMEN AND GIRLS IN INDUSTRY.

By Miss Anderson, *H.M. Principal Lady Inspector of Factories.*

General characteristics of work in 1914.—The work of the Women Inspectors in 1914, the year of my eighteenth Annual Report for the Branch, must be considered in three phases of unequal length, of which the last two have no parallel in previous experience.

The first phase, nearly seven months long, closed in the last week of July and only differed from any former first seven months of the year in being more than usually full of hopeful work and of increasing co-operation with us on the part of workers, employers and their organisations in obtaining improved general conditions in factory industries for women and girls. Moreover, during that period, when the general feeling seemed to be in favour of a more rapid advance than hitherto, an increasing number of prosecutions to bring laggards into conformity with the Acts were undertaken and planned, some of special interest obtaining helpful support from magistrates. And the great effort to bring more health and safety to workers in earthenware and china works by the new Potteries Regulations was just coming into practical effect. During that period my staff was first diminished by transference of Miss Whitlock, M.B., whose work in medical questions affecting women has been very valuable to us to the Industrial and Reformatory Schools Department, and then replenished by an addition of two Inspectors, Miss Keely and Miss Anne Smith, giving us a net increase in staff of one in the year under survey.

The second phase, the phase of unemployment and short time, following immediately on the sudden alarm and shock of war, was felt throughout our industries and by almost all workers to some degree, but most intensely of all and for the longest time by women. Although in their case this phase had not passed away, even at the beginning of the New Year, yet as the predominating aspect of industrial women's lives unemployment and under-employment ceased to command the main attention of the Inspectors of this branch; and the third phase began when the tide of emergency orders for overtime (under section 150 of 1901), to meet the necessities of the nation at war, came upon us in the month of September, and rose thereafter rapidly through the remaining months of 1914.

The last of the phases which accompanied the war in 1914 was closely linked up with the beginnings of yet another new phase of women's industrial life. Then increasing shortage of industrial men and unlimited demand for munitions of war of all kinds led to enormously multiplied demand for women's service, extending to occupations hitherto closed to them. This emerged, clearly, early in 1915, and no adequate account can be given in a report for 1914.

While the period of unemployment and short time predominated, the chief thought of the Women Inspectors was for encouragement of workers and employers—who held together in a most remarkable way—in looking ahead and in planning for the development or extension of new trades and specially those branches in which we had recently most depended on industrial nations of Central Europe. The extensive enquiry into the state of employment that was made by all branches of the Factory Department in the second half of August was most helpful, not only in giving us a summary review of the immediate effect of the war on industry, but in strengthening the links between inspectors and employers and workpeople at a time of profound anxiety and unexampled upheaval. Many difficulties were expressed to us and appeals made for information by manufacturers suffering from sudden shortage of materials necessary or customary in their trade. The many-sided help afforded by the rapid issue of statistical pamphlets and by the fortnightly exhibitions of foreign samples at the Commercial Intelligence Branch of the Board of Trade were gratefully received by manufacturers, and for many weeks I was in constant communication with the Director of the new Department, forwarding queries from employers of women's labour and receiving information from him that gave help to many. Outside the usual channels of official activity, the formation of Women's Employment Committees, central and local, to further wise administration of the Work for Women Fund inaugurated by H.M. Queen Mary, made other important claims on the Women Inspectors. I was appointed Official Adviser to the Central Committee sitting at Westminster, and in each Division (Manchester, Leeds and Birmingham) the Senior Lady Inspectors, Miss Tracey, Miss Sadler and Miss Martindale, act in a similar capacity to the Local Women's Employment Committee. In Ireland two Committees were formed, one centered in Dublin (for the provinces of Leinster, Munster, Connaught), another for the province of Ulster, and to these Miss Slocock also acts as Official Adviser.

When the period of stress and strain due to emergency overtime on war supplies was well begun, the inspectors necessarily reverted to first principles of Factory Act regulation

when advising on application for emergency orders and watching over their degree of observance. Then the absorbing pre-occupation was with the problem of how to reconcile the claim and need for maximum intensity and volume of output with a due regard for maintenance of protected workers in such a condition of efficiency that they could continue to serve without breaking down or loss of health. Standardising of the Orders for such overtime as was necessary in various industries began as soon as practicable, and from the beginning Inspectors urged counsels of moderation on harassed, over-pressed employers struggling to cope with unprecedented demands for rapid delivery.

At both these stages of under-employment and over-employment, when nothing could be more worthy of admiration than the spirit and endurance shown by the girls and women, questions of industrial training and mobility of women workers came into the forefront, and one realised as perhaps never before how a nation could increase its own strength if it would take full thought in advance for the skilled training and mobilisation of its women as well as its men workers. It is practically certain that, not only during the progress of the war but even after it, women and girls must take a larger share than hitherto in productive industry, and that this has to be duly considered in relation to the primary claims of domestic life. Their capacity for development undoubtedly lies rather in manipulative skill than in heavy labour of muscle and sinew, even if the latter can be in some degree increased. Thus provision of trade training of all suitable kinds for them will have an increasing significance for the nation. Out of wholesale destruction of material wealth may come not only simplified general conditions of living, but a new perception of the social value of utilisation of the whole of our national resources—workers material, plant, machinery and implements, and a survey of every aspect of the conditions of women's service. Already we have seen on the superficial, material aspect of factory life—not to speak of certain psychic factors in fatigue-resistance and sustained energy—unforeseen changes. We have not indeed had, in the rush of events, any such inventory or stock-taking of plant and machines and trainable workers adaptable to the various articles of clothing and equipment needed as would have led to approximate calculation of the maximum possible output. Even at the close of the year some factories might be seen that were capable of holding nearly twice the number of sewing machines without overcrowding, and capable, though untrained, young women lacked employment when other factories were overwhelmed with their contracts, and girls and women strained nearly to breaking point. Still there has been a marvellous re-distribution and adjustment of work, workers and processes.

Industrial Changes and Developments.—Old factories have been adjusted to new processes, workshops transformed into factories by addition of power, new factories built, necessary products revived which had been allowed to lapse out of our home control into the hands of nations cut off from us by war, and new markets found in place of continental markets also cut off by the war. Workers have adapted themselves to new processes in old workrooms, as well as to new processes in new workrooms. And in certain industries specially increased by the war, of which foremost stand ordnance and munition works, large numbers of girls and women have been drawn in who never previously worked in a factory or workshop, including girls hitherto entirely engaged in their parents' homes, waitresses, shop assistants, clerks and domestic servants, as well as unemployed women from miscellaneous women's industries such as printing, chocolate making, millinery, dressmaking, blouse-making, outfitting, cardboard box making, silk weaving, watch making, golf ball making, picture frame making.

So great has been the passing from industry to industry that at the beginning of the New Year it seemed almost as if women and girls had gone through a process of "general post." Still in the two largest women's industries most severely suffering (through differing immediate causes) from unemployment in the autumn, cotton textiles and dressmaking, there has been less general movement of the workers to find a livelihood in other directions. In each trade in wholly different ways—in the cotton trade relatively high wage-rates and specialised factory skill, in the dressmaking trade deep-rooted social traditions and special craft-skill—certain factors operate to delay resort to other callings. In the cotton trade a certain revival came to reward some of the workers for waiting; not so in the dressmaking trade, and it is doubtful whether in the future dressmaking or ladies' tailoring will survive in general quite as we have known them without the aid of power-driven sewing machines, finely adjusted as these now are to all sorts of delicate processes. To a very small extent cotton weavers passed to woollen weaving, but a relatively easier transference was technically possible of linen weavers, thrown out of employment by shortage of flax, to woollen and worsted weaving (see below). Much more general in England and Scotland was the adaptation of certain carpet weavers and their looms to army blanket making. Even by the close of the year relatively little

has been achieved in the way of finding steady, normal employment for women and girls thrown out of work, or on short time, in the machine made lace trade, silk and felt hat making, potteries, printing, fish-curing. The large trades concerning women, in most of which there has been an incessant, increasing demand for their labour, are:—Woollen and worsted textiles (khaki, flannel, blankets); hosiery; clothing (military tailoring and fur coat making, cap making, shirt making); boots and shoes and other leather articles; ordnance and ammunition; rations and jam; haversacks, kit-bags, holdalls, bandoliers; surgical dressings and bandages; tin canister and box making. This demand has been limited only by difficulties in (*a*) absorbing undue proportions of unskilled workers at a time when available skill was more needed for production than usual; (*b*) shortage of machines, or machine parts, *e.g.* hosiery needles; (*c*) shortage of raw material, *e.g.* dyes for yarn, wool at times in woollen weaving mills, khaki cloth in military tailoring. The conditions for women in these and other emergency trades I will deal with presently in the paragraphs particularly relating to employment. The shortage of skilled workers in many trades at once, and attempts to overcome the difficulty, is a sub-division of the whole question of employment that is especially significant in time of a great war; closely linked with that question has been the part played by the relief workrooms, and other schemes, financed by the Queen's Work for Women Fund and various funds, local and voluntary, or by private individuals, in keeping women and girls physically sound and improving their fitness for normal employment. By inspection of these workrooms, as well as by watching over their initial stages when acting as Advisers to Committees, the women Inspectors are in position to judge of the great service they have rendered (see below) at an exceptional time.

The Senior Lady Inspectors and their staffs furnish me with abundant illustrations of the main kind of changes in industrial activities during both the phase of under-employment and over-employment. They show, in the midst of much local diversity of trades, the prevading spirit of goodwill and of unselfish service that has led employers and employed through the differing trials of both periods. I can only select enough to bring out some characteristic conditions of different localities. In London the adaptations were too diverse and numerous to be illustrated in a brief report of this nature. Miss Squire gives two cases which suffice to show the spirit which met the crisis, first of total unemployment and then of over-pressure.

> *Miss Squire.*—At the beginning of the war a London firm of theatrical costumiers in a large way of business wrote to ask if I could help them to find some work which would enable them to keep their staff of nearly 200 women employed. Orders in their own trade had entirely failed owing to there being no new productions at the theatres and pantomime orders being cancelled. I advised them where to apply, and eventually they secured a War Office contract for khaki uniforms and a sub-contract for shirts, and the empty workrooms were once more in full work. The same weekly wages were paid as when the workers were on theatrical costumes, but the firm were content for the time being to make no profit rather than that their staff should be disbanded and the factory closed down.
>
> The furriers were found to be suffering severely at the outbreak of the war; the early autumn would, normally, find all this industry busy preparing the winter goods, ladies' muffs and neckwear, fur coats and linings for men and ladies' wear. But on the day after the declaration of war orders from wholesale houses were cancelled and the retailers' demand ceased. Relief came to this trade early in October with the placing of orders from the War Office for fur and skin coats for the troops. Immediately all furriers were fully occupied, and a shortage of fur sewers and machinists became a serious difficulty in the execution of the contract.
>
> *Miss Tracey.*—The whole industrial situation in the north of England, and especially in Lancashire has undergone extraordinary changes since the beginning of the war. During the second part of August hardly any factories were running under normal conditions, almost without exception they were on half time, some with reduced staff; some were closing and some were closed down altogether. The work of years seemed in danger of being swept away in hardly more than a few days. The financial pressure, and in some trades the difficulty of getting materials, hitherto easily and cheaply obtained from Austria, Germany, France or Belgium, created an absolutely unknown situation. In addition to this cancelled orders, or instructions to delay delivery, came in by shoals. The firms in their own deep anxiety almost without exception showed much concern for their workers and did their utmost to prevent the unexpected blow falling the heaviest on shoulders least able to bear it. Some firms could not stand against the unexampled strain, and yet even they were not unmindful of their workers. One firm in the darkest days, who told me they were "done, killed dead," were yet considering whether they could not utilise the factory kitchen to make bread for the displaced workers whom hunger threatened. For an unforgettable fortnight many women came to my office in their distress. In an incredibly short time the position changed and the demand for the machinists in the sewing trades was far greater than the supply, but the cotton workers, the makers-up and women in the furniture and some other trades were still out of work, and remained so for some months. Unskilled in the use of the sewing machines or in cap making, &c., these displaced women were, and many in January still were, thankful to accept the assistance offered in the relief workrooms which were opened all over the Division.

Miss Constance Smith who was acting for a time, covering August, in the Birmingham Division in Miss Martindale's absence, was in a favourable position for comparing the

immediate effect of the war on the Midlands and south and west of England. In a special degree the industries of the Midlands have been able to respond to the demand for Home products and implements to replace the supply which was so suddenly cut off by the war as well as miscellaneous articles of military equipment.

Miss Constance Smith.—In Birmingham, Leicester and Nottingham, before the war was a fortnight old, I found energetic employers putting their workers to new kinds of work, experimenting in unfamiliar materials to supply the place of German and Belgian-made goods no longer obtainable, or French and Swiss goods temporarily held up by the movements of troops, and even preparing (this is specially true of Leicester) to lay down new machinery. In these early days, when the industrial future seemed highly uncertain, and cancellations of orders by the wholesale houses was hitting the fancy hosiery, blouse, millinery and general making-up trades exceedingly hard, much of this activity was directed to the immediate purpose of keeping factories going (if only on short time) and avoiding wholesale dismissal of workers. Makers of neckwear set themselves to the manufacture of army shirts, and first-class blouse houses, accustomed to handle only lace and gossamer fabrics, took orders for "territorial" canvas and holdalls at 6d. each. In the metal trades, the transfer of labour from one industry to another seemed a comparatively simple matter; the value in ammunition works, and in plating workshops—where ration tins and mess tins and biscuit tins had to be manufactured under pressure for Army and Navy—of the neat-fingered jewellery workers, or maker of cycle parts, was obvious, and the service of press girls in trades suddenly become slack could be easily utilised in producing military buttons. Blouse and pinafore makers were found very generally employed on shirts. Certain unemployed collar makers were found, after one or two unsuccessful experiments on the part of large firms to transfer them to the busy shirt department, to take kindly to the making of certain kinds of equipment, especially soldiers' "hussifs" and the new khaki bandoliers.

Miss Martindale found great changes already effected in October on her return to her charge in Birmingham:—

Miss Martindale.—The war acted as a wonderful stimulant to enterprise. Toy factories or workshops are springing up through the Midlands; ladies' fancy bags and purses, largely imported from Germany, are being made in factories where heavy leather goods have formerly chiefly been made. Makers of heavy enamel hollow-ware are turning their attention to the manufacture of light enamel goods for which Germany has been so famous. China manufacturers are attempting to make dolls' heads, and a workshop in the potteries has been opened where dolls' bodies and limbs in composition and papier mâché will be made. Patriotic china ware, formerly obtained in large quantities from Austria, and making of transfers, which, until now, we have been importing extensively, have both increased. Jewel and spectacle cases of straw and leather boards or in brass or aluminium are being made in far larger quantities now that they cannot be obtained from abroad. The papier mâché trade is being revived, and lace manufacturers are considering the substitution of Levers lace for German-made Plauen lace. Attempts are being made to manufacture hat-band galloons, to extend the manufacture of dried grasses, mosses and palms used for decoration and artificial wreaths. Exhibitions of German and Austrian-made articles have been held in Birmingham and the Potteries, and in the latter place the exhibition was visited by over 4,000 persons associated with the potting trade. Lectures on the manufacture of German pottery have also been given.

In the Midlands it is not only the employers who have faced the situation and have altered their manufacture to suit the needs of the hour. Workers, too, are showing an adaptability which speaks well for the future. Jewellery, pen workers, dressmakers, pinafore workers, nut and bolt workers, shop assistants, have sought employment in the leather trade. Black Country workers and pen workers have been engaged in surgical dressings factories; dressmakers and tailoresses in canvas knapsack factories; cigar makers in an electric lamp factory. Fish hook makers have become hosiery needle makers; jewellery and pottery workers have taken situations as domestic servants, carpet makers have been employed in enamelled hollow-ware factories, while the ammunition factories have absorbed workers from many and various trades.

Miss Escreet.—It is the rapid pace that strikes the mind, in looking back, no less in the industrial than in the military and social worlds. And never before have we been seized and made to realise with such intensity the inter-dependence of those worlds one upon the other. It must be remembered that the position of firms having a Continental trade was far worse than any other. One small firm occupied in making cycle accessories felt the pinch in the direction of both home and foreign trade; the occupier's son, a clever tool maker, devised dies and the firm began to print small silk flags for which there was a heavy demand. The firm had no difficulty in getting the silk through its Continental connections, and Lyons was only too glad to continue trading. An important example of the trade of firms who turned their attention to supplying the home country with articles for which she had hitherto been dependent on Germany is that of hosiery needles. It is estimated that 90 to 95 per cent. of these essential tools of the maker of hosiery have hitherto been made in Germany in large factories employing lad and girl labour as well as that of adults. The whole skill and ingenuity of the German tool maker has been concentrated on the machines which are triumphs of his art, so that it is not an easy task for the English manufacturer to take up, though the welfare of the hosiery trade depends upon the firms who have done so.

Miss Pearson.—The unfortunate town, Grimsby, has been severely hit in all directions. Five trawlers were sunk by mines and the fish trade brought to a standstill. Normally, 120 men and 550 women from the north of Scotland are employed in barrelling fish in brine for export to Germany, these firms have not opened at all this season. The local women are employed in kippering and salting fish. Work has been very short with them, preference being given to single girls and widows. The withdrawal of 25 per cent. of the fishing fleet for mine-sweeping operations has caused a permanent shortage of fish in addition to the damage from mines. The dislocation of the fishing trade has reacted

on the twine and net-making industries, in which less than half-time is being worked. For a time the employment of workers on a three shifts system (6 a.m. to 2.30 p.m., 2.30 p.m. to 11 p.m., and 11 p.m. to 6 a.m.) in a factory engaged on Army contracts for jam gave relief to some unemployed, and particularly to workers engaged in box-making in the fish yards.

The Leek silk manufacturers have a choice between the spooling of khaki thread or the knitting of woollen mufflers, &c., for the troops, and making of embroidery cottons or the knitting of artificial silk golf coats, caps and scarves, or the weaving of petershams and trimmings for civilian customers. An unemployed woman worker is unknown in Leek at present, and some manufacturers are seriously considering the introduction of Belgian refugees.

Miss Sadler.—The outbreak of war and the pressure of work resulting from the placing of large Army and Navy contracts for cloth and clothing entirely changed the face of many industries throughout the West Riding. Half-time had been the rule in the early summer months, but the autumn found mills and factories working at full pressure. In the tailoring trade workers in the "Ladies'" and kindred branches of the trade found themselves unable to cope at the outset with the heavy "Khaki" work; but by the beginning of October many of these had been absorbed, and by December no skilled tailoresses lacked employment. In the mills given up to the manufacture of khaki cloth and shirtings this pressure has been equally phenomenal. In some cases orders for shirts and uniforms had to be held up until the material could be manufactured. In ammunition work the pressure has been enormous, and has led to the employment of women in an occupation very different from those to which they have been accustomed. *Miss Taylor*, whose district includes the important clothing trade in Leeds, reports that the pressure of work consequent on the demand for uniforms has precipitated a change which has slowly been taking place throughout the year, that is the gradual conversion of workshops into factories. During the last three months of the year the demand for soldiers' and sailors' clothing has exceeded the amount the combined forces of the trade can supply. At the same time the demand for civilians' clothing was very small. The nature of the khaki work makes it impossible for places equipped only with treadle machines to turn it out at remunerative prices. Therefore, unless they are to be continually out of work it becomes necessary to fit power to their machines. April and May have hitherto been the months when the notification of new factories was heaviest. The notifications for the last six weeks have been exactly double what they were in April and May. Since the beginning of the war 45 new clothing factories have been added to the registers on a total of 420. Whether this increase is likely to be permanent it is impossible to say.

Miss Vines reports, on the Division for Scotland, that women and girls employed in factories there have "nobly borne their part in the production of equipment and other supplies for the British and Allied Forces." She contrasts the under-employment in letter-press printing in Edinburgh and in fish-curing stations with the serious shortage of labour in many directions. In the Border Counties, in some factories, women have taken the place, as piecers in spinning mills, of men who have joined the Army. Some of the women compositors in Edinburgh have for the same reason been engaged as extra sorters in the G.P.O. and are said to be doing well.

Miss Vines.—One of the most important industries in which occupiers in Glasgow and other districts have adapted themselves to new conditions is that of carpet making, some of the looms in several carpet factories having been successfully adapted to the weaving of Army blankets. Another instance of industrial development was in a canvas bag factory where a number of women, girls and men have, since the outbreak of war, been employed in the making of nosebags for horses, engaged in sewing the bottoms to the bags. In two factories, in one of which hosiery is manufactured and in the other Army uniforms, additional British labour being unavailable, the management have taken on a few Belgian women and girls.

In industrial Ireland the position was, in August and September at least, as dark as any part of the United Kingdom, and much short time, even less than half time, followed. By October confidence was to some extent restored, and several trades had recovered slightly and were able to work three quarter time and more, while manufacturers were already preparing to develop new branches of industry such as embroideries, apron and underclothing hitherto made in Germany and Austria. Woollen mills throughout Ireland, Dublin and other shirt and clothing factories, and hosiery factories able to undertake military work rapidly became busier. Flax spinning and weaving factories owing mainly to uncertainty in supply of flax remained on short time at the close of the year, and were anxious for the future.

Miss Slocock.—In Belfast the workers most adversely affected were punch hemstitchers, who are employed largely on a cheap class of handkerchief for the continental market, and machine embroiderers engaged on a cheap class of household linen which amounts to a luxury in war time. The machines used for both these classes of work are of a light make and, unfortunately, they cannot be adapted to any of the heavy Government work. Blouse and apron manufacturers, and any making-up manufacturers who had plain machines, were able to adapt them to new classes of work, and as many as 25 factories of this description undertook Government mattress covers, bolster and pillow cases, and haversack making. By the time this work was finished their normal trade was recovering, and before Christmas apron and blouse manufacturers were busy. Shirt manufacturers were fully occupied with Government and other orders, and clothing manufacturers who had never previously made uniforms started very successfully, and are now carrying out War Office contracts.

In most of the flax spinning and weaving factories in Ireland about 40 to 45 hours were usually worked up to the end of the year. A few thread factories have worked overtime on Government contracts. The state of employment in this industry in the future depends almost entirely on the supply of flax from Russia.

In Londonderry and district the white and tunic shirt trade was very adversely affected, and if it had not been for Government contracts for flannel shirts the position of the workers would have been hard. The laundry departments of shirt and collar factories and the trade laundries doing shirt and collar dressing suffered most of all, and by November it became necessary to put a very large number of workers in these laundries on to relief work. An effort was made with some success to obtain camp washing and mending of soldiers' clothes for these laundries. In Dublin the shirt factories and clothing factories doing military work were very busy, and in several cases additional machines were installed. High-class dressmakers and milliners on the other hand were very adversely affected, and many of their workers found their way into relief workrooms.

Carpet factories and workshops suffered heavily, the combination of increased cost of yarn and diminished orders for hand-woven carpets, which are a luxury, necessitated the closing down of some works and short time in others.

The war has caused a welcome revival in the scattered woollen mills of Ireland; nearly all were able to undertake khaki cloth, and several make blankets, and by October most of these mills were working overtime and the pressure continues. In one woollen mill I found the occupier was being pressed to manufacture khaki, and blankets, and blue grey cloth for the French Army at the same time. All available weavers are apparently now employed; it has been difficult to obtain new looms quickly, and old woollen and blanket looms have been brought into use. Hosiery factories, able to undertake coarse work, have also been working at high pressure, and pants and vests for the Army and Navy, jerseys for the French Navy, and cardigan jackets for the English Army have been made in Ireland. Manufacturers have put in new machinery and have done their utmost to cope with the demand, but they have been somewhat handicapped by the limited number of skilled workers available, and training for the intricate automatic machines takes time. These factories like the woollen mills are often rather isolated.

In face of changes so great as those we have seen between August 1st and December 31st earlier industrial developments of 1914 may seem almost unimportant and obsolete. Probably, however, the changes that will endure after the war is over are those already begun in movements or tendencies before the war. This is not the place to examine them thoroughly, but unless they are examined at leisure it is unlikely that the after-war re-actions and depressions will be well met. Wise applications of use of power driven machinery, and adequate general control of access to necessary supplies of appliances and raw materials are factors on the material side, and good relations between employers and workers are factors on the human or spiritual side, essential for our future that have begun but incompletely in the past. The shock of war has hurried them into new life and activity that calls for continuance, while they will be necessary more than ever in the days of straitened means ahead.

Illustrations large and small of the hampering effect of lack of quick access to specialised power machinery are already indicated above, or will be touched on in the following pages. The slow development hitherto in women's trades in the United Kingdom of use of the power sewing machine in its manifold possibilities was one of the biggest difficulties that had to be faced, and possibly even bigger for a short time was the sudden impossibility after war began of getting an adequate supply of hosiery machine needles. One factory for these existed at the outbreak, but by the close of the year eight had been opened, and were reported on by Miss Martindale and Miss Escreet.

On the human side there can surely be no doubt that the constructive social reforms of the last 25 years have told in clearing away misunderstandings, and softening relationships between employers and employed. Before the war came the Inspectors knew of a greatly increasing and extending desire on the part of manufacturers to improve the conditions of factory life beyond the statutory requirements, but even that hardly prepared them for the sudden blossoming out in August and September of innumerable cases where the foremost thought was to "stand by" the weakest of their workers and share alike in profit and loss. And this appeared not only in such cases as that of the large old-established factory where the senior partner slowly explained to me how everyone in the business, office and all, was sharing *pro rata* in the short time and short earnings with the factory workers, and how any sums that he might have given to relief funds were going either to his workers in need or to wives and dependents of his workers who were reservists or recruits for the new Army. It appeared also in smaller employers who made deep inroads on their savings to avoid discharging a single worker. Factory Inspectors are not likely to forget these things, which so greatly predominated in spite of instances of a contrary kind. As Miss Squire says in characterising our work of the early autumn :—

It linked Inspector and employer and workpeople together in a common interest at a time when the foundations of life as we knew it seemed to be threatened. The opportunity afforded of an unburdening on the part of the hard-hit employer and the assurance that the Government Departments were alert, the encouragement the appearance of the Inspector, as usual, gave the workers, were often commented upon, and I believe contributed to the steadiness and cheerfulness which have been such a feature of that trying time.

Complaints.—The continuity of the work of this branch as well as the special character of the year may be seen in the usual analysis of complaints received. In the first seven months of the year the rate at which this form of appeal from the workers' side for the

protection of the Acts came in was faster than usual, but it naturally fell away in the time of extensive unemployment. It rose again as employment rose but relatively much less, and in face of the enormously long hours and alternating day and night shifts worked in many women's industries it is evident that the workers were mostly too absorbed in their work and its objects, "for the soldiers and sailors," to think of appealing for normal conditions. The patriotic spirit in which the work was done was indicated by such remarks as that "we would not work like this any other time." Although the total number of complaints received was 1,812 as compared with 2,014 in 1913, the total under the Acts was 1,498 as compared with 1,657 (a drop of 9 per cent.). The sources of complaints are very similar to those of ordinary years, the chief change being in a decline in the number received from the Industrial Law Committee and kindred Organisations. It seems worth while to print as usual for future reference the classification of the nature of complaints received. In almost every main item there is a decrease including even sanitation and safety, employment, truck, but in the important item of particulars of work and wages there is a rise, a healthy sign of desire for clear contracts. In complaints of matters outside the Acts the total has fallen, but the items relating to various wages and contract of labour questions has again markedly risen to 101 as compared with 71 in 1912.

TABLE I.—NATURE OF COMPLAINTS, 1914.

Nature of complaint. (1)	Received. (2)	Investigated. (3)	Upheld. (4)	Not upheld or not traced. (5)	Awaiting investigation or referred to another authority. (6)
Administration	72	70	53	17	2
Failure to affix abstract and notices ...	18	18	9	9	—
Evasion of Inspector and failure to notify factory or workshops	54	52	44	8	2
Safety and Sanitation	646	592	381	211	54
Sanitary accommodation: want of separate, sufficient and suitable ...	115	108	69	39	7
Insanitary, uncleanly, ill-ventilated, damp or unsafe workrooms	177	163	100	63	14
Overcrowding of workrooms	21	21	9	12	—
Extremes of temperature (*a*) heat ...	43	38	29	9	5
Extremes of temperature (*b*) cold ...	121	106	77	29	15
Regulations or Special Rules not observed	37	37	22	15	—
Dangerous or unhealthy processes and excessive dust, heavy weights for young persons	68	58	35	23	10
Wet and badly drained floors	13	12	6	6	1
Want of fire escape and closed doors ...	17	16	7	9	1
Want of fencing	24	23	19	4	1
Accidents	10	10	8	2	—
Illegal Employment	582	547	267	280	35
Before and after legal limits—					
(*a*) Women	263	252	110	142	11
(*b*) Young persons and children ...	60	54	24	30	6
In mealtimes and exceeding 4½ and 5 hours' spell	103	97	48	49	6
In shop and workshop (excessive hours)...	11	11	7	4	—
Overtime, without observing conditions...	39	33	20	13	6
On Sundays and holidays...	50	48	23	25	2
At end of legal day (homework)	29	26	19	7	3
Without certificates of fitness	15	15	10	5	—
Within four weeks of childbirth	12	11	6	5	1
Particulars of Work and Wages not supplied...	37	36	26	10	1
Truck	108	102	81	21	6
Excessive fines and deductions	90	86	69	17	4
Fines and deductions without contract or particulars	18	16	12	4	2
General or indefinite complaints: need of increased inspection	53	46	24	22	7
Totals (*a*) Under the Act ...	1,498	1,393	832	561	105
Totals (*b*) Outside the Act ...	314				
GRAND TOTAL	1,812				

Employment and hours of Labour.—The extraordinary prominence in 1914 of problems and hours of employment as distinct from conditions of sanitation and safety in the technical sense which have mainly been kept at their level of past years, brings this section of the work of the women Inspectors into the forefront of my report. The contrasts within the year in the matter of hours of labour and their regulation are no less great than in the matter of changes of occupation and process for girls and women. In the first seven months the movement from the side of workers and many employers was still towards a lessening of hours generally to something well within the maximum allowed by the Factory Acts. In the last four months the problem has been, increasingly, how to effectually regulate the admittedly necessary relaxations of the law relating to hours so as to secure the best possible output of supplies for His Majesty's Forces while preventing undue overstrain of women and young workers. For the Factory Department the anxiety over unemployment prevalent in August and part of September rapidly gave place (with a few notable exceptions—*e.g.*, cotton textiles, machine-made lace trade, dressmaking, fishcuring) to an almost breathless endeavour first to watch over the application of the incessantly flowing emergency Orders under Section 150 of 1901, secondly to standardise the application of such Orders to the needs of groups of industries. Everywhere the endeavour of the Inspectors was to make it clear to all concerned that sanction for the exceptional hours and periods and night shifts was only, for a limited time, by strictly defined Order of the Secretary of State, renewable in case of need, and to overcome the belief or impression which suddenly spread in September that the Factory Acts were "in abeyance." Unquestionably many cases occurred of exceptionally long hours worked without any legal sanction whatever, but these have been steadily brought under better control, and the more steadily because of the knowledge of intelligent manufacturers that unlimited hours cannot be worked without detriment to output in the long run by encroaching on workers' reserve energies. It is unnecessary for me to attempt to summarise the full scope and number of the Orders actually granted as these are dealt with in Chapter V. My object is to illustrate by the reports of my staff, their effect for women and girls in the chief industries. The renewal of Orders from time to time for individual works makes the total number of Orders (6,000) issued very large, but the actual number of factories in which such Orders ran is small relatively to the work of administration. In the earlier stages of the rush towards employment of all available labour on Government supplies, night and day shifts (by alternating double or treble shifts) seemed to be called for not only in the interests of maximum output by available machinery and workers, but also for absorption of as much unemployed labour as practicable. Early absorption of all available labour for skilled or semi-skilled processes soon limited resorts to these methods, as a rule, to the industries (*e.g.*, ammunition, jam and provision works) where new workers could learn some of the processes and become useful after a very short period of teaching. Another important limiting factor in organising shifts lies in the difficulty of securing sufficient relays of supervisors, foremen and managers, to keep the works efficiently in operation day and night.

The work of the 20 women Inspectors in dealing with applications for emergency Orders, in controlling the observance of their conditions after issue, and in gradual reduction of their limits to a reasonable standard, has been chiefly and most systematically in factories and workshops for military clothing, uniforms, shirts, caps and their accessories throughout the United Kingdom. They have, however, also done much work in many other industries *e.g.*, woollen textile factories engaged in khaki cloth and blanket making, ration making, tin box making, ammunition works and miscellaneous equipment, by test visits to watch over the effects of Orders granted for overtime or night shifts, or Sunday work, and making special enquiries and reports for the purpose of amending Orders. As far as possible they have also visited works engaged on Army supplies and equipment which had not applied for emergency overtime so as to check irregular resort to such overtime.

In military tailoring the net number of factories remaining under emergency Orders early in the current year was found to be 308, covering the work of about 19,227 workers. The largest group of military tailoring factories under such Orders was in the important special district of Leeds—92 under Orders out of 375—which is in the charge of Miss Taylor. The standardised Orders, allowing either 1½ hours' overtime on 3 nights a week, or 1 hour on 5 nights a week, on days other than Saturday, to young persons over 16 and women, came into operation in November and only 24·5 per cent. of the Leeds tailoring factories came under such Orders (and a smaller proportion in the Bristol tailoring factories). Even if we add to this percentage the factories utilising the direct provision in the Factory Act, Section 49, for 1½ hours' overtime for women over 18 years on 30 nights in any 12 months, and a certain number irregularly working overtime without detection (and without complaint from the workers) we can see that a considerable amount of clothing for the Forces

is now produced without deviation from the ordinary limits of the Factory Act. It was in the earlier stages of the rush to produce war supplies, before greatly extended use of power machinery had been achieved, and before numbers of workers from other occupations had been brought in and trained, that overtime was in some places worked to a really serious extent that must have defeated its object if it had continued much longer. The provision stands in all the Orders that it shall not be " a condition " of a worker's employment that she shall work overtime. This, coupled with the workers' own recognition of their country's need of them, made explicit by direct personal appeal to them of Lord Kitchener—" in carrying out the great work of providing the Army with its equipment employers and employees alike are doing their duty for their King and Country equally with those who have joined the Army for service in the Field "—posted in the factories, has led to a spirit of sustained, untiring effort never seen before and most admirable. "This spirit has accomplished," says *Miss Squire*, " what the mere prospect of increased wages has failed to do ; it is a truism among managers that girls, even on piece work, cannot be induced to exceed a pace which enables them to earn what they consider a normally sufficient wage, but during the last few months the motive—' our soldiers need it '—has made them work at top speed." Further says another Inspector, *Miss Escreet*, there is the personal note—" My sweetheart he's out there, and my two brothers, so I may as well be working." A married woman can write to her husband in the trenches to tell him she is " doing her share." *Miss Tracey* says : " It is a sustaining thought to many an overtired mother or sister that she is not leaving all the hardships to the soldiers." *Miss Slocock* says : " It is only by visiting the factories that one can realise the extent to which the equipment and comfort of the troops in the field depends upon the work of the women and girls at home, and the amount of overtime worked has, I believe, only been possible without injurious effects because the workers have been so glad to help. In one factory I found them singing for joy because after a long spell of short-time on blouse making they had started on a Government Order for mattress covers. . . . .About overtime under emergency Orders the Irish workers have never complained." *Miss Pearson* says she has been surprised to find so little complaint or ill-effect from long hours. "This may be partly due to the better standard of living that the overtime money makes possible, but I think it is mainly due to the ideal for which the women are now working. . . .It would revolutionise industry if some ideal other than money could be inspired during times of peace."

" No army," says the military correspondent of the *Times*, " was ever better fed, and the fresh supplies of clothing which have always been at hand when needed have enabled the troops to be refitted constantly and well." As the labour of women and girls has been predominant in the making and tinning of rations, and the making of most articles of clothing, they may comfort themselves with the thought that so far as their arm could reach they have done their best to sustain and clothe the Army and Navy.

The chief exception to the nearly general rule that workers have worked without complaint of the long hours has lain in the surgical dressing and bandage factories which at the end of 1914 were relatively few compared with the enormous output necessary. Here much emergency overtime has been worked. The age of the workers is lower than in most other factories engaged on war supplies for many of the processes are simple, requiring little skill. To meet the strain seriously felt by these young girls both development in number of workplaces and workers and improved organisation were found necessary, and the more because of the vital importance of not risking a chance of a breakdown in rapidly adjusting rate of supply to suddenly increasing needs.

The testimony of the Inspectors on the whole has gone to show that the main resistance to excessive overtime in the greater normal industries, comes more from the employers' side than from any other, although there have been marked exceptions to this rule, and the method of approach to the problem of obtaining the best output has varied greatly among them. It is highly satisfactory to lead off the account of the employers' work in this matter with the example of a crown factory where the experience is, says *Miss Squire* that any lengthening of the day beyond 6 p.m. and a total of 8½ hours' work daily exhausts the workers and is of no advantage in increasing output. A notice is affixed in this factory congratulating the women on their output and on the splendid response they have made to Lord Kitchener's appeal to them to do their best ; they are asked " to continue to work to the utmost of their ability as they have been doing since the war broke out." A number of instances of serious conviction on the part of large private employers of labour, and even of occupiers of medium and small sized factories could be quoted to the same effect. These may be illustrated as follows :—

Miss Squire.—A well-known wholesale clothier employing 1,000 women on Government contracts gave it as his well-considered opinion that the full period allowed under the Factory Act, 8 a.m. to 8 p.m., is sufficient, and " any work beyond this is quite useless : it exhausts the workers and does not pay." Another employer of a thousand women pressed by the War Office to increase his output, refused firmly

to work them overtime; all he asked for was to be allowed to keep the factory open seven days a week, employing Jewesses on the Sunday and the rest of the women on the Saturday.

Miss Constance Smith.—In the month of October, when applications for orders were general in London, the great Bristol clothiers were for the most part carrying out their contracts within the Factory Act day. Two firms only had emergency orders, and they were not using them to the full. Where overtime was worked at all, it was under Section 49; but in several instances this had been tried and discontinued, the managers finding that an hour and a-half's overtime after 8 p.m. on three nights in the week had an injurious effect upon output, as well as upon health if carried on beyond a fortnight at the outside. In one case, where this bad effect showed itself at the end of the second week, the manager persuaded the directors to return as an experiment for a week to normal hours; the output and quality of the work improved so much during this week that the firm decided to keep to normal hours altogether. It would appear as if the question of carrying out contracts within the Factory Act day, if not within the normal clothier's day (some of the Bristol factories worked 9–7) were largely one of thorough organisation and complete knowledge on the part of the managers of the rise or fall of output in each week, in proportion to hours worked and number of hands employed. Certain keen-sighted managers found their disapproval of overtime strengthened by the results of the short time worked in the early weeks of the war. One responsible for a factory employing over 2,000 women and girls, where the normal day is 7–6, told me that when this day had to be reduced to 8–5 by reason of cancelled orders, he found the girls' output remained the same.

Miss Taylor.—The outstanding feature was the refusal of the great majority of the occupiers of the largest and the better conducted factories in Leeds to entertain the idea of systematic overtime beyond the ordinary period of employment allowed by the Factory Act. Their reasons were, I gather, twofold. In the first place, overtime beyond the usual limits is never financially beneficial for the output decreases relatively, while the standing charges for power, light, &c., remain the same. But the second and far more important reason was that the women were unable to stand any prolonged period of overtime employment. The supply of skilled labour is scarce in any circumstances, and it was generally felt that to overstrain the available labour was to the best interests neither of the Trade nor of the Country at the present time. With a few exceptions the demands of those firms who applied for an extension were moderate, and little difficulty was experienced in reducing the overtime to an extra two hours on three nights in the week, or its equivalent, for all women and young persons over 16 years of age.

Miss Vines in Glasgow found considerable divergence of opinion among manufacturers. One member of a large firm making military uniforms informed her that overtime did not pay, but that as it increased his workers' earnings he was obliged to continue it lest his workers should leave for another factory. The manager of a powder bag factory on the other hand found after some weeks' experience that the pieceworkers were making less during overtime than during the normal period of employment. The experience of this occupier is more than matched by that reported by several during the short-time period *e.g.* (*a*) a cardboard box manufacturer who told me he had put his workers on shorter hours only to find that their output and earnings were equal to those on the full factory day; (*b*) a biscuit manufacturer, (*c*) an apron manufacturer who reported a similar result to *Miss Constance Smith* and *Miss Squire* respectively.

While I have thus rapidly sketched the situation as regards issue of emergency Orders and the attitude towards output and overtime of both employed and employers it is perfectly clear that deviation in some ways from the fixed Factory Act limits was necessary to prevent breakdown in the flow of output as well as for increase in its amount. Some delay in getting out and obtaining contracts and in getting steady supplies of materials, machines, implements to carry them through was inevitable at the outset, and from time to time dislocation occurred in the delivery of those supplies of material, etc., interfering with a continuous run of work in making up the articles. If considerable emergency overtime had not been available undoubtedly delivery of the required supplies by the multitude of factories and firms of widely varying experience and capacity would have been far less satisfactory.

Miss Whitworth.—Waiting for cloth, sudden pressure for deliveries by the War Office and Territorials, the workers being scarce and not skilled in the particular work have been the most frequent reasons given when overtime was asked for: although in some cases it was evident that employers tendered for far larger quantities than they were able to turn out.

Miss Escreet.—Though the needs of the New Army for ammunition, rifles, uniforms, boots, leather equipment, to take only some of the more obvious lines of industry, began immediately, yet the actual contracts for supply were not in some cases received until September and October. Thus women and girls had the experience of being one week on half time and the next full tilt on a Government order which promised a continuous run of work. No sooner had the contracts been issued than an increased output was required. The problem of increasing output and at the same time husbanding the strength and staying capacity of their women workers, has been one which employers have faced in various ways. One firm employing 500 women and girls before the war has increased that number by 200 and has hitherto worked no overtime. This was no light task, as it entailed the emptying of stock storerooms and the putting down of a considerable amount of new machinery. The feat has been accomplished in the midst of heavy pressure and to the great benefit of many unemployed women and girls who have been taught new work when they most needed it.

Miss Tracey.—The effect of the unheard of demand for uniforms, caps and other military and naval equipment was almost startling. The demand followed almost all at once upon trade stagnation

which seemed to threaten annihilation. From unknown depths trades concerned sprang to a height equally unknown before. Contracts of inconceivably large dimensions, which ran into hundreds of thousands sometimes, for equipment for the troops, were required with such insistent haste that nearly every firm was at its wits' end to know how to carry out its undertaking. A large number of firms applied for an Order which extended the working day to one of 14½ hours for women and young persons as the only means by which the urgent needs of the country could be met. Even if they did not make full use of the permit it was there in readiness to meet unexpected contingencies. Undoubtedly those contingencies do arise, and one of the worst of them is the non-arrival of cloth, as I saw in visiting factories where the expected khaki had failed to arrive, leaving the workers with little to do. It hardly seemed quite fair, but half the staff had migrated to other factories which were running at fullest pressure and the much needed help of these workers was thankfully absorbed.

Great as were the difficulties from uncertain rates of supply of raw material at each stage (*e.g.*, wool for khaki cloth, cloth for tailoring factories) even greater in its effect (and sometimes the primary cause of shortage of material) was the shortage of skilled or even half-trained workers in the overpressed industries. At first the possibility of a shortage so great as that which actually existed in the industries producing war supplies was not foreseen, and even after it began to be seriously felt the degree of shortage was partly masked by some movement of the workers from one workplace to another. The industries where the use of power machinery is most highly developed, and the number of individual workers to a given output is relatively low, are also relatively in the best position for quickly increasing output, provided there is any margin of trained labour. Probably relatively to the enormous supplies necessary, the highly developed boot and shoe and other leather industries were better able to respond to the pressure than the military tailoring and shirt making factories. These latter trades having far inferior development of power machining appliances and methods were heavily dependent on obtaining a great increase in number of workers, so great that when the shortage of machines began also to be felt it was impossible to double their use of those they had by application of alternating shifts. Miss Squire is convinced that in London the chief reason for emergency overtime Orders in military tailoring factories and the form they took lay in the shortage of trained hands while the excess of unemployed workers in blouse and dressmaking could not, owing to lack of the right kind of skill, be sufficiently quickly absorbed. She and Miss Whitworth find that this shortage in spite of steady absorption of a great deal of previously untrained labour still continued to a considerable extent at the close of the year.

Miss Squire.—The wholesale tailors of London, and the bespoke tailoring workshops have beseiged the Labour Exchanges, have advertised and done all they could to secure workers to execute the urgent orders placed by the War Office and Admiralty. At the beginning of September it was apparent that the supply of workers trained to that kind of work was exhausted; there were not enough to go round; any fresh hands taken on at any factory had been attracted there from another where they had left vacancies which could not be filled up. Employers who had opened new factories to deal with overflow of orders could not get started for lack of workers. These difficulties have, unhappily, not yet been overcome in the trade as a whole. One or two exceptions stand out from the general rule, such as the following: A firm employing now 300 women and girls have taken a few new hands daily and trained them. The managers say that experienced tailoresses and those accustomed to bespoke work have become proficient in a few days, blouse hands in three weeks. Another, employing 200 hands, required 1,000 more; finding that he could get no more trained workers, he began to take on and train blouse hands and others, and trained them in his factory and passed them on to the workrooms as soon as expert. He found that many were ready in about three weeks.

The same difficulty in greater or less degree appeared in all the other chief centres of the clothing industries: Leeds, Manchester, Glasgow, as well as Bristol and Birmingham. The shirt makers found it much easier than the makers of the more highly specialised military uniforms, etc., to absorb previously untrained workers, the work being less heavy as well as simpler. The Bristol clothiers were able to quickly absorb, even in military tailoring, the unemployed surplus of the skilled machinists from neighbouring corset factories. In all these centres it is understood that the majority of retired workers, married and widowed, responded to the call for them and returned to the factory work, and ill as the services of the experienced workers could be spared for teaching much was achieved in training fresh workers from a great variety of trades. Gradually adoption and extension of the sectional system of work, especially in Leeds and Manchester, has enabled the workers to learn a part of the work (of say tunic making) more easily and quickly than if they had to make the completed article throughout. In Lancashire some cotton workers were absorbed into tailoring factories and are likely to stay in their new occupation. There too even dressmakers have come into factories to learn, and when taught have been able to employ their girls in their own workrooms. In Birmingham a typical occupier making pinafores and babies' clothing before the war put down 40 new machines for haversack making, and proposed to work day and night shifts on them, but could not find enough workers; he then set to work to open a new factory and train workers in a Surrey suburb

where there was not much employment for women. In Glasgow typical examples of adaptation of workers and plant to production of Government supplies were mantle factory to uniform making and lace stitching factory to military shirt making. In Ireland one hosiery manufacturer would meet the pressure by training new workers on additional machines, another by giving out finishing to married former employees after drawing in all that were willing to come.

> *Miss Tracey.*—In many cases firms engaged in other dress trades accepted contracts for uniforms and started on this to them hitherto unknown side of trade. Even greatcoats were turned out at the rate of hundreds a week where ladies' robes and blouses only had been made before. Some firms offer a bonus of 2s. to any girl who will bring in a new skilled worker. New machinery has been laid down and large new premises opened. One firm alone has opened three new factories employing hundreds of girls at each, in addition to those already working. On one large clothing factory Miss Akrons found a room of 70 learners, most of whom had never worked a machine before, being taught by a man specially engaged for the purpose. The smaller occupiers, however, could not afford the time or the space for unskilled hands, and only engaged those accustomed to machining. Miss Stevenson found a firm of saddlers undertaking the new work of making ammunition pouches. The women, even the forewoman, were absolutely new to the work, but were dealing with it successfully.

As the speed of output increased other adjustments have had to be made. The shortness of power driven buttonholing machines which could be filled in only by hand work led in some factories to serious congestion through the impossibility of the hand buttonholers working fast enough to cope with the output of the machinists in making the garment. I have received various interesting reports from Miss Squire, Miss Constance Smith and others on the efforts made to cope with the large orders for army fur coats needing a certain skill in the workers. The full available number of those seasonal workers was called up when the War Office order came and there was little time for training more as the work had to be delivered before Christmas. The supply of machinists and machines was short and additional overtime was inevitable. One employer who ordinarily used three machines ordered 29 and succeeded in only getting 8; and yet apparently with the help of outworkers in Whitechapel, Stepney and Bethnal Green the necessary supplies were achieved.

The shortage of solderers in tin box and provision factories was probably in the last quarter of 1914 proportionately greater than of fur sewers, owing to the enormous demand for tinned rations and various receptacles for Army and Navy supplies, and in spite of much overtime and valiant efforts in various factories to train extra girls the use of soldering machines, hitherto rare, increased of necessity. *Miss Constance Smith* reported really systematic training of girls in three London factories:—

> One firm had transformed a packing room into a learners' shop, and an expert foreman tinsmith was installed here with his "class." The girls were drafted into the factory and on to piecework as they became proficient. At this factory they were making progress at a rate which astonished the manager himself, and in all those where training was going on the girls were said to go through the learners' stage very quickly. As the soldering of Government tins requires much more care and uniformity than is demanded for ordinary work, the testimony to their zeal and industry is the more striking. Some firms stated that they were paying 1s. a gross extra for Government biscuit tins as against ordinary biscuit tins of the same size, on the sole ground of the closer attention and greater strain which the work involved.

Some efforts were made though with very small results in numbers as regards Lancashire to transfer cotton weavers when they were out of work to the overpressed woollen weaving trade. The chief obstacles appeared to lie in the special skill and high standard of wages for cotton weaving combined with the difficulty of finding cheap and suitable lodgings for immigrant workers in the neighbourhood of Yorkshire woollen mills. A few Lancashire cotton weavers have been found weaving woollen shirting for the Government a long way from their homes, successfully, but more adapted themselves, near their own homes, to tailoring. Carpet weavers adapted themselves widely and readily to blanket weaving, and some dressmakers have shown noteworthy energy and enterprise in turning to meet the great demand for Army hosiery by ordering hand knitting machines and training their workers to make socks, cardigans, etc.

Considerable inadaptability to other industries among Aberdeen fishworkers was reported to Miss Vines in the last quarter of the year. If any fish came in the fish-girls, even in good other employment, preferred to go off for a few days of their own work. It can hardly be doubted that the nation gains in the long run by this attachment of these valuable workers to their own arduous calling. At the same time it should be noted that early in the current year large numbers of fisher-girls have been sucessfully transferred to Dundee Jute Factories and elsewhere.

Little has yet been done to train women workers outside the overpressed factories, and although a few manufacturers have intimated to Inspectors incidentally that they think more might be done in that direction by Education Authorities, organised, definite

representation from them on the subject have been lacking. The Liverpool Education Authority has begun classes for power machining and toy making for girls, the Cordwainers' Technical College, under the London County Council has begun an excellent scheme for training in leather machining, and the Technical Instruction Committee of the Belfast Corporation has begun special technical classes for girls unemployed through the war, a payment for attendance being given to the girls by the Committee of the Prince of Wales' Fund. No doubt other Education Authorities are doing similar work. In Walsall in the current year a leather hand-sewing class has been established by manufacturers. In a Glasgow relief workroom 20 power sewing machines were fitted, for the training of unskilled workers out of work through the war in shirtmaking, and the experiment seems to be succeeding. The Central Committee on Women's Employment, in laying down principles for the guidance of Local Representative Committees when opening special workrooms for the relief of women unemployed through the war, expressly provides for work that shall be the means of giving educational or technical training or instruction, and in London special attention has been given by the Central Committee to trade instruction and development of opportunities for the women to attend trade classes under the London County Council.

The adaptability of our industrial women and girls to new processes in new circumstances as a whole throughout the United Kingdom has shown itself in a marked degree, in spite of a general absence in the past for them of openings through technical or skilled trade training. Another quality, mobility, has, as seen above, had to come into question in this time of testing and change. The difficulty touched on of moving the Lancashire cotton weaver to the Yorkshire woollen mill cannot, owing to her special position as regards the skill and pay among industrial women, be held by itself to confirm the general belief that women on the whole are less mobile than men. The mobile fish-curing girls and seasonal laundry girls live by their willing capacity to move round the coast as and where they are needed. And in their case difficulties as to unsatisfactory housing do not seem to take effect. In Ireland isolated woollen mills after absorbing all available woollen weavers were able to draw in from elsewhere unemployed linen weavers who could do the new work in two or three weeks, but this, Miss Slocock says, was only accomplished successfully when whole families were persuaded to move. In Scotland a few efforts to draw unemployed women from one part of the country to employment in another were observed by Miss Vines. The most successful, she says, was in a Perthshire cotton mill where many unemployed women from Edinburgh and elsewhere were brought and trained, a house being taken and furnished for their accommodation. In the case of another textile mill, in the South, workers offered similar accommodation wrote to the Senior Lady Inspector to ask if they might safely accept it. In a Midland City where a great increase of women's labour was necessary for munitions of war the only obstacles that I could see after careful enquiry were a marked shortage of lodgings and of adequate hostel accommodation, and absence of a margin in the wages to pay for such accommodation as could be made available. Undoubtedly as the country has need of the women's work suitable billeting and rates of remuneration to cover billeting must in such cases be provided. Where there are large supplies of unemployed labour, or employable girls and women live at home, undoubtedly the least difficult and expensive plan, if otherwise practicable, is to open new factories near the homes of the workers and this course has been lately adopted by ammunition and clothing factories.

Among the important deviations from Factory Act limitations Sunday work has appeared, though hardly in Scotland, where only one Order affecting women has been found necessary to sanction it. In the cases where an Order simply permitted the employment of Jewesses on Sunday in works where non-Jewesses work on Saturday, relaxing section 47 of 1901 to admit of steady output without overtime, the change is mainly technical. Orders further have been made allowing Sunday work in the sense of seven days employment or night and day shifts beginning or ending on Sunday, eight being still in force at the close of 1914. Here again the object has been generally to avoid daily lengthening of hours of work, double pay has frequently been given, and the workers consenting to the arrangement for a time appeared to be satisfied. Complaints, however, have increased, of Sunday labour in the current year. The extent of emergency night work for women and girls, and the kind of provision made by employers to mitigate its bad effects for them, have seriously engaged the attention both of myself and the Senior Lady Inspectors. Many visits have been made at night to works under Orders for night shifts and these have been well received, even with gratitude by occupiers glad to know that the conditions were being watched by a woman Inspector. It has been found that there is none of the unanimity of feeling amongst the workers about night work that there is about simple lengthening of the day's work to meet the nation's need. Some workers, especially the younger ones, appear for a time to like the novelty of night work,

and, where it extends only to eight hours, as in an ammunition factory from 10 p.m. to 6 a.m., and sleep in the morning is followed by some opportunity for normal life at home in the afternoon the objections to the system operating for a time are not great. Most older women object to night work for they rarely if ever can escape home claims on them during the day, and if married object to leaving their children at night. In many places parents simply refuse to allow their daughters to work on night shifts to avoid exposing them to risks that they prefer they should not run. The difficulty for employers and managers of arranging for supervision of work by night in addition to the day as well as the frequent shortage of workers, and the uncertainty of their attendance even where there was no shortage of supply of workers, soon led to abandonment in many cases of use of Orders granted after application. In one factory Miss Martindale found that out of 250 women only five would consent to work at night, and on one night only two arrived to work the shift. The number of such Orders remaining in force at the close of the year was 54 (though the figures were much greater in the first quarter of 1915), and the chief industries and processes to which they applied were field, camp and general equipment, metal equipment, munitions, food, and rubber goods, making of blankets and flannel, and weaving of canvas for tents.

No such Orders have been in operation in Ireland and only seven in Scotland. In the Leeds Special District (clothing factories) there have been no night shifts and no women and girls are under Orders permitting work after 9.30 p.m., nor girls under 16 working after 8 p.m. In some of the factories in the Midlands illegal night work as well as Sunday work without an Order was found and the defence made that the Act was " in abeyance." In most of the factories girls and women working at night have done so under the supervision of a responsible woman or matron, and in some ammunition works a nurse is invariably on duty at night, a time when faints are most liable to occur. There has been marked readiness in most cases on the part of employers to act on recommendations from the Senior Lady Inspectors that girls should at night be under the charge of a competent woman, and I know of very few cases where there has been delay in making good arrangements of the kind. A great deal of attention has been given to securing reasonably good arrangements for the girls to get a wholesome meal in the course of the night shift. In some cases the Inspectors found the managers extremely careful in the whole of the arrangements already made. For example, in a large engineering works in the Eastern Midlands where women had been engaged for the first time for lathe work on Government contracts the men's and women's shifts changed at different times, the women were escorted to and from the dining-room for the meal between 1.30 and 2 a.m., and hot water was brought to the workroom in case they wished to make tea ; a police patrol is on duty when the women's shift leaves. Here the wives of the Directors take a personal interest in the welfare of the girls. On the other hand Miss Martindale has found factories where a few young girls (without overtime pay) have been locked in at night with men workers, no responsible person in charge, with no means of heating food beyond a small oil lamp and no lighted sanitary convenience. She points out that :—

> In the Birmingham factories the manufacture does not lend itself to a division between men's and women's work or to the employment of girls under a forewoman. Men and girls work side by side in big sheds filled with machinery. The sheds are situated in large yards which often at night are insufficiently lighted, and undoubtedly the women workers are exposed to serious risk.

As regards effect on health of the greatly increased hours now is not the time for attempting a serious estimate, for the material is incomplete. It is evident from the preceding pages that, for the time, a new power of resistance to fatigue has shown itself in industrial women in a way comparable with the spirit of their men at the front. And they have taken on the extra labours without relaxation from their home cares and yet in some cases can manage to do "a bit of knitting for the soldiers." One old weaver over 60 years of age told Miss Stevenson that it reminded her of the days when she first started work in a factory, and another said to Miss Sadler, " we never seems to get any rest, but if we did not do it nobody else could." Where hardy, adult women are concerned, in the circumstances, it is unlikely that injury will be done to health if the strain does not continue too long. Still we cannot overlook the indications given by numerous individual reports to some such effect as the following on a Yorkshire mill : " This firm have been working overtime continuously for some months, but have found it absolutely necessary to stop it for a week as the strain was becoming too great and the number absent through illness was so large." In report after report I find it stated that manager or employer speaks of the signs of strain in the women from the overwork, and as I have already shown thay have widely tried to reduce its amount. Even while we recognise that it is war-time and that the work " must be done," yet as regards the youngest women and still adolescent girls it is most necessary for all in responsibility to take every possible care so to organise the work and adapt the available supplies

of workers and machinery that *unnecessary* risk shall not be run of injuring the future life and health of the race. The Inspectors have done much in drawing attention to signs of overfatigue especially in the case of younger workers engaged either in heavy processes such as military tailoring, sack making (two hours overtime on four nights a week), or over a long succession of weeks in less heavy processes. Sometimes individual workers suffered partly from long journeys to and from the factory or poor nourishment, and inevitably the rate of remuneration and total weekly earnings has had to come into consideration (see below). Extra refreshment provided by careful managers has repeatedly played an important part in protecting the worker's health.

Miss Perry reports on a Lanarkshire factory where Navy and Army woollen cardigans, etc., are made: "The workers are supplied with free dinners, soup, beef and bread. There is a nice messroom attached with a cook who washes up. About 130 girls stay to dinner; the overtime girls also get tea given to them, bread and butter and tea and cake, or scones and pancakes, etc."

It is impossible to give as one would wish any exact estimate of the increase, which must be very great already, and is bound to grow greater, of the number of women and girls employed in factory industry. I do not see how it can be much less already than 100,000, it may be more. If the normal rate of increase during the 15 years preceding the last return from Employers to the Factory Department in 1907 was maintained, not less than 2,000,000 female workers were already employed in industries under the Factory Acts at the outset of war. Ammunition and ordnance factories employ now more thousands than previously hundreds, a high proportion of the girls, say 60 per cent., being drawn, in certain works, from sources outside industrial ranks. Tailoring, shirt and hosiery factories have probably increased their employed by at least a third, and other war supply industries proportionately. The number of women and girls thrown out of factory and workshop industry by the war may be estimated from the Board of Trade Reports to have shrunk from the large dimensions in August to less than 50,000 by the end of the year, and many of these would be unadaptable to war supply processes. Even with the great accession of workers to these processes we can estimate, again from Board of Trade Reports, that at least 200,000 were working overtime at the close of 1914; a considerable proportion of these would be girls between 16 and 18 years, and in woollen textile districts not a few between 14 and 16 years.

By the close of the year 99 special workrooms, opened for women thrown out of employment through the war, had been inspected by Senior Lady Inspectors and their staffs, or by myself. The number employed in them at the time of inspection was 2,891, and the number proposed was 4,136. The kind of workroom varied considerably, 56 of those visited were among the number opened by or given under the control of Special Committees, Central and Local, set up by the Government in order to administer application of the centralised voluntary relief funds. The remainder had been opened by private persons or by various societies depending on their own funds: for example, the various Women's Suffrage Societies, 9; Women's Emergency Corps, 6; Women's National Health Association, Ireland, 5; Scottish Council for Women's Trades, 3; Young Women's Christian Association, 2. We inspected 14 small workrooms which were managed and financed by private persons A few of the 99 workrooms inspected carried on their work by way of trade, making articles for sale or to order, and these ranked as ordinary workshops under the Factory Acts. The majority, including all approved for grants from the Queen's Work for Women Fund, were expressly organised so as to avoid any competition with ordinary industry. These all, by the express wish of the Central Committees responsible for them, were begun and carried on in compliance with Factory Act standards, and were considered as technically covered by Section 5 (1) of the Act of 1907. The scope and aim of these approved special workrooms may be studied in the Interim Report of the Central Committee on Women's Employment for England, the Irish and Scottish approved workrooms being under similar bodies acting on similar principles and methods. All the Inspectors speak of the good conditions under which the work has been done, the educational effect of the employment and the domestic and other training schemes carried on in, or in connection with, these special workrooms, and the efficiency of women who have been put in charge of them. Of the Local Committees who supervised the management of them one Inspector says: "Busy men and women gave of their best and brought their business knowledge or their long experience of home conditions to devise the best ways in which the women could be aided; the same spirit animated the manageresses, and nothing struck me more than the spirit of camaraderie manifest in almost every place I visited." It is already evident says another that "much useful work of a permanent and lasting character may be done . . . classes in cookery, needlework and other useful subjects arranged are specially beneficial to girls partially unemployed through the war, and still

in attendance at their own work places for a part of each day ; for those totally unemployed and likely to have lost their former employment, training in a new industry has been possible in some localities." The renovation work taught at a number of centres, says another, " is not only remarkably successful in its results, quantities of useful and attractive garments for practical purposes equal to new being produced out of old ones, but cannot fail to have an excellent educational effect on the learners." The mass of new garments made of materials bought wholesale on exceptionally favourable terms, including the instructive mothers,' babies' and children's outfits, besides all sorts of adult clothing, must have been of considerable value to the community as a whole, considering not only the exceptional needs of our own poor, but also those of the refugees for whom our country was responsible. All of these articles were given to the recipients and neither lent nor sold. In the process of making, while salvage of derelict workers went on and workers were saved from becoming derelict, numbers were taught for the first time how to handle a needle. The range of industries represented by the workers thus employed was very wide taking the whole country over, though here and there a single trade was predominant. In London workrooms at first charwomen, waitresses, hotel servants and casual workers were prominent, but, throughout, dressmakers predominated, tailoresses soon being mostly absorbed by military needs. In the Cradley Heath and Lye district a special combined workroom was opened by the Central Committee for nail and chain workers, who in the current year have been largely drafted into factories for war supplies In the Aberdeen workroom, where almost all were fish-girls, Miss Vines found that their employment was irregular and " depended on the fish." " The lightening of the cotton situation is, of course," says Miss Tracey, " affecting the workrooms in some districts, and a weaver invariably takes the first opportunity of returning to her mill though it be to run only one loom and that temporarily, though all gratefully acknowledge the boon that the workroom has been during the time of waiting." In various parts of the country it has been possible to close workrooms or combine two in one. The record of the high proportion of workers who after a short time in the workrooms passed back into their own or other industries (approximately 4,055 out of a total 8,963) is gratifying testimony to the effect of the principle of non-interference with ordinary channels of employment on which these special relief workrooms were based. Workers were, however, though compelled to register for fresh employment at local Labour Exchanges, not under compulsion to accept re-employment in ordinary industry on less favourable conditions as to conditions of work or pay than their previous experience and employment entitled them to expect, for it was necessary to protect them against becoming victims of sweated or otherwise undesirable employment. Special training in toy-making, chiefly wooden and soft toys and doll dressing, in various parts of England and in Scotland is referred to by several Inspectors as an interesting departure from the ordinary undertakings of the recognised relief workrooms ; in most of these a grant could not be obtained from the Queen's Fund as the products were chiefly sold. The girls were young and " seemed to be without exception delighted with the work, rapidly gaining skill in it." Other new industries taught were halter making and crochet button making.

The freshness and originality of the management and methods adopted generally in this new special class of workplaces lend comparison with those in the type of the majority of workplaces for which Section 5 of 1907 was specially devised. Some of these are now passing under the Board of Control, Mental Deficiency Act, the employees in them being morally unable to protect themselves. In many, however, the one thing needed is to fit the girls for ordinary life by industrial training combined with discipline, and one is ready to believe that application to their problems of the open air principles, of public control, access to sufficient funds, variety in methods of educational and technical training (instead of the sameness of money-earning laundry work), absence of too inquisitorial research into past personal character, non-residence in the workplace, might possibly lead to more fruitful results in them also, and incidentally in time might set free for ordinary industry some part of the 9,500 or more workers shut up in semi-conventual seclusion in Institutions.

In one of the Institutions in the Midlands Division in 1914—as in one in Scotland in 1913—it was necessary for the Home Office to withdraw all privileges conferred by Section 5, the infringements of the Act, regarding fencing, limewashing, hours of work and other matters, had been so persistent after instruction and caution. As *Miss Martindale* comments, " it is impossible not to feel surprise and certainly regret that such measures should be found necessary in a Home with the aims and objects of a Penitentiary for women." In the great majority of Homes under Section 5, however, there continues to be faithful observance of the Act.

Both before and since the war I have received a number of interesting special reports from various members of my staff which it is impossible to reproduce in this year's report,

but all of which are filed for future reference and some will have bearing on problems of future development and administration of the Acts. Several had special reference to administration of the Acts, and their effects comparatively in commercial and institutional laundries, and provided me with figures for my evidence given on behalf of the Board of Trade before the Select Committee of the House of Commons on extension to certain processes in laundries of the Trade Board Act in the month of July. Miss Whitworth at the same time gave evidence on technical questions relating to ironing machinery and fencing. Miss Meiklejohn during three months, May to July inclusive, was engaged on enquiry into employment and health of women at 300 Scottish herring stations in Stornoway, Castlebay, Orkney, Shetland and Wick; this was to supplement and complete the earlier work of Miss Squire and Mr. Williams, and bring into effective application the voluntary agreements made with the principal fishcurers for improved conditions of employment, and sanitation. In no other industry so far as I know was so complete an interruption brought about by the war in the midst of great prosperity as in the Herring industry, and the whole question of administration necessarily stands still. In the first four months of the year other important administrative questions, under the new Pottery Regulations, were the subject of a series of conferences with the Trade, at the Home Office first, and subsequently at Stoke-on-Trent. In these the question of weight carrying by young workers took a prominent place, and the enquiries of Miss Whitlock, M.B., in the potteries themselves, and her evidence were material on which discussion was largely based. The conference closed leaving the potters to formulate any statement they thought necessary for further consideration of the Home Office. Here the war again, bringing serious unemployment for a time, caused a delay in any action to test or enforce the Regulations in question.

Wages questions, particulars, truck.—In past years the only wages questions which could concern Factory Inspectors were those which are directly or indirectly governed by the provision for particulars to Pieceworkers in Section 116 and Orders thereunder, or by the Truck Acts. Enquiries into grievances possibly remediable in these ways naturally often covered wide ground, and sometimes material for action under the Trade Boards Act would appear, and be referred by our Department to the Board of Trade. In 1914 the enormous increase of inspections in premises where Government contracts are carried out has inevitably brought to the Inspectors facts and representations with regard to wages and effects of sub-contracting which similarly were bound to be referred to the Government Departments concerned. Large wage questions have also necessarily arisen, in investigating the grounds for allowing application for emergency overtime, whenever it was necessary to weigh : (*a*) how much overtime workers can stand without disastrous inroads on their strength, or (*b*) whether more outside labour can be brought in to increase output. And this because (*a*) extra output of energy necessarily depends at least in part on improved quality and increased quantity of food and (*b*) labour *cannot* flow into a locality without adequate lodging and sufficient wage to pay for such lodging. If the average wage of girls and women throughout has hitherto, for a week of 54 to 60 hours, been no more than 10s. a week, it is clear that in a time of rising prices of food, fuel and lodging, there is no general margin to meet the extra physical strain they have to had face. Supposing the extra ten hours represented by the frequent 70 hours a week, of emergency overtime to be remunerated at time and a half (and this was not always done) an average resultant wage of 12s. 6d. a week would certainly not correspond to a steady unflagging output of energy without injury to the workers concerned. Without any direct enquiry into wages, much information necessarily came to the Inspectors which shewed a wide and sometimes apparently arbitrary variation in rates of remuneration for similar kinds of work. Sometimes the women were making what seemed to themselves comparatively high weekly wages ranging from 15s. to 25s. and even 30s. (exceptional cases, a few even more). These were more than balanced by earnings which represented very low hourly rates, as low as 1½d. to 2d. an hour, even in comparatively skilled work such as worsted or asbestos weaving, or 2½d. in ammunition works. The ingenious method of an employer who paid the extra rate promised by him for emergency overtime on the total extra hours per week, not on the daily extra hours, went far to defeat the condition in the Orders that women should not be compelled to work overtime. Fatigued workers coming in late to work in the morning, after late evenings, lost at the end of the week, so much of the overtime rate, even though they had stayed all the overtime, and this tended to compel full attendance. The employer rectified this on the Inspector's pointing it out, but the case, taken with that disclosed to Miss Whitworth when she was taking evidence for a Particulars prosecution, illustrates a good deal of current opinion as to women's wages; she found that a worker who had not been given the Particulars due to her was paid for some work in the week of enquiry,

without notice of any kind, less than she had been paid in the previous week for the same kind of work. The foreman's explanation to the Inspector was: "What can one do when a girl is earning as much as 15s. a week but lower the piece-rate?"

So far as women's work is concerned in connection with national supplies the main question has not been, so far: "Are they getting an extra reward for extra labour commensurate with profits yielded by the industry," but, "Are they being adequately maintained in strength for the work that the nation needs from them?" When we remember further that any margin in excess of that desirable minimum goes practically wholly into family maintenance, we realise the national importance of good wages for industrial women.

Complaint made by a Local Representative Committee to the Home Office of "sweating" in the carrying out of certain Government contracts was investigated by Miss Squire and her staff, and similar questions arose in various parts of the country for enquiry in the late autumn and early winter. All evidently arose directly or indirectly from the combined effect of temporary relaxation of the prohibition of sub-contracting (apparently rendered necessary through the sudden overwhelming rush of contracts) and of the separate placing of contracts by numerous Territorial Associations in addition to those by the Government Departments. The complaints were well founded and sub-contracting was repeatedly found to the 3rd, 4th and even 5th degree, some of the small sub-contractors suffering nearly equally with the homeworkers to whom they gave the work, and great variations in price paid to outworkers for the same kind of article were discovered. Fortunately some outworkers in London, as well as other parts of the country, after trial refused any more work at the same price.

> *Miss Squire.*—A striking instance of this was some body belts for the troops which were received by a firm of blouse makers through a sub-contractor. The price offered was so low that the firm could not give them to their own inside workpeople and therefore gave them to outworkers in the East End. One after another these outworkers took back the work and refused to do it, the price paid being 8d. per dozen, providing their own cotton at 3¾d. a reel. The firm received 1s. 2d. a dozen, but had to pay for cutting, machining, carting and a percentage to the sub-contractor "for the introduction." This sub-contractor received 3s. 3d. a dozen for these belts, which he merely passed on to the blouse manufacturer.

In 1914 37 complaints were received of lack of particulars of prices to pieceworkers, 26 of which were verified, some being outside the Orders. Eight occupiers were prosecuted and convictions were obtained in 20 out of 23 cases taken into court; penalties imposed exclusive of costs averaged 19s. 1½d., a good record. The only cases dismissed were again in respect of lace outworkers in Nottingham, a regrettable matter, as these poor and dependent workers cannot be secure of getting the minimum wage due to them without a definite written contract as to the amount of work to be done at the given price. So far the Court still tends to regard written particulars, in the way that the contractors urge, as merely a technical matter. Still it is to be hoped that the Chairman's remark that the law "must be obeyed" will help in time towards its due observance. Miss Martindale says that some of the middlewomen have made valiant efforts to comply with the Order and one even declared that while it was at first a "harassment" she would now be "quite lone" without it.

Enquiry into need for extension of the Particulars Section to women core makers in foundries, rubber tyre and hose makers and tin canister makers were made. As usual it is found that in many cases the spirit of the requirement is complied with, but some outstanding cases of well-founded grievance give the workers a definite claim to extension of the Section. In one rubber hose factory there were 16 to 20 different diameters and prices, and the girls, who work in gangs, did not know how much they would get till the work was finished; they thought the prices sometimes were lowered and that they did not always get the same price for the same kind of work. Enquiry by Miss Squire into a complaint of a complicated system of deductions in a large tin canister works, where the girls also worked in gangs and alleged "overbookings" represented the difference between the girls' records for the work despatched, shewed the girls' great need of full particulars of work and wages. "The deductions were made for the convenience and advantage of the employer to adjust wages which he had taken no steps to compute or to enable the workers to compute."

The usual amount of work in connection with Truck Acts was carried through in the first seven months of 1914; 108 complaints were received and 81 cases verified. Seven cases were taken into Court against two occupiers and convictions obtained in all the cases. No special new points arose and indeed the whole case for revision of the law relating to Truck is so strong in previous Annual Reports that little more need be said in this year of other pressing problems relating to employment. Charges in connection with execution of Government contracts were duly investigated, and on the whole were found regular.

An interesting communication was made to Miss Slocock by the manager of a large weaving factory in Ireland. She found early in the year that 33 per cent. of the weavers were being fined for cloth faults, and after her visit the manager abolished all fines "as an experiment." Later he informed her that he found the experiment an unqualified success. "He did not wish his competitors to know, as he found it gave him an advantage in getting good weavers." Miss Slocock also obtained amelioration of conditions in many cases among very poorly paid outworkers whose wages average not more than 1d. an hour falling often to ½d. or even less. Certain cases investigated by her where an agent failed to pay and left the town owing a considerable sum to outworkers revealed a surprising state of mind in the outworkers that deserves mention. The firm that sent the work to the agent had already sent a representative to make enquiry into the matter, but he had been completely deceived through the action of the outworkers, who became frightened and tried to shield the agent. Miss Slocock found out that they had actually, "after being paid in the shop, returned the money through the back door in order that the agent could use the money over and over again." The firm was duly informed of the conduct of their agent and the deception that had been practiced when their representative investigated the matter.

Safety and Sanitation and Industrial Disease.—The work of investigating and preventing accidents due to known causes in the wearing apparel and laundry industries has proceeded without break or interruption through all the phases of 1914 as in previous years, and the fall in the total reportable to certifying surgeons for the United Kingdom is even more marked than usual: 701 in 1914, 766 in 1913, 780 in 1912, 818 in 1911. The separate figures for laundries are 353 in 1914 as compared with 384 in 1913, and for wearing apparel industries (exclusive of boots and shoes and hosiery) are 348 as compared with 382 in 1913. The reduction in the number of laundry accidents, satisfactory as it is, is very much what I hoped for. The control of fencing of dangerous machinery is increasing each year, and in the last five months of 1914 there must have been a considerable check in the natural growth of use of power driven machinery. The decrease in number of wearing apparel accidents seems more striking in view of the enormously increased activity and pressure of production in all kinds of military clothing from August to December; against this increase, however, stands the great extent of unemployment in many of the non-military wearing apparel industries. There may have been some falling off in completeness of reporting in the overpressed industries as regards minor accidents, the fall of just over 5 per cent. in reported needle puncture accidents suggests that this is a true explanation. On the other hand the severe accidents due to shafting, belts and pulleys has also dropped from 48 in 1913 to 22 in 1914; accidents due to band knives and guillotines have also fallen from 61 in 1913 to 43 in 1914. In both these groups of industries the incidence of accidents among girls under 18 years of age is too high: in wearing apparel industries 152 out of 348, and in laundries 96 out of the 353. The Senior Lady Inspectors investigated, personally or by members of their staffs, 401 accidents reportable to certifying surgeons (of which 239 were in laundries) and 100 (of which 21 were in laundries) reportable only to Inspectors. The South Eastern Division, including London, provides the largest proportion of accidents reportable to certifying surgeons, 274, of which 160 occurred in laundries, and the North Western Division, including Manchester, follows with 190, of which 133 occurred in wearing apparel factories. Contravention notices to occupiers on matters relating to safety numbered 1,342 for the United Kingdom.

Investigation of the accidents shows that in an increasing proportion, particularly in laundries, causation is due either to neglect to maintain fencing in good working order or to careless setting on of untrained, inexperienced workers to dangerous operations such as cleaning machines in motion. Lack of fencing is now rare, and the accidents due to unforeseen and unforeseeable causes are always relatively rare. Seventeen girls under 18 and 34 over 18 years suffered more or less severe injuries in laundries through cleaning or clothing indrawing heated rollers or straightening out articles as they were being fed into such rollers. One girl and one woman lost each an arm in hydro extractors covered but not fitted with automatic locking covers. One woman survived terrible injuries from overhead shafting, with which she came in contact only through too great readiness to open a ventilator by climbing on a machine bench. Seven accidents in laundries and six in wearing apparel factories proved fatal. Falls down a staircase or a lift well or otherwise, were prominent in the latter cases. In the former, septic developments of wounds and shock were prominent; in one case tetanus followed on an injury by a splinter entering a woman's hand while she was washing the floor. Another poor woman was scalded to death by her leg entering a tank of boiling water, a case similar to those reported

in the last two Annual Reports in connection with sumps. Neglect to maintain fencing on a Poland calender was the cause, in the Midlands Division, of two accidents, one following closely after the other. Prosecution followed under Section 136 and a penalty of £25 was imposed.

The table analysing causes of accidents in Laundries in 1914 and comparing their totals with those of four previous years follows :—

TABLE II.—LAUNDRY ACCIDENTS REPORTED TO CERTIFYING SURGEONS—CAUSATION.

Causation.	1910.	1911.	1912.	1913.	1914.	Total.
Indrawing hot rollers—						
Calenders and multiple roller ironers	45	80	52	65	51	293
Shirt and collar ironers	82	86	93	81	56	398
Body linen ironers	13	15	8	9	17	62
Indrawing cold rollers—						
Wringers and starchers	50	49	51	44	47	241
Traversing parts of machines—						
Box mangles	7	8	7	6	4	32
Shirt and collar machines...	8	17	17	20	30	92
Hydro extractors—						
Revolving cage	27	22	23	24	21	117
Gear and friction cones	—	2	3	—	6	11
Washing machines—						
Rotary cage	26	21	23	10	9	89
Lid and gear	6	8	6	10	13	43
Hoists	3	3	4	4	1	15
Engines, &c.—Flywheel	10	3	8	4	2	27
Mill gearing—Shafting, belts, pulleys, &c.	8	14	18	12	17	69
Other gearing—Accessory to machines	14	17	20	19	20	90
Miscellaneous—						
Scalds	34	45	46	40	35	200
Burns	4	4	6	14	11	39
Blows, falls, &c.	3	9	9	4	10	35
Fans	3	3	3	3	—	12
Other	9	6	3	15	3	36
Totals	352	412	400	384	353	1,901

Contravention notices issued to occupiers with regard to matters of sanitation numbered 1,674; of these, notices with regard to temperature numbered 438, cleanliness and limewashing 435, general ventilation 174, exhaust ventilation 61. Notification to Local Sanitary Authorities of defects remediable by them in workshops or factories numbered 1,329, of which the great majority related to defects in sanitary accommodation. I have received the full usual number of reports from my staff on valuable routine work, by persuasion as well as direct administrative action, in securing improved cleanliness, ventilation, reasonable temperature, basement lighting, lavatory, messroom and seating accommodation. Except in the cases of provision of messrooms and standard number of sanitary conveniences, questions are not, in 1914, raised that have not been already well illustrated in past Annual Reports. As regards sanitary conveniences the question has necessarily arisen as to the standard to be applied in relation to rapid temporary increase in numbers employed in factories engaged on war supplies, covering often more than double the ordinary numbers; the co-operation of Medical Officers of Health in settling the line to be followed has been specially sought, for rigid application of a numerical standard was in the circumstances generally inconvenient and in some cases impossible. An additional convenience for every additional 50 workers has been asked for as a provisional measure, and Sanitary Inspectors have been asked to visit frequently and report on cases where this proves in practice insufficient.

As regards provision of improved messroom accommodation much work has been done by all the Inspectors, and the systematic enquiry on this point at every inspection,

with resulting information recorded on each register card, yields me now for all the Divisions two years' extensive records as to progress made in the matter. Miss Squire continued also her joint enquiry with Dr. Legge and Miss Lindsay into dietaries and food values for the information of the Industrial Museum Committee, and well thought out action by various Philanthropic Societies has secured some slight increase in the number of restaurants for girl workers.

Miss Squire.—How greatly the army of industrial workers need a commissariat department to cater for them during their days of active service will perhaps be better realised now that the public attention has been riveted on the victualling of our soldiers in camp and at the front. If "an army fights on its stomach" is it not also true that a factory works on it? On the one hand the workers require the opportunity to buy good nourishing food and to eat it under good conditions, on the other the money to spend on a sufficient dinner—to illustrate these needs the following out of numerous examples are given. A large factory has since the war been filled to its utmost capacity, working long hours on uniforms—at a dinner hour visit I found in every room on six floors, 12 rooms in all, the workers were seated at their work-tables and sewing machines eating their mid-day meal. The stuffy rooms were for the time a restaurant, the smell of cooked vegetables and fish being added to the general smell of humanity and cloth. The manager was much concerned, and asked if nothing could be done; he said he had spoken about it to his Directors till he was tired and there was no available room for a mess-room, and the restaurants and eating-houses in the neighbourhood were overfull in the dinner hour already. The workers were making good wages on War Office contracts, the Factory Act secured them the hour's break, they were hungry, the Army needed all the work these girls could turn out at top speed, but for lack of opportunity unsuitable and insufficient food was eaten under the very worst conditions. Referring to the second point, that sufficient money to spend on food is required, is illustrated by the fact that at a large East End restaurant where the mid-day meal is served daily to a hundred workers from a neighbouring factory the Superintendent and her helpers had for years deplored the insufficiency of the dinner purchased by the young girls under 16. Meat and vegetables were purchased by the elder girls and women, but a little pudding and gravy or tea and bread and butter was all the younger ones could afford. The ladies felt that these needed it as much as their elders, and could scarcely refrain from supplying more than was paid for. One day soon after war broke out there was such a run on meat and vegetable dinners that the supply was not equal that day to the demand—all the young girls were asking to be served with them. The cause was that the wages had that day been raised voluntarily by the occupier to the proposed Trade Board rate, and the effect was immediate, and has continued. This fact is a striking answer to those who cling to the theory that an increase in wages is of no substantial value to a girl.

The novel institution of night shifts for women is another outcome of war which has directly led in the factories working by night shifts to improved conditions and facilities for partaking of food. The Home Office in granting Orders for night work expressly laid down the condition that suitable provision shall be made for mess room facilities. In some cases good and substantial arrangements have been made, even dining and cook rooms built and fitted up, in all visited some provision more or less sufficient has now been made for workers to heat and partake of a meal in the course of the night on the factory premises. These arrangements will remain available, and I hope help to spread the good custom of taking thought for sustenance of the worker after the immediate cause has passed away.

Ventilation and temperature problems have been important and absorbing in 1914, but as work in connection with them is still in progress, *e.g.* exhaust ventilation in Irish flax scutch mills, high temperatures in woolcombing sheds, reporting upon them may be postponed until next year. A very useful joint conference, which I attended, was held between representatives of the Factory Department and the Irish Board of Agriculture and Technical Instruction in Belfast on methods of ventilating the scattered small Irish scutch mills intimately connected with agricultural industry. Problems of ventilation in clothing factories, both general and exhaust for dust and fumes were also very usefully included in the programme of the sixth annual conference of the National Association for Prevention of Tuberculosis which took place at the University of Leeds in July. Miss Sadler and Dr. Collis joined in reading papers on various aspects of these problems as they present themselves to the Factory Department. Their significance for Leeds and district is great, for not less than 28,000 women and 12,000 men are there employed in clothing factories, and the existing means of ventilation are, Miss Sadler observes, still mainly of an old-fashioned kind.

Anthrax and lead poisoning were the principal reported cases of industrial disease affecting women which were referred for investigation by members of my staff. Six cases of anthrax among those so referred affected workers employed in various factories, chiefly worsted spinning, in addition to one affecting an outworker engaged in brush making; two further cases affected women who were not themselves employed in industry, one being the wife of a tanner employed in a factory. The one fatal anthrax case was in a woman employed in mending sacks in which bone dust had been conveyed from India to a factory in Aberdeen. A public enquiry followed, and the jury found that the woman had died of anthrax contracted accidently. No one in the factory, as I had found by personal enquiry before the public enquiry was instituted, had realised the possibility

that she might be exposed to risk, as she was not at work in the part of the factory where bone dust was stored or handled, and it was only through the facts coming to the knowledge of the Medical Officer of Health that this case was reported as one of anthrax to the Chief Inspector of Factories. In the case of the out-worker affected the Regulations for brush making did not apply, and this fact came out at a prosecution by Miss Squire for breach of the Regulations at the factory from which the work was given out. The prosecution actually occurred in 1915.

Twenty-seven cases of lead poisoning among those referred to Senior Lady Inspectors for investigation were confirmed, of which eight occurred among women employed in china and earthenware works, 4 among women employed in file making, 2 in white lead works; 3 among women engaged in soldering and 3 among women engaged in common tinning; 3 in use of paints in various industries; 2 among women engaged in japanning (one a scourer), and the remainder one each in vitreous enamelling and moulding of lead seals.

Other cases of industrial disease or illness which have come under our consideration or enquiry in 1914 are: occupational dermatitis or trade eczema in enamel dipping and chocolate workers, illness due to escape of fumes of suction gas in a clothing factory from pressing irons, a fatal case in a girl employed in a glass polishing shop where she was exposed to fumes of hydrofluoric acid and a fatal case soon followed by others in 1915 of jaundice in a girl exposed to fumes of tetrachloride of ethane in aeroplane making (see Chapter XII).

The most marked change in 1914 is the decrease in number and severity of cases of lead poisoning in earthenware and china works. Miss Martindale, who has the majority of potteries in her Division, suggests that the causes of the decrease may be seen in (*a*) the improved standards of exhaust ventilation, cleanliness and reduction of hours in lead processes effected by the new Pottery Regulations; (*b*) the lessened orders and output due to the war; (*c*) the effect of the National Health Insurance Act which enables women suffering from ill-health to obtain treatment and rest at an early stage. Careful observance of the new Regulations was stimulated by the large amount of detailed, careful work of routine inspection and instruction done by Miss Whitlock, M.B., in the first few months of the year. This work culminated in a serious of prosecutions for numerous contraventions, convictions were obtained in all the cases and heavy penalties imposed. Miss Martindale supplies me with a detailed examination of the methods and effect of the potters' self-inspection which so far has not proved very satisfactory or intelligent. The conditions being abnormal in 1914, I propose to revert to this subject in a later annual report.

A case of lead poisoning which occurred in a trunk works where terne plates were used for the trunks is of special interest:—

> *Miss Martindale.*—The occupier of these works contended that the woman could not have come into contact with lead in his workshop. A sample, however, of the sandpaper used in rubbing down terne coated plates was taken and analysed, with the result that lead equal to ·03 grains metallic lead per 10 square inches of the used portion of the surface of the paper was found in the sample. This case was a sad one, as the woman was wretchedly poor, her wages after employment of five years in the workshop averaging 8s. a week. Her employers disclaimed any responsibility in this matter, and until the case was taken to the County Court in June, she did not receive any compensation, although she had been incapacitated since March.
>
> In the tinning works from which three cases of lead poisoning were reported the special regulations were well enforced, and the causation of the illness was probably due to a temporary breakdown of the exhaust draught attributable to contrary winds.

More than the usual large amount of attention has been given by the Inspectors to limiting heavy, overstraining work and weights, especially of very young workers. Following on systematic enquiries in the Potteries, Miss Martindale collected information as to standards applied in Birmingham under the Employment of Children Act. There she found that 278 prosecutions had been taken by the local authority for contraventions, after leaflets setting out the requirements of the Act had been widely scattered.

Summary of Administration including Prosecutions.—The normal methods of administering the Acts proceeded with increased activity during the first seven months of the year, but, during the sudden check to manufacturing industry in August and part of September, a pause in all activity except that of sympathetic inspection followed, and during the last 3½ months of the year the main energy of the staff of women Inspectors was absorbed in warning and advisory work in connection with exemptions under Section 150 of 1901.

Effective visits to places under the Acts numbered 13,995 as compared with 11,370 in 1913 and 9,205 in 1912. Factories visited were 8,768, workshops 4,657, other places under the Acts 570. Further, there were 2,989 visits to places not under the Acts. Under each heading there was an increased number of visits. Attendances at Courts of Summary Jurisdiction numbered 217, and at inquests 5. Interviews at office increased to 807 from 540 the previous year. Accident reports for investigation affecting women and girls in laundries and wearing apparel industries numbered 792, and industrial

poisoning reports 49. Contravention notices to occupiers, as distinct from correspondence, numbered 7,412, being less than those sent out in 1913, but more than in 1912.

Prosecutions were taken against 88 occupiers with 226 cases as compared with 142 occupiers and 373 cases in 1913 (69 occupiers 178 cases in 1912). Among these were a considerable number of important cases, on one of which appeal was made to the Justiciary Court in Edinburgh. The average penalty imposed, reckoned on convictions, rose to 25s. 9d., above any we have recorded since 1903 and 1904. The Midlands Division was specially active early in 1914, laying 50 informations against 21 firms, the penalties amounting to £73 13s., the most important cases being under the new Potteries Regulations, and for failure to fence dangerous machinery in laundries; one of these latter includes a penalty of £25 under the penal section 136. In Lancashire a case for allowing a young person of 15 to clean the heated roller of a collar polisher causing serious injury to the girl, resulted in a small, inadequate penalty, and the chairman caused considerable astonishment by expressing the view that the girl, expressly protected by the section which places the responsibility on the occupier for preventing such employment, "had brought about her own punishment." A very different view was taken by a Bench in the Eastern Counties of an employer's responsibility in a case of systematic employment of young girls at night in their homes with the knowledge of the firm. It was proved that at the close of the day in the factory girls were given lancer feathers to knot at home, work which kept one girl busy from 7 p.m. to 1 a.m., and from 5 a.m. until she returned to the factory, her weekly wage being 4s. The Magistrate declared the case to be as bad as it could be, and imposed the maximum penalty.

CHAPTER V.

EMERGENCY OVERTIME.*

By G. BELLHOUSE, *H.M. Superintendent Inspector of Factories.*

Under Section 150 of the Act of 1901 power is given to the Secretary of State, in case of any public emergency, to exempt from the Act, by Order, to the extent and during the period named by him, any factory or workshop in respect of work which is being done on behalf of the Crown, and with the outbreak of war questions immediately arose as to what amount of latitude ought to be sanctioned. In the earlier stages the situation presented many difficulties. The number of trades affected was unexpectedly great, extending from big guns to boot nails, from blankets to tapes, from motor wagons to cigarettes. Not only was there extreme pressure in factories engaged in the manufacture of the ordinary munitions of war, untold quantities of clothing of all kinds were required; there was an instant demand for camp equipment, leather and canvas equipment, electrical appliances, scientific instruments of various kinds, surgical dressings, articles of food, ration tins, and for all the minor accessories used in the making of these various articles. The problem at once arose, how was the situation to be met? On the one hand unrestricted overtime was clearly impossible; it could only result in a serious breakdown of labour; on the other hand the greatest possible output was required to satisfy the country's needs. Where was the line to be drawn? Again there was the spectre of unemployment looming in the background. Was it right that one set of operatives should be working excessive hours, while others were without work at all? Could not orders be more widely spread? Was it not possible to encourage the transfer of workers from trades adversely affected, and by thus increasing the supply of labour, reduce the need for overtime?

Such then were the problems in August, 1914. They were far reaching and complex; there were few precedents to serve as guides to their solution, for never had the pressure been so great. A full and complete answer could hardly be found at once, and the expedient was adopted therefore of granting temporary orders for short periods, after the merits of each individual case had been investigated. The Orders allowed twelve-hour or eight-hour shifts, or alternatively, overtime amounting to a maximum of two hours a day on not more than five days a week, but, save in exceptional cases, no extra hours on Saturday, and no Sunday employment. Additional meal times were required when overtime was worked, and a provision was included that it was not to be a condition of the workers' employment that he or she should work overtime. Orders were usually granted for one month, and were accompanied by letters urging contractors to meet the emergency by taking on extra hands and by increasing plant, rather than by overtime employment. In this way opportunity was afforded for enquiring into the actual needs of different trades, and of framing general schemes applicable to all in the same industry.

But the whole position rapidly underwent a complete change. Orders for the British Government and for the Allies continued to be placed in ever increasing quantities, and applications for latitude poured in from all parts of the country. It was soon evident that all available machinery was being brought into use, and the fears of unequal distribution of work disappeared. The labour problem changed its aspect; there was no longer danger of unemployment, the difficulty soon became one of how to get adequate supplies of workers. The sole problem now was to determine what the need of the different branches of industry were, what amount of overtime could properly be worked in each, and what scale of hours was likely to give the largest amount of production.

The earliest trade to be affected, apart from the regular munition factories, was the woollen trade. Khaki cloth, flannel and blankets were required immediately for the large body of men who flocked to the recruiting offices. At the beginning, only those comparatively few mills which were accustomed to this class of trade were affected, but the pressure rapidly spread throughout the West Riding district and extended to Scotland, the West of England and all parts of the United Kingdom. Almost simultaneously huge demands were made upon the hosiery factories, and applications for extensive overtime arrived not only from the recognised hosiery districts of Leicester and Hawick, but from practically every hosiery factory, large and small, in the country. As the supply of cloth increased, pressure spread to the clothing trades; huge contracts were placed and were gradually distributed. In the boot trade pressure was first felt in Northampton and

*Since this was written it has been found possible in some industries, *e.g.*, wool, clothing, boots, to reduce the overtime still further or even discontinue it.

District, but quickly spread to other recognised boot centres such as Bristol, Leeds and the south of Scotland, until all the available machinery suitable for the making of heavy boots had been brought into use. There were indeed many instances where machinery and plant not normally suitable was converted and adapted, and works in Leicester, where the normal trade is chiefly limited to ladies' boots, may be specially mentioned in this connection.

Concurrently with these developments in the clothing trades, pressure was increasing in numerous other trades. Surgical dressings were imperatively required and the number of factories where they were made was few; kit-bags were needed for the new army, so also were haversacks and other canvas equipment; there was an urgent call for rations for the expeditionary force and for tins to pack them in; tobacco was wanted for men in the trenches. But in order that the position may be more clearly understood it will be convenient to insert here a table showing as regards the period August 4th to February 19th, the industries in which Orders were granted and the number of firms affected, and then to give some account of the action that has been taken in the more important industries:—

Industry.	Firms affected.	Industry.	Firms affected.
Textile—		Clothing—	
Wool (*a*)	748	Uniforms	514
Hosiery	231	Fur coats	9
Cotton (*b*)	159	Boots	245
Flax	28	Caps	28
Hemp and jute	29	Shirts	73
Silk	8	Bedding	33
Dyeing and finishing	37	Surgical dressings	21
Leather and leather equipment	105	Tobacco	10
Canvas equipment	137	Food	37
Munitions of war (*c*)	151	Tin boxes	37
Shipbuilding and repairing	15	Camp equipment	52
Electrical supply	35	Wire and wire netting	34
Metal accessories (*d*)	141	Transport (wagons, &c.)	34
Machinery	57	Rubber	16
Wood	44	Miscellaneous	73

(*a*) Includes yarn, flannel, woollen cloth and blankets.
(*b*) Includes small ware (braid, tapes, &c.).
(*c*) Includes explosives, ammunition, shells, mines, grenades, ordnance, and aircraft.
(*d*) Includes buckles, spurs, bits, horse-shoes, nuts and bolts.

In the earlier cases different scales of employment were proposed in almost every application and it now became necessary to take steps to establish uniformity of latitude to all firms engaged in the same class of work. In the woollen and worsted and boot trades, in both of which the demands put forward had been on a very varying scale, formal conferences were held with representatives of the workers and of the employers, and some special account of the proceedings may be given.

In the *woollen and worsted industry* the first conference was held with representatives from the West Riding of Yorkshire. All sections of the trade were affected; immediate supplies of flannel, khaki, blue serge, overcoats, and blankets were urgently needed, and every mill in the district was rapidly fully employed. Demands for overtime on a very extensive scale were put forward, many firms asking to be allowed to work each day from 6 a.m. to 9 p.m., and from 6 to 6 on Saturdays.

The first point to be considered was whether the situation could not be met by working on a shift system, but this was found to be wholly impracticable for there was no supply of labour available. The bringing in of old married weavers who had left the trade was not regarded by anyone as a practical solution of the difficulty, for all who wanted work had already been pressed into service. Similarly the idea of importing cotton weavers from Lancashire was equally objected to, for they could be of no service without a long period of training which it would be impossible to give under the existing conditions. There was also a further difficulty arising from shortage of machinery in certain departments. Even if hands could be obtained the available spinning machinery would not provide sufficient yarn for the looms to run night and day, nor would there be sufficient milling and finishing machinery to deal with the cloth produced. It became evident, therefore, that overtime was the only practical remedy, and discussion turned upon what

limits should be imposed. The long hours that had been proposed were admitted to be altogether unreasonable, but eventually it was agreed that a period of 6 a.m. to 8 p.m. from Monday to Friday with two hours off for meals, and from 6 to 2 on Saturdays with one hour off for meals would meet requirements, and Orders on these lines were issued throughout the Yorkshire area. A provision was also inserted modifying the requirement that work shall not be continued for more than 4½ hours without an interval for a meal. Many occupiers said they would not work after 7 p.m., provided they did not have to give the full half hour for tea, but might allow what was known as a "snatch" tea-time. There were obvious advantages in the workers being able to leave at seven o'clock instead of eight and the proposal had the approval of the workers' representatives. This Order applied to women and young persons over 16 years of age, and in spinning (where the nature of the work renders it necessary to employ young persons between 14 and 16 as doffers and piecers) and in certain other special cases to young persons of 14 years and upwards, and was made available for two months.

In other parts of the country similar hours were allowed, though with certain variations, to meet the needs of local circumstances.

At the end of two months the whole situation was reviewed, and further conferences were held both in Yorkshire and in Scotland. There was still the same need for overtime, but the fact that production had been gradually falling off suggested that some reduction of hours ought to take place. A number of firms both in Yorkshire and in Scotland had already found it necessary to reduce their hours, and the workers' representatives in Yorkshire were strongly in favour of reduction. Consideration was also given to the possibility of arranging a uniform scale of hours for all works; opinions were divided on this point, but local conditions made fixed hours for all factories undesirable. In some districts it was preferred to work till 9 o'clock on three days a week with two and a half hours for meals, while in others, where for instance the workers have to walk a long distance to the mill, one or one and a half hours' overtime without tea-time was preferred. The only way to secure uniformity was to make an Order in a general form, and it was suggested that the best arrangement to meet the needs of different districts was to fix a weekly limit of overtime and to allow as much latitude as possible in its distribution over the week.

This was the course adopted, and a General Order was issued applicable to all woollen mills in which 75 per cent. of the work was work done for the Crown, which allowed overtime not exceeding 9 hours per week (exclusive of meal-times) to be worked on the system either of two hours per day on not more than 4 weekdays other than Saturday and one hour on Saturday, or of one and a half hours per day from Monday to Friday and one hour on Saturday. This Order proved generally acceptable and has since been universally adopted.

Boots.—In many cases the periods of employment for which sanction was sought were beyond all reason, and the claims had evidently been put forward without proper consideration as to what was physically possible, or as to what the results of excessive hours might be in relation to production. At the conferences, however, it was generally recognised that, as the work consists largely of manual labour of a rather heavy character, little advantage is to be gained from long spells of overtime which only result in undue fatigue. On the other hand abundant evidence was put forward that some amount of overtime was essential, first on account of the urgent demands of the War Office, and secondly because the change of trade from ordinary to army work had upset the balance of departments necessitated some elasticity of hours to enable one department to keep up full supplies for the next. The normal week's work in the boot trade (by agreement with the Union) is 52½ hours, and is thus considerably below the maximum permitted by the Acts. After some discussion, during which different totals of hours were suggested for different departments, it was agreed that a weekly total of 60 hours (exclusive of meal-times) would meet all requirements, if this limit were accompanied by certain provisions allowing some elasticity in the arrangement of the daily hours of work. A General Order was issued on these lines, subject to the conditions that work should not commence before 6 a.m. or be continued after 8 p.m., and that there should be no overtime on Saturdays and no Sunday employment. Approval was also given to a system of working from 7 a.m. to 7 p.m. with one hour for dinner in the middle of the day only, and a short break in the morning and afternoon. It had been adopted in a number of factories and was found to be appreciated by the workers.

Having thus set up a general standard for the Northamptonshire area, steps were taken to bring factories in other parts of the country into line. Eventually general agreement was reached and the Order was accepted by and proved satisfactory to the trade as a whole.

In the *hosiery trade* a general working agreement was arrived at as a result of consultations with representative employers. In the first instance conferences were held between Mr. Seymour, the District Inspector, and representatives of the trade in Leicester and District, when it was agreed that the pressure in the industry could be met if an exemption were granted authorising a 13 hour period of employment on week-days other than Saturday, with intervals for meals amounting to not less than one and a half hours, and including also provisions allowing a five hour spell and a reduction of the tea interval to quarter of an hour when only a 12 hour period of employment was worked. A General Order was accordingly issued and made applicable, in the first instance, to Leicester and District only, but steps were taken later to apply similar provisions to factories in other parts of the Country. As a result of further negotiations, during which consideration had to be given to local requirements and to difficulties in certain districts of separating Government from private work, an Order applicable to the whole Country was evolved. This was applied to works in which (*a*) 50 per cent. or more of the output of hosiery was for the Crown, or (*b*) 75 per cent. or more of the coarse gauge frames (*i.e.*, frames suitable for work for the forces) were in use exclusively for such work. In these overtime was allowed to the extent of one and a half hours on four days a week, or one hour a day on five days a week, with intervals of one and a half hours for meals; but provisions were also included under which, if two hours were allowed for meals, the hours of work might be prolonged by half an hour, or if two and a half hours were allowed by an additional hour, and a further one, to meet the convenience of occupiers and workers, allowing the tea-time to be reduced to a quarter of an hour on days when no overtime was worked.

In other trades the experience gained during the first few weeks made it possible to frame orders on general lines also for other industries. Thus in the Clothing Trade (dealt with a greater length in Chapter IV) the Orders allowed either two hours' overtime less an extra half hour for a meal on not more than three days a week other than Saturday, or one hour's overtime on five days a week. In capmaking overtime was limited to one hour, and in leather equipment to one and a half hours on each week-day other than Saturday, while in tin box and canister making, a trade in which there was in the earlier stages very pressing demand for latitude, it became possible to reduce the overtime to one hour on any three week-days other than Saturday.

Overtime in the manufacture of *surgical dressings* was very generally required at the beginning of the war, both in the manufacture of materials (wool and cloth) from which the dressings are made, and in the making up of the actual bandages and dressings. In the former portion the overtime asked for did not amount to more than two hours a day, but in the latter longer hours were required by certain firms and included day and night shifts, extended day shifts, lengthy overtime, and Saturday and Sunday work. These hours caused a very natural anxiety, for not only were they excessive in themselves, but it was felt that if so much overtime was required when a comparatively small force was at the front, even more extended latitude might be asked for as the size of the expeditionary force increased. A special enquiry was therefore undertaken by Mr. Graves (Deputy Chief Inspector) who visited all the works in the country. The results of his enquiry were eminently satisfactory, for it was found that ample provision was being made by large extensions of buildings and plant to meet increased requirements, and as these came into use the need for overtime disappeared and the orders have not had to be renewed.

Having dealt with what are in a sense the minor industries first, it is necessary now to turn to the *munitions trade*, and under this heading may be included not only the actual manufacture of powder, shot, and shell, but accessories such as metal equipment, electrical apparatus, and transport, which form a necessary part of the outfit of an army. It will be readily understood that nowhere was the emergency more keenly felt than in the large armament works, subject as they were to sudden and urgent demands from both the Admiralty and the War Office, and to difficulties in obtaining adequate supplies of labour, while it was of the utmost importance that the greatest possible output should be secured. It had to be recognised at once therefore that latitude on a very wide scale must be permitted. Orders were granted allowing employment on day and night shifts, and also extended overtime both on week-days and on Saturdays and Sundays, and the permission thus granted extended to boys of 14 years of age and upwards, as well as to women and girls over 16.

While it has been necessary thus to allow wide latitude in the large munition works, on which the chief brunt of the pressure has fallen, it has been possible to impose closer limits on smaller works and on most of those where metal equipment and accessories, electrical apparatus, and transport wagons and fittings are made. When the whole situation came to be reviewed after some six months of experience it was found practicable to frame a General Order to cover the great majority of these firms, leaving only the larger

works and certain exceptional cases to be separately considered. Under this order four alternative schemes of work are allowed as follows :—

(*a*) Overtime not exceeding 7½ hours per week, exclusive of meals, subject to the conditions that the period of employment (inclusive of overtime and meal-times) shall not exceed 14 on any day other than Saturday or 12 hours on Saturday, and that an additional interval of half an hour shall be allowed for meals for every two hours worked on any day beyond the statutory period.

Under this scheme women and male young persons over 16 may be employed, but the former only if employed in processes incidental to the making of ammunition or engines of war, or in the manufacture of special machinery or tools required for the purposes of any such process.

(*b*) Overtime not exceeding five hours a week (exclusive of meal-times) subject to the same conditions as in (*a*).

(*c*) Three shifts of eight hours each, subject to the conditions that half an hour shall be allowed for a meal in each shift and that every worker shall have an interval of 16 hours between each two shifts of employment.

(*d*) Two shifts of 12 hours each, subject to conditions as to number of turns that may be worked each week, change of shifts, meal hours, and arrangements for cooking and supervision of workers at night.

Under schemes *b*, *c* and *d*, women and female young persons over 14 may be employed, except that no female young person and no male young person under 16 may be employed under scheme *d* in the night shift. In no case may a woman or young person be employed under any of these schemes on a Sunday, except in the case of a night shift commencing on Sunday evening or ending on Sunday morning.

A consideration of this subject would hardly be complete without some attempt to examine the effects of this long spell of overtime upon the health of the workers and upon production. As regards health it is perhaps too soon to arrive at definite conclusions. There is a noticeable absence in all the reports from the Inspectors of any evidence of increased sickness, indeed there have been occasional statements that the claims on sick funds have been below the normal, and in particular one large firm of munition makers employing nearly 20,000 hands, who keep careful records of time lost through sickness and accidents, reported that a comparison between the return of the autumn and winter months of 1913 and 1914 respectively show a lower sickness rate for the latter year. On the other hand there is again evidence that in many cases it was found necessary to reduce overtime in various trades because of the strain imposed on the workers by long spells of extra hours. Looking at the question as a whole, it is probably safe to say that, whatever may be the future effects of so prolonged a strain, there is at present no sign that workers have been injuriously affected. There can be little doubt that the knowledge that they were taking an active share in the struggle in which the country is engaged, and the feeling that they were thus "doing their bit," has enabled workers to carry on under conditions that in normal times would be insupportable. Employers too, in almost every case, have used their overtime in a restrained and reasonable way and often provided free teas and refreshments for their workers. It has been a remarkable feature of this period of stress that there has been almost an entire absence of complaints, and but few cases where the hours were so unreasonable that prosecution became necessary.

The effects of continued overtime on production are so intimately connected with those bearing on the health of the workers that a separate analysis of this side of the question is almost uncalled for ; yet the period under review has not been without its lessons. Though it has been found impracticable to give the results statistically, since the variations in work from week to week make comparisons most difficult, instances have repeatedly come to light where it has been found that production has gradually fallen away when long spells of overtime have been worked. Thus in the woollen trade it was found advisable, after overtime had been worked from Monday to Friday each week for nearly three months, to knock it off on one day in the middle of the week ; in some of the largest ordnance factories where work has been going on day and night for seven days a week, it has been found desirable if not to abolish Sunday work, at least to reduce it to a minimum. "The men get stale," it is said, "and their tempers are upset." Again a remarkable instance is afforded by the clothing trade. When the pressure first arose it was noticeable that whereas no applications for latitude were received at all from some of the largest manufacturers, others desired to work overtime for two hours every evening of the week. Amongst the former were some of the most

experienced in the trade, who believed they could obtain a maximum of output by working within the limits of the ordinary statutory hours. The others commenced their overtime but quickly learned that they had over-estimated the capacity of their workers and readily agreed to material reduction of their Orders. And so too, in other trades, there has been noticeable a general tendency to reduce the overtime. The whole experience of these last months leads unquestionably to the conclusion that while long and even excessive hours can be worked with advantage for short periods, continued overtime, if not kept within proper limits, soon fails in its object and ceases to aid production. The limits may vary in different industries, according as the work is arduous or light; to adapt the hours to the conditions and requirements of the different industries has been the responsible but most interesting work of the Factory Department since the war began.

CHAPTER VI.

REGULATIONS: COTTON CLOTH FACTORIES.

By J. JACKSON, *H.M. Superintending Inspector of Factories.*

The first legislation passed to deal with excessive humidity in cotton cloth factories was the "Cotton Cloth Factories Act, 1889." This Act was amended and embodied in the Factory and Workshop Act of 1901, and, in consequence of the recommendations made by the Departmental Committee on the Humidity and Ventilation in cotton weaving sheds, the sections relating to cotton cloth factories were repealed by the Factory and Workshop Act of 1911, and power given to the Secretary of State to make regulations dealing with this trade. These Regulations which were issued on 21st December, 1911, and came into force on 1st April, 1912, deal with both humid sheds (those in which humidity is artificially produced) and dry ones (those in which no artificial humidity is produced).

The use of artificial humidity varies greatly in different towns, even in those in which the kind of cloth woven is not of so different a character as to be an explanation of this diversity of practice. Mr. Crabtree pointed out that in his district (Burnley) nearly every shed in the towns of Accrington and Padiham is humidified, but that little is used in Burnley and still less in Nelson and Colne.

Artificial humidity, locally known as "steaming," is produced in most sheds by one of three methods, viz.: by the introduction (1) of live steam, (2) of currents of steam and air (mixed), and (3) of atomised water. The use of atomised water is the most modern of these methods, and the Inspectors agree it is superior to the other two. Dealing with places where steam jets (live steam) are used, Mr. Joseph Law (Blackburn) says:—

> In these sheds the difference between the wet and dry bulb readings varies from 2·5° to 5°, and it has been noted that the lower the pressure of steam used, the greater is the difference between the readings, and the more comfortable are the working conditions. In one shed where the pressure of steam was limited to 30 lbs. per square inch, the difference between the wet and dry bulb readings averaged 5°, and there was no discomfort felt, but in other sheds, where higher steam pressures are used, the average difference was only 2·5° to 3·5°, and a sensation was experienced as though a weight were pressing on one's head.

The following table has been compiled (on the same lines as the one published in last year's report) from the returns that have been furnished.

System of humidifying.	Number of samples taken.	Average outside temperature. (Dry bulb.)	Average inside temperature. (Dry bulb.)	Average wet bulb reading.	Average CO_2 per 10,000 of air.
(1)	(2)	(3)	(4)	(5)	(6)
1. Steam jets	89	51·4	71·3	65·0	8·1
2. Steam and air by diffusion ducts	42	50·8	72·4	65·7	7·3
3. Atomised water ...	41	53·7	72·2	66·4	8·3

From the table it will be seen that by the use of atomised water the shed temperature is kept nearer to that of the outside air than when either of the other systems are used, but it is surprising to find that the CO_2 content is higher in the former case.

Of the two inventions for humidifying the warps while on the looms (localised humidification), referred to in last year's report, one of them does not appear to have passed beyond the experimental stage; the other has been used on and off during the whole year. As in all new appliances some defects have been found in working it, but these do not present insuperable difficulties, and the manufacturer in whose works the plant is fixed is confident of its ultimate success.

No complaint that the *water used for humidifying* did not conform to the standard required by the Regulations has been substantiated. In atomised water plants town's water is always used, and its use for other systems is increasing.

Neglect to affix standard *hygrometers* led to one firm being prosecuted, which quickly brought into line others who had been dilatory in this respect, and the Inspector reports that they are now in use in every shed in his district, but he finds that if a thermometer has been accidentally broken it is often replaced by one which does not comply with the Order. It appears to be the general practice to have the humidity schedule attached to the hygrometer stand so that it can be easily seen by anyone when reading the instrument. The humidity records are still used in many places, and the readings entered up on them, although not required by the Regulations. The joint reading of hygrometers by the representative of the occupier and of the workers has proved a complete failure, and is not carried out satisfactorily in any district. The absence of remuneration for the time spent by the workers' representative in doing so, and the legal responsibility which certified entries in the register might involve, if they disclosed a breach of the Regulations, are the principal reasons given for this want of co-operation.

Complaints of low *temperatures* come chiefly from workers in tenement factories, where the steam supply is under the control of the tenement owner: both Mr. Crabtree (Burnley) and Mr. McCaghey (Keighley) refer to such cases in their reports. In the cold weather complaints of draughts are not infrequent; these arise generally through badly placed fans or other ventilators, and Mr. Joseph Law (Blackburn) finds that the fixing of heating coils in the air inlets does not stop the complaints, but that the best remedy is to put up screens to deviate the air currents.

The certificates given for the efficiency of *pipe covering* are often loosely worded and do not clearly show that the pipes have been covered with material which has been tested and approved. A clear and concisely worded certificate has been insisted upon, as, in other cases, investigation has shown that untested material had been used although a certificate for the covering had been given. Where properly certified material has been used the results have been satisfactory.

Owing to *new sheds* having been erected in contravention of the requirement of Regulation 7, the Chief Inspector gave instructions that letters should be sent to the Surveyors of the residential towns of the Inspectors in the North Western Division suggesting that, before plans for new factories were passed by the Local Authority, a conference with the District Inspector might be of service in preventing approval being given for plans of buildings which, if erected, would contravene the requirements of the Acts or Regulations. The result was most gratifying, the proposal was welcomed in every instance, and cases were at once discovered where, but for the co-operation of the Deparment, unsatisfactory plans would have been approved. Mill architects now not infrequently seek our help before submitting their plans.

The observance of the requirement to *whitewash the roof* and roof windows, during the summer months, varies greatly in different districts. Mr. Joseph Law reports that in the Blackburn District it is properly carried out, but both Mr. Crabtree (Burnley) and Mr. McCaghey (Keighley) complain of the irregular way in which it is done in their respective areas. Mr. McCaghey found that its observance was worst amongst occupiers of tenement factories and that in some cases the work done did not tally with the entries that had been made in the General Register. Neglect to whitewash the slates and whitewashing the outside, instead of the inside, of the windows are the chief irregularities reported. As in former years latitude has been allowed (under certain conditions as to temperature) to Oldham velvet sheds, sheds where dark coloured cloth is woven or where jacquard looms are used, and to dry sheds in Scotland. No complaint of excessive temperature has been received from the operatives in any of the sheds to which latitude has been allowed, and in each case their wishes were consulted before it was granted. Mr. Younger (Halifax) confirms this in respect to four sheds in his district where a similar concession has been made.

Judged by the CO_2 content, the air samples obtained show very satisfactory results, and that the *purity of the air* is well maintained. Several of the samples obtained in humid sheds showed 2 or less parts of CO_2 in excess of that in the outside air, and, as will be seen from the table already given, the average was only 7·9 per 10,000 of air. The samples taken in dry sheds gave a much higher percentage, in one case as much as 20·3 parts per 10,000. Air samples taken when investigating complaints of impure air or of bad ventilation often gave quite satisfactory results upon analysis, and Mr. Crabtree (Burnley) suggests that the cause of complaint is stagnant air and not excess of CO_2. As a remedy for this he suggests that agitators in the shape of flat boards (about 14″ wide and 10″ long) should be fitted to the overhead shafting, so that the air is made to circulate by their revolutions. This plan has been successfully tried in three sheds in his district.

The *cloakroom* accommodation provided does not appear to be used; upon this all the Inspectors' reports are unanimous, and it would appear to apply equally to sheds where the accommodation is of the best type, and to those where it is only sufficient to meet the minimum requirements of the Regulations.

The reports received from all Inspectors in whose districts there are cotton cloth factories state that the Regulations are on the whole well complied with, but that any comparison with the previous year is misleading as so many sheds were closed or on short-time during the last six months of the year.

The suggestions made by the Departmental Committee on Humidity and Ventilation in cotton weaving for keeping down the temperature of the sheds in hot weather have not been widely adopted. In erecting new sheds double or concrete roofs have been provided in a few cases, and a new roofing material, made of asbestos, has recently been put on the market, but there has been no opportunity so far, of testing the efficiency which is claimed for it as a non-conductor. Spraying of roofs in hot weather is only done in isolated cases, but improvements have been made in many sheds by raising the inlets above the roof so as to obtain cooler air, as well as by using wet mats or cloths in conjunction with the inlets on Hart's humidifier. In humid sheds the tendency is to substitute atomised water for steam humidification, but nothing has been done to improve the ventilation of the sheds at night or to extend the mid-day meal time, and no improved method of sizing, which would reduce the need for artificial humidification, has been brought to our notice.

CHAPTER VII.

REGULATIONS: ELECTRICITY.

By G. Scott Ram, *H.M. Electrical Inspector of Factories.*

During the past year I have had considerable assistance from three of the Divisional Inspectors—Messrs. Topham, Evans and Lowe, in the North Western, North Eastern and Midland Divisions respectively, and various members of the district staff have also done much work, especially in the investigation of accidents. Mr. Evans reports that he has taken every opportunity of getting into touch with consulting engineers and contractors, so that all new work for which they are responsible may be put up in the first instance in accordance with the requirements of the Regulations. He points out, as does also Mr. Topham, that many contractors put in inferior apparatus and material, on account of cheapness, well knowing that it does not comply with the Regulations, being afraid that if they tender for work which will comply with the requirements other contractors will not do so and will get the orders on the question of price alone. The factory occupier eventually has to suffer, and is put to a greater expense in putting the matters in order than if he had paid for the proper material in the first instance. The obvious course for consulting engineers and for factory occupiers is to specify that the installation shall comply with the Regulations. If then it is found not to be in accordance with the requirements, the contractor can be called upon to put it in order at his own expense. The extra cost involved is becoming less important as more manufacturers are making apparatus (e.g. fuse boards, &c.) to comply, and which is little if any more costly than the inferior and dangerous types which do not comply. Mr. Lowe finds that by repeated visits to different districts the local contractors are beginning to realise that bad work is liable to be found out and condemned and are improving their standard accordingly. Both Mr. Evans and Mr. Lowe draw attention to the inefficiency of earth connections on most installations, and they enumerate many other dangerous conditions which they have found. Mr. Topham found some high tension switchboards having passage-ways only 18 inches wide and unprotected conductors all along one side. Mr. Shinner reports in the case of an accident in a factory sub-station, where a workman of a Corporation Electric Supply Department got on to some high tension conductors and was rescued by one of the factory employees, the Corporation showed their appreciation by presenting the rescuer with £10. Reports from other districts show that various defects in installations have been found and dealt with. Many inspectors refer to the continued increase in the use of electrical energy for power purposes. It is impossible to make an estimate of this increase for the past year, as I have generally done, as the usual returns from sources outside the Department are not available.

Four prosecutions for breach of Regulations were taken during the year and penalties of £5, £10 and £50 were imposed. One case was dismissed on technical (legal) grounds.

Table I.—Accidents at Electrical Generating Stations and Sub-Stations in 1914.

(The small figures relate to fatal accidents and are included in the principal figures.)

Description.	Stations for Public Supply and Electric Railways and Tramways.	Other Stations.
(1)	(2)	(3)
Non-Electrical :—		
At engines, pumps and generators	36	11^{3}
At boilers and steam plant	76	1
At coal handling plant	18^{1}	1
Falls	97^{2}	5
Struck by falling bodies	35^{3}	1
Miscellaneous	88^{1}	12
Total	350^{7}	31^{3}
Electrical :—		
At switchboards when engaged in ordinary routine work	19	7
Cleaning, repairing, &c., at "live" switchboards or other "live" conductors.	29^{1}	20^{1}
Cleaning, repairing, or other handling of switchboards supposed to have been made "dead."	2^{1}	—
Adjusting brushes and cleaning commutators and flashing at commutators.	2	4
Miscellaneous	13^{1}	3
Total	65^{3}	31^{1}

The mechanical accidents are fewer by 58 than in the previous year, a reduction of 13 per cent. They are such as are liable to occur in engineering works. A number were due to working on moving machinery. One, causing two deaths, was due to the bursting of a steel bottle of compressed air for starting a gas engine.

The number of electrical accidents is slightly larger—99 as against 94 in the previous year, with four fatalities as against three. Under the first heading of the table some of the accidents were due to mistakes on the part of the switchman; others were due to matters beyond his control, either to faulty switch gear or to faults on the circuit at some distant point. In all cases the injuries were burns. In one the tank of an oil switch burst, and the attendant was injured by the burning oil. Six of the accidents occurred in the renewing of fuses.

One half of the total accidents in electrical stations occurred to men when working on live conductors—mostly on switchboards. Eight occurred on extra high tension systems, and three on high tension systems. Two cases were fatal. One of these occurred in a consumer's sub-station to a man dusting a switch (5,000 volts) in a compartment with a door normally kept locked. but which he had himself opened. He was probably under the impression that the switch was dead, but the controlling switch in another compartment had been left 'on.' The other case occurred to a man working in an underground sub-station making contact with an inadequately protected temporary cable (2,400 volts). In most of the high tension accidents the injured persons were doing work which was unauthorised and were themselves to blame. In one case an engineer attempted to do some work in a switch cubicle (10,000 volts). The switch was not in use, although live on one side, and it could have been made dead by means of the isolating switches provided for the purpose. This, however, involved the taking down of a heavy iron screen, and rather than take the trouble to do this he took the risk. This accident emphasizes the desirability that such doors should be hinged or made to slide on runners so that they may be readily opened. One accident was caused through a short circuit to the framework of the switchboard by the metal end of the insulating pole provided for operating the isolating switches. One accident was due to the misunderstanding of a telephone message. Of the accidents on medium pressure and low pressure systems, sixteen were caused by making short circuits with ordinary spanners, screw drivers or pliers. One accident was due to short circuit in attempting to remove the tank on a live oil switch. Two other fatal accidents under this heading were reported, but they are not included in the table as they did not occur on premises under the Act. One was in a switch-house on a 10,000 volt system, and the other at a transformer box in the street at 2,400 volts.

Under the next heading the fatality occurred to an engineer-in-charge taking hold of live conductors of a high tension arc lighting switchboard presumably thinking they were dead. A switch controlling the switchboard had apparently, contrary to the usual custom, been left on inadvertently from a previous shift. The victim was no doubt to some extent blameworthy in not ascertaining for himself whether the board was dead.

Under the miscellaneous accidents the fatal case occurred to a man who touched with his head a neutral conductor of a high tension alternator. Several alternators were running in parallel, the neutral point of one being definitely connected to earth. It had previously been assumed that the neutral points of the other machines would have been very nearly at earth potential. In this case it proved that there was 500 volts pressure to earth. The machines were of different types, and the one in question was of lower voltage than the others and connected through a step-up auto-transformer.

TABLE II.—ELECTRICAL ACCIDENTS IN FACTORIES OTHER THAN ELECTRICAL STATIONS IN 1914.

(The small figures relate to fatal accidents and are included in the principal figures.)

Arcing of { switches	38
Arcing of { fuses	9
Shock or burns when replacing fuse wires	22
Portable apparatus, connectors and flexible wires	65^{2}
Unprotected conductors, switches, terminals, fuses, &c.	36^{7*}
Working on live electrical apparatus or conductors { skilled persons	42^{1}
Working on live electrical apparatus or conductors { unskilled persons	46^{2}
Miscellaneous accidents in electrical manufacturing and repair works—mostly in testing operations	55^{1}
Adjusting brushes and cleaning commutators and flashing at commutators	6
Miscellaneous	31^{3*}
Total	350^{16}

* One fatality, fall following shock.

The electrical accidents in factories are fewer by 68, or 16 per cent., than in the previous year, the number of fatalities (16) being one less. The accidents in renewing fuses afford examples of the dangers of different types of fuses to which I have drawn attention in former reports. Most of the injuries are burns from short circuit, but some from shock. In some cases short circuits were made by getting the fuse wire or pliers or other tool across the terminals of both poles or between one pole and the metal case. In some instances the fuses had been protected by a switch, but this being at a distance was not used. In other cases where there was a switch at the fuses it was connected on the wrong side so that the fuse terminals were live whether the switch was 'on' or 'off.' Several occurred with fuses in porcelain carriers having the fuse wire in a groove in the front of the porcelain. In these cases the fuse having blown the attendant replaced it without having investigated and rectified the fault which caused it to blow in the first instance, with the result that immediately the fuse holder with the new fuse wire was put into contact, the fuse blew again, burning his hand. Others, causing shock, occurred with the 'bobbin' or 'grip' type carrier having live metal at each end of the porcelain. None of the above arrangements of fuses complies with the Regulations. Fuses not protected on the live side by switches should be of the switch-fuse type so constructed that the hand when grasping the handle cannot touch live metal and is shielded from the arc should a fuse blow when being plugged in.

Of the accidents in the use of portable apparatus, 26 occurred in handling the flexible conductors. One case, having fatal results, occurred to a man when working on the wet floor of a dry dock. He was engaged in scraping a ship's bottom and is supposed to have trodden on the flexible cable of a portable lamp cluster, a nail in his boot piercing the insulation of the cable. In many works there is no proper examination of the flexible conductors which remain in use after being badly damaged and worn out. In some cases the metallic armouring of the flexible wires had broken and pierced the insulation. Metallic armouring, especially in the form of a wire helix, is not a desirable form of protection. The earth connection is liable to become disconnected, and through rough usage and constant bending the wire is apt to break and pierce the insulation, and becoming live is very dangerous. Other forms of protection such as rubber or hard cord braiding are generally preferable. Twenty of the accidents occurred in connecting the flexible wires to the circuit. In six cases 'adapters' were being put into lamp-holders and short circuits occurred. In other cases pin plugs of the old type were used, the wires short circuiting at the point where they enter the plug. In most of these cases the use of safety type hand shield plugs would have prevented the accidents. The short circuits which occur in this way are often very heavy, leading to very severe burns, by reason of the circuit being too heavily fused. In one case it was found that the circuit for a hand lamp was fused for 60 amperes. Three cases of shock accurred from unearthed portable drills. Some cases of shock from hand lamps also occurred. One fatal case—also in a dry dock—occurred in the use of a portable 'cargo lamp,' a cluster of several lamps being mounted in a metal reflector. The whole fitting became live by reason of a terminal screw in one of the lamp-holders being in contact with the barrel of the holder. The man took hold of the reflector of the fitting and was killed. The fitting was not earthed and was not in accordance with the requirements of the Regulations. It is noteworthy that safety type cargo fittings have been devised and are now on the market.

Under the next heading 'unprotected conductors' there were seven fatalities, of which six were due to contact with overhead wires. The wires, although out of reach from the ground, were so placed that workmen in the course of their duties might have at some time to get into close proximity to them. In one case, wires covered only with braiding were run out of doors close to a steam valve. A man had to get to the valve and came into contact with the wires (440 volt 3-phase) and was killed. The braiding of wires without any insulating covering is quite useless, and may lead persons erroneously to suppose that they are insulated and safe to touch. The next case was similar, the bare wires although out of reach from the ground were within reach from a pipe bridge on which the man got in the course of his duties. He made contact with the wires and fell to the ground, a distance of 11 feet, and although he died from the results of the fall, he was able to state that he received a shock. The next case occurred at a wharf where pit props were unloaded and stacked. The wires were 22 feet from the ground, but the props were stacked in some places to within 3 feet of the wires. The supply was 440 volts, 3-phase. A man on one of the stacks touched the wires and was killed. The next case was also on a 440 volt, 3-phase system. Bare wires were run under the roof of a large engineering shop. Men were at work painting the roof and one of them took hold of the wires and was killed. His mate managed to hold him until assistance came and he was lowered to the ground. Another case was similar in all respects except that the system was 400 volts, 3-phase. Two men tried to get the victim off the wires, but themselves received shocks and he fell to the ground. In the other similar fatality a man

was sent to clean out a gutter close to which were live wires at 500 volts, 3-phase. The seventh fatal case occurred in an engineering works to a man touching the live parts of a 240 volt, 3-phase switch which had no cover and which he had to use. It was a throw-over type of switch having double blades at right angles on each pole so arranged that in grasping the handle the hand would be liable to touch the projecting blades of the out-coming side. Of the non-fatal accidents nine were in connection with electric cranes. Five were by men touching the bare trolley wires when getting in or out of the cage. Four were due to unprotected conductors in the cage.

Under the next heading 'skilled persons working on live conductors,' the fatality occurred on a 440 volt, 3-phase system. Alterations had to be made to a motor circuit, and the electrician cut into a live wire with a pair of pliers. It was found that the fuses protecting the circuit had been removed from two of the wires but not from the third. The accidents under this heading might for the most part have been avoided if the work had been done at night when the works were shut down. Several occurred at switch-boards when tightening nuts with ordinary uninsulated spanners.

The corresponding accidents to unskilled persons are less excusable, as the men should not have been allowed to attempt the work. In many works, sometimes even in large works using a very considerable amount of electric power, no technically qualified person is employed, and unskilled workmen are consequently permitted to attempt repairs or alterations at great risk to themselves. The two fatalities occurred on travelling cranes. In one case the driver was oiling the gear on the crab whilst the conductors were live, and in the other a fitter was repairing the crane and came into contact with the live trolley wires. In both cases the system was 440 volts, 3-phase. Of the non-fatal accidents the victims were described as labourers (13), fitters (9), bricksetters, oilers, &c. They were mostly attempting to do some work on the electrical apparatus for which they were quite incompetent.

That the testing of electrical apparatus in electrical manufacturing works is largely carried on by apprentices and pupils is again indicated by the ages of the persons meeting with accidents. The fatal accident occurred, however, to an experienced electrician, who touched wires at 2,000 volts apparently under the impression that they were dead. Artificial respiration was carried on for two hours without success. In another case a man touched some testing leads at 12,000 volts pressure. He was rendered unconscious, but was brought round by artificial respiration. In the other cases the injuries were mostly burns from short circuits. The testing departments of electrical manufacturing works are often carried on in a very unsatisfactory manner. There is unnecessary exposure of live conductors where they are liable to be accidentally touched. Any old connecting cables with damaged insulation are considered good enough. Even in high pressure testing unnecessary risks are run. In one large armature winding shop it was customary to test the armatures by applying 2,000 volts between the commutator and the spindle. A twin flexible cable was connected to a transformer in a cabin the other end being moved about to whatever part of the shop a test was required, perhaps twenty or thirty yards from the cabin. The cable terminated in bare ends projecting from short vulcanite sleeves. There was only one tester, who could, of course, not be at both ends of the cable at the same time. An accident occurred at an armature under test, the armature winder, who was applying the ends of the test leads, getting a shock. The tester was walking back to the test cabin where at the moment there was no one to switch off the current. In this shop also there was no one qualified or instructed in first aid methods, someone having to be fetched from another department of the works.

Amongst the miscellaneous accidents there were three fatalities. One occurred to an electrician in a large iron works in switching on a lighting circuit transformer, arranged across one phase of a 460 volt 3-phase system, at a totally enclosed ironclad switch, the case of which was not earthed. The switch was of a well known type having fuses in the same box so arranged that when the switch is in the 'off' position the fuses are withdrawn from the contacts, and by opening the cover they can be renewed in safety. The apparatus was intended by the makers for use with cartridge type fuses. As so often happens, however, the cartridge fuses had been replaced by wires. The electrician in question had the duty of switching on the lights at dusk, and in order to prevent other employees switching on before the proper time, it appears that he had disconnected one end of one of the fuse wires and had closed the cover of the switch. Later on when he went to turn on the lights he had evidently forgotten that the fuse was disconnected, and the effect of putting the switch to the 'on' position was to make the fuse wire live and bring it into contact with the metal case giving him at the same time a shock which proved fatal. The accident would no doubt have occurred to any other employee attempting to turn on the lights. At the inquest it was urged that the apparatus was advertised as being "fool-proof." It

is evident that this description requires some qualification. In the second fatal case the man received a shock from a 200 volt 2-phase motor, the frame of which was live and not earthed. He was about to start up the motor and had turned on the main switch but not the starting switch. He was engaged in shifting the belt on to a loose pulley and his hand was trapped between the pulley and the belt. A man who went to his rescue also received a shock. The third fatality occurred to a boy who climbed up on to a roof where he had no business, and took hold of two wires of a 440 volt 3-phase system. Amongst the non-fatal accidents two were due to stay wires of poles becoming live. In one case an electrical engineer took hold of a stay wire and was unable to let go. His two assistants who were fortunately at hand succeeded in pulling him off by his clothes. The system was 440 volts 3-phase, and the leakage was due to the failure of an insulator.

Amongst the electric shock accidents there were several cases where the victim was brought round by means of artificial respiration. On the other hand in several of the cases which ended fatally no adequate measures were taken to attempt to restore animation. In one case the patient was sent on an ambulance to the hospital where the doctor pronounced him dead. At the inquest the doctor stated that as he was informed that the man had received a 5,000 volt shock it would have been of no use if artificial respiration had been carried out in the first instance. In another case (440 volts 3-phase) artificial respiration was started by the employees. Fifteen minutes after the accident a doctor arrived and pronounced the victim dead, and no further efforts at resuscitation were made. In another case (200 volts 2-phase) artificial respiration was conducted until a doctor ten minutes afterwards pronounced life extinct, and no further efforts were made. Similarly in two other cases efforts were abandoned after 25 and 30 minutes respectively on the doctor pronouncing the patient dead. In my report two years ago I drew attention to a letter by Dr. Reignald Morton which appeared in the "Lancet" and other papers, pointing out that death from electric shock is in general at first only apparent, and that by means of artificial respiration promptly and carefully carried out patients may often be revived, even as long as two hours from the time of the accident. In general, however, the medical profession appears to be somewhat ignorant on this matter, with the result that in many cases adequate efforts at resuscitation are not carried out.

TABLE III.—SHOWING VOLTAGE AND SYSTEM IN FATAL CASES.

Number of fatalities.	Voltage of system.	Voltage of Circuit or probable voltage of shock.	System.
1*	6,600	500	3-phase.
1	5,000	2,900	,,
1	2,000	1,150	,,
1	2,400	2,400	1-phase.
1	2,000	2,000	,,
1	500	290	3-phase.
1	460	265	,,
2	440	440	,,
7†	440	250	,,
1	400	400	,,
1	400	230	,,
1	240	140	,,
1‡	200	200	2-phase.
20			

* Shock from neutral conductor.
† 1 fall due to shock.
‡ 1 fall due to shock.

It will be noticed that all the fatalities were due to shock from alternating current; 18 were due directly to shock and two to fall following shock. 15 were from pressures of 440 volts or less. Most of the shocks being to earth from touching one conductor only of the system, the voltage received by the victim was less than the voltage between phases.

In my visits during the year I again found numerous examples of dangerous switch gear and other apparatus contravening the requirements of the Regulations. In high pressure and extra high pressure stations switchboards without any protection of conductors within easy reach of persons in the passage-ways were noted. In one case there were bare

conductors at 10,000 volts along one wall with a gangway about three feet wide, a single iron rail 12 inches out was all the protection. At the far end there were isolating switches requiring to be operated at intervals of a few days, necessitating the use of the passage while the conductors were live. In another case, although the passage was wider, there was not even a hand rail. The excuse sometimes offered is that only authorised persons are allowed in the passage-ways. When an accident happens to the authorised person and experience shows that such persons are by no means immune, he is blamed for not having been more careful. In one case such a passage-way was also used as a store room. Sometimes where bus-bars and isolating switches are placed out of reach from the floor, lamps for lighting the passage-ways are placed close to them, so that when a lamp fails and requires renewing the attendant will have to get up dangerously close to the live conductors. In some cases where the protection was adequate as regards ordinary routine operations and inspection, and where duplicate bus-bars were provided, the arrangement was such that when cleaning or other work should have to be done the advantage of the duplicate bars was lost. Thus the generator and feeder cells were arranged for connecting to either set of bus-bars by selector switches. Both sets of selector switches were, however, in the same compartment, and the two sets of bus-bars were not separated, so that when it should become necessary to clean the insulators of the isolating switches or bus-bars or otherwise work upon them, it would be necessary to shut down on both sets and therefore to stop the supply. This point has been overlooked in a number of public supply stations from which the supply is supposed to be continuous. In some cases a still more obvious mistake has been made in putting the isolating switches in the same compartment with the oil switches, so that unless special screens are provided for covering up the live side of the isolating switches, which is not always practicable, an oil switch cannot be overhauled without shutting down the whole switchboard. On a 2,000 volt direct current switchboard there were double pole switches having exposed blades five inches apart with the handle arranged as a cross piece between. Although there was a flange at each end of the handle, the arrangement was obviously very dangerous.

Further examples of medium pressure 3-phase switchboards, mostly with oil switches, were found on works where the supply has to be maintained continuously, including night time and Sundays, and where no provision was made for isolating the oil switches or other parts when any work should become necessary. On some switchboards, fuses, even for main circuits, were placed at the back in positions (e.g. between the bus-bars and the slate panels) where they could not be reached without danger. On a 550 volt switchboard having three rows of double pole switches, the switches of the lower rows were arranged so that their handles came between the blades of the switches in the row above. In a works using large electric welders, the primary switchboards, 440 volts alternating, having bare switches, fuses, &c., were placed behind the welders where they could only be reached by standing on the welding machines, and where the metal hoops being handled would be liable to be accidentally brought into contact with them. At a large new dock, the cranes had bare switchboards in the confined space of the driving cabins. The connector plugs for the main cables to the cranes were not protected by switches, and were so designed as to be liable to short circuit on plugging in. The most common faults in works concern the distribution fuse boards. Fuse-holders which cannot be handled without risk of touching live metal, and in which the fuse wires are unprotected are still supplied for new installations. In one 400 volt 3-phase installation cartridge fuses with thumb-screw terminals were found in iron cabinets and over non-insulating floors. In a timber yard having portable electric saw benches out of doors on a 440 volt 3-phase system, the flexible conductors were not protected by switches and the fuses were of a type dangerous to handle, and the metal saw benches were not earthed.

CHAPTER VIII.

REGULATIONS: POTTERY.

By the late C. R. PENDOCK and E. A. R. WERNER, *H.M. Inspectors of Factories.*

Condition of Trade.—In the first seven months of 1914 the rate of production of pottery throughout the United Kingdom was probably not far from the normal, although there was an absence of the "booms" in special branches which were noticeable from time to time in 1912 and 1913. The outbreak of war temporarily reduced many potteries almost to a stand-still, but within the next month or two general trade conditions revived sufficiently to provide employment for the usual full complement of workers, though in a number of instances short time was worked. Certain special branches of the industry, e.g., those which are confined to the manufacture of expensive art ware, those which are dependent on the activity of the building trade, and those which have hitherto sent large exports to the belligerent countries on the Continent, were necessarily still depressed at the end of the year; on the other hand, some sections of the stoneware trade and a few other special potteries have been busy owing to demands arising—generally indirectly—out of the requirements of the war. Extensive new developments in the industry may be anticipated in the near future, as there is a considerable opening for vitreous electrical goods and laboratory ware, as well as cheap toy sets, ornaments, and dolls' heads. The demand for British pottery transfers has also been rapidly increasing since the German supply became inaccessible.

At the beginning of August, grave dislocations were feared in the trade, and this materially reduced the amount of reconstruction and renewal work which it is customary to do during the annual holidays. With the renewal of confidence in the autumn, however, such work was generally resumed, and definite further advancement towards the close of the year is reported from Stoke-on-Trent.

The pottery industry being eminently one in which the working conditions are affected by alternating spells of good and bad trade, it is important to bear these in mind whilst reviewing the statistics of any given period.

Lead poisoning.—The reported cases of plumbism, as tabulated in the Medical Inspector's Report, indicate a gratifying improvement, the total for 1914 being less than half that for any previous year, viz., 27, as compared with 62 in 1913, 80 in 1912, 92 in 1911, and an average of 116 in the years 1899-1910. While some portion of this improvement must admittedly be due to the slackness of trade and the consequently reduced production of pottery, it is significant that only 22 cases occurred in the first seven months of 1914 as compared with 44 in the corresponding period of 1913. The 1914 figures for North Staffordshire show a noteworthy absence of plumbism among ware-cleaners (8 cases in 1913), majolica paintresses, and lithographic transfer makers, while the cases among aerographers have fallen from 4 in 1913 to 1 in 1914. Even more encouraging is the decline of cases among the younger workers: of females under 20 years of age, 8 were affected in 1913, and only 3 in 1914; among males, no case arose in 1914 under the age of 24.

The Regulations have resulted not only in improved conditions in those places where raw lead glazes are still used, but also in a wider adoption of non-poisonous glazes whereby occupiers secure the extensive exemptions offered as an inducement to dispense with raw lead. The total number of factories under the Regulations at the close of 1914 was 648, and the proportion of these using raw lead glazes is shown by the following table:—

Potteries using no lead glaze	Coarse ware	51
	Other	58
Potteries using no glaze containing more than 5 per cent. of soluble lead	Coarse ware	42
	Other	48*
Potteries using unrestricted lead glaze	Coarse ware	18
	Other	359
Factories in which processes incidental to pottery manufacture only are carried on (no glazing)		72
		648

* 13 of these make a large proportion of leadless glazed ware.

Thus it appears that out of 111 coarse ware potteries, raw lead is only now used in 18; and out of 465 other potteries (including all the general fine household earthenware and china manufactories of the country),106 are now confining themselves to substantially non-poisonous glaze materials. This represents a very distinct advance on the previous position with regard to the use of lead in pottery glazes, especially as the firms under exemptions include a number of the large employers of labour.

The progress made in the use of leadless glazes is especially commented on by the Stoke inspectors, Mr. Harston (Birmingham), Mr. Shuter (Leeds), and Mr. Kirkwood (Lanarkshire); the last-named particularly refers to the success of one firm in making leadless Rockingham ware and quotes a letter of the firm in which they state: "With the glaze we are now using we get an excellent Rockingham glaze absolutely free from lead, and it has been working with entire satisfaction for six months."

In the coarse ware trade, recent advances have been mainly in the direction of substituting galena for red lead; the successful use of the native lead sulphide on red coarse ware bodies is mentioned by Mr. Shinner (Bristol), Mr. Wolfe (Wolverhampton), Mr. J. L. Edwards (Wrexham), and Mr. Brown (Edinburgh).

Non-lead departments.—Health conditions in those departments in which danger arises from dust and other causes, unconnected with the use of lead, have received due attention and much progress is reported. Although no actual health statistics are available for these sections of the industry, it may fairly be assumed that the general effectiveness of the Regulations has been commensurate with that of the requirements specially directed to combating plumbism; and, moreover, abundant confirmation of this view is constantly to be found in the voluntary statements of occupiers, managers, and workpeople, no less than in the observations of Inspectors, who testify to the improved appearance and health of the workers.

Mr. Shinner (Bristol) has been impressed by the evident desire manifested by certain large employers to secure full compliance with all the requirements. This spirit of willingness on the part of occupiers has been equally noticeable in the best factories in North Staffordshire and other districts.

Mr. Brown (Edinburgh) speaks of the provision of exhaust ventilation, hopper windows, smooth walls and impervious floors, and the proper storage of moulds, as revolutionizing an old pottery, although structural alterations on a large scale were impracticable.

Regulations in detail.—The following points arising out of particular regulations have been noted during the year:—

Reg. 1b. Wedging of Clay.—Mr. H. R. Rogers (Stoke) states that the introduction of the vertical pug-mill into china potteries has largely reduced the amount of clay wedging.

Reg. 1c. Carrying.—It is reported from Stoke that misunderstandings still arise in respect of the carrying of clay and other burdens by young persons; compliance is facilitated where employers will take the trouble to post up lists of the carriers and the maximum permissible weight for each. Prosecution has been found requisite in one instance where the prescribed weight was exceeded.

Improved conditions of labour resulting from this requirement are commented on by Mr. Parkes (North London) and Mr. Ward (Derby); the latter refers to various methods of wheeled transport, one of which does away with carrying altogether:—

> The balls of clay are placed on boards which are provided on the underside with small runners. The boards are carried on trolleys (made of a uniform height) which are pushed to the desired position at any work-bench and the loaded tray is run on to the bench. An empty tray is pulled from the bench on to the empty trolley and taken to the clay supply ready for a fresh charge. It is, of course, essential to make the benches of a uniform height to suit the height of the trolleys.

Reg. 2. Periodical examinations.—Mr. Ward (Derby) and the Stoke Inspectors have observed neglect of the re-examination of young persons employed as carriers. In North Staffordshire, also, prosecution was found necessary in regard to the monthly examination of casual lead workers and the provision of a suitable room for the doctor's examinations.

Reg. 3. Health registers.—It is somewhat surprising that large firms have not taken more advantage of the facilities offered by the Regulations for the use of card registers in place of the book form, which is far less convenient when changes in the personnel are frequent.

Reg. 4. Overalls.—In the Staffordshire potteries there appears to be a general agreement that the old fashioned "slop" is not a satisfactory overall for lead workers, but it has not yet disappeared. Overalls are also sometimes made from materials so loosely woven as to allow dust to penetrate to the clothing.

Proper arrangements are now general for ensuring the washing of overalls at a laundry, but the daily cleaning of waterproof aprons still calls for attention.

Reg. 6. Mess-rooms.—The following note is forwarded from Stoke :

> Several excellent mess-rooms have been built during the year by a number of the larger firms. Under the same roof with the mess-room have been erected the lavatories, overall and outdoor clothing storage rooms, and the building has been so well planned that the workers can pass from one to the other in the correct order and thus leave all dust and lead behind before entering the mess-room. The cooking arrangements in many cases are also excellent, and enable the workers to obtain dinners or to cook their food under the best conditions.

Similarly excellent arrangements have been made at a large factory in Devonshire; this regulation has proved indeed most valuable in improving mess-room conditions throughout the country, and the effect on the general tone of the workers is noticeable.

> Mr. Garrett (Stoke).—Where the provision is good, the cleanliness of the men has also shown a marked improvement. One still has frequently to call attention to the dirty habits of men in the use of mess-rooms; but it is almost invariably the case that where this is necessary, the mess-room is in itself poor. A good mess-room, with proper cleaning and supervision, is generally respected by the men who use it, and there is scarcely anything better appreciated or more instrumental in uplifting the workers to proper self-respect and care of their personal health than the provision of good mess-rooms, lavatories, and sanitary accommodation.

Reg. 7. Dust.—Continuous attention is needed to secure the provision and maintenance of efficient local exhaust apparatus in every process for which it is prescribed; it is, therefore, satisfactory to be able to record that the average efficiency of such installations has decidedly increased during the year 1914, with corresponding beneficial results to all concerned, especially where an ample exhaust draught is suitably applied in conjunction with well distributed and properly constructed inlets for fresh air, so as to combine the benefits of dust removal with the advantages of a plentiful supply and frequent change of air in all parts of the workroom. Systems in which propeller fans are used with wide airways are often found to be best for this purpose, and many of the difficulties due to faulty construction or disposition of the plant have been avoided, where occupiers have submitted plans to the District Inspector before deciding on any particular scheme.

Mr. H. R. Rogers (Stoke) reports that, of 59 potteries using flint as a bedding material, 42 have discarded antiquated systems of exhaust for flint processes and have replaced them by modern plants. In connection with the emptying of china biscuit saggers, it has been found generally to be impracticable to apply an exhaust efficiently at the oven-mouth, and consequently the majority of manufacturers have arranged for flat ware to be emptied at one of the placing benches, a method which has proved to be satisfactory and economical. An investigation of the handling of broken saggers, which caused a large amount of flint dust to be disseminated in the air at or near the breathing level, showed that it would be quite feasible to use a suitable tray for carrying the broken receptacles and their contents; this is now the common practice in many china factories.

In many earthenware biscuit warehouses, Mr. Garrett reports that the means for avoiding dust in the brushing process are still unsatisfactory, although a large number of the smaller firms have erected quite efficient installations.

Instances are reported from Stoke in which the 15-minute limit for ware cleaning of moist ware has been exceeded; in one case the firm was prosecuted and fined, the expenses of the ware cleaner in attending the Court being also disallowed by the Stipendiary to mark his disapproval of her contributory negligence. Mention is also made of successful adaptations of agricultural apparatus, *e.g.* a condiment machine and a churn, for sieving and mixing dry colours without the escape of any dust during the operations; local exhaust is being added to ensure safety during the removal of the dangerous material and during the cleaning of the machine. The remodelling of exhaust installations for the aerographing process has resulted in material improvement in many decorating departments in North Staffordshire, a better type of hood being used for colour blowing work.

Considerable attention has been given to processes which come within the scope of paragraphs c. and m. of Regulation 7, requiring removal of dust generated in operations not definitely specified in Reg. 7a.

> Mr. Garrett (Stoke).—The old process of riddling freshly calcined flints inside the kiln was surely one of the most dusty and dangerous processes connected with the potting industry. The best installation consists of a duct from an exhaust fan brought to a position near the mouth of the kiln and about 3 feet from the ground; a barrow placed under the duct receives the broken flints, and the cloud of flint dust is carried away by the exhaust draught.
>
> The glost placer carries newly washed saggers on his head, and as he slides each sagger off his head he pulls down a little cloud of lead dust which falls directly past his nose and mouth. One works manager has removed this source of danger by adding one pint of silicate of soda to each bucket of sagger-wash; this effectually prevents any dust being rubbed off before the wash is fired on the new sagger.

Reg. 9. Ventilation.—Hopper windows of a satisfactory type are now general although they are sometimes placed too high; misunderstandings, however, are still encountered as to the proper use of such windows in summer. Probably the most suitable type is that in which the hinged portion is retained in its normal inclined position by pegs which can be removed to allow the window to fall wide open on very hot days; this construction, moreover, greatly facilitates window-cleaning.

It is at last becoming generally admitted that clay ware can be dried by judicious ventilation better than by excessive heat; but the old misconceptions on this point are hard to eradicate. The regulation of steam-supply to drying stoves is extremely important and should be in the hands of the most competent man available.

> Mr. Garrett (Stoke).—The experience of last summer shows that in very hot weather, stove ventilation is the one factor that enables the shops to be kept below the 70° Fahr. wet-bulb reading. Generally it can be said with confidence that where the stoves are adequately ventilated there is no difficulty in meeting the requirements of Reg. 10a. One or two prosecutions had a salutary effect in getting this section better observed.

It is, moreover, important to note that adequate stove ventilation automatically ensures proper ventilation of the adjoining potters' shop.

Reg. 10. Temperature.—Mr. Garrett (Stoke) mentions the necessity of keeping before managers and others the fact that 70° Fahr. is a wet-bulb limit not to be exceeded; too often a close approach to 70° is regarded as normal, and steps are not taken to rectify the conditions until 70° is actually reached, when it is generally impossible to act quickly enough to prevent a breach of the Regulations. Mr. Good (Coventry) and Mr. H. R. Rogers (Stoke) comment specially on the indifferent maintenance of wet-bulb thermometers; the latter says:—

> It is only too common an experience to find the supposed wet-bulb thermometer recording the same temperature as a dry-bulb thermometer. This is accounted for by the fact that the care of the thermometers is not intrusted to some responsible person, but is left to anyone working in the room. Consequently no one feels responsible for renewing wicks and gauzes when they become clogged with dust, or for filling the pots with clean water. In fact, the necessity for using clean water does not seem to have dawned upon many of the persons concerned. There is need for much closer supervision of these thermometers by the persons appointed under Reg. 27.

Very few cases have been noted of ovens being drawn at a temperature exceeding 125° Fahr.; cooling dampers have been widely adopted and in some cases also air-ducts and fans have been installed to expedite the reduction of temperature.

Reg. 11. Lavatories.—Compliance is now reported to be substantially universal. The Stoke inspectors report that many of the larger firms have built excellent new lavatories during the year in conjunction with new mess-rooms. Many have a basin for each worker; this can be numbered and the man or woman held responsible for its cleanliness and proper treatment. Also, where the provision made is good, the workers use it regularly and keep it clean. It is only in the lavatories that come up to the bare minimum of the requirements that trouble is experienced in securing proper cleanliness.

Reg. 12. Floors.—As regards the necessary re-construction of floors, Mr. H. R. Rogers reports of the Stoke District that "the effect of the Regulation has been very marked and the potteries have been greatly improved by the alterations which have been made." The same decided improvement is also noticeable in many potteries outside North Staffordshire.

Mr. Garrett (Stoke) has found wood block flooring very satisfactory for potters' shops, while for dipping house floors good red quarries have many advantages, and look so well when clean that the operatives take a pride in keeping the workplace in a proper condition. He also notes that the wearing qualities of a concrete floor are greatly enhanced by facing with granite chippings.

For cleaning floors, Mr. Mead (Birmingham) and several other inspectors record their conviction that the use of damp sawdust is eminently satisfactory. Sweeping under benches is troublesome and apt to be neglected; many firms have found it advantageous to board up the fronts of the benches and so prevent the accumulation of débris underneath.

The alterations in steam-pipes necessitated by this Regulation have doubtless been costly in many instances, but the outlay is not necessarily unremunerative.

> Mr. Ward (Derby).—Many occupiers have freely admitted that the structural alterations to the drying stoves required under the new Regulations were desirable on the score of efficiency alone. I have seen drying stoves in which clay dust and scraps have been allowed to accumulate to such an extent as completely to bury the steam-pipes. Since clay dust is a bad conductor of heat, the loss of heat energy is self-evident. At one works, where the steam-pipes in the stoves were re-arranged to comply with the new conditions, I was informed by the occupier that the cost of alterations to the

stoves would be recovered (by increased efficiency in drying) "in a year or so." As this works has been running from 30 to 40 years the losses due to the cause stated are more easily imagined than calculated.

Reg. 13. Workbenches.—Steady progress is reported, potters' benches being rebuilt of strong timber, covered with sheet metal, or otherwise properly dealt with. For placers' benches the use of blue brick, quarries, slate or concrete, is becoming general; the latter material can be made very economically by utilising sagger "grog," and the ground sagger bodies appear to be hard enough to withstand considerable wear and tear.

Reg. 14. Lead-houses.—The requirements of this Regulation are not yet observed with sufficient thoroughness.

Mr. Garrett (Stoke).—Carelessness in the lead house is still a failing, and to all arguments there are two answers, either that the man is employed there for such a short time that he cannot possibly pick up lead, or that, being the manager, he is able to look after himself, and is free from all danger.

Mr. H. R. Rogers (Stoke) is also dissatisfied with the observance of the 5 per cent. added moisture standard for raw lead compounds; though these materials are now generally ordered with at least 5 per cent. of moisture, the requirement of a cover or damp screen on the opened package is sometimes so neglected as to allow the moisture to evaporate.

Reg 15. Dipping-houses.—Mr. Dunolly (Southampton) reports full compliance at the principal potteries in his district; and the Stoke Inspectors also state that the structural conditions are now satisfactory. Mr. H. R. Rogers, however, complains of indifferent cleansing of tubs and walls in many china dipping-houses.

Reg. 17. Boards.—Mr. H. R. Rogers and Mr. Garrett (Stoke) again emphasise the importance of providing really clean water for board washing; this is best supplied by means of a spray or rose-jet impinging directly on to the board, without the immersion of the latter in a trough of water which is invariably dirty.

Reg. 24. Separation of processes.—It has been necessary to remind occupiers of the importance of this Regulation in connection with glost placing shops during the drawing of ovens, and in mills where glazes and slips are being prepared simultaneously.

Reg. 25. Hours of employment.—Some infractions of this Regulation have been noted; prosecution and conviction ensued in one case where glost placers were employed as much as 65 to 67 hours in one week. Cautions have also been given in respect of glost placers sitting up with an oven and not observing the prescribed interval of 12 hours' rest thereafter.

Reg. 26. Sectional placards.—This simple and useful requirement is now well observed in North Staffordshire, but in other districts it seems to have been frequently overlooked.

Reg. 27. Observance of regulations.—The paramount value of this Regulation, if systematically observed, seems now to be generally admitted; but contraventions of its provisions are much too frequent and form the subject of comment by Mr. Dunolly (Southampton), Mr. Good (Coventry), Mr. Ward (Derby), Mr. John Law (Sheffield), Mr. Hunter (Wigan), and Mr. Young (Dundee); the last-named notes reluctance to record workers' offences, whilst other Inspectors record omissions in respect of duties of occupiers.

Mr. H. R. Rogers (Stoke).—Some manufacturers, who have tried seriously to carry out the spirit of the Regulations, have appointed really competent men as their works' inspectors. Such factories have improved wonderfully since the Regulations came into force. On the other hand, many manufacturers have appointed a man without giving any thought to his capacity, suitability, or other duties. These men, as a rule, display ignorance of the Regulations for the observance of which they are responsible; they are sometimes unable to ensure the enforcement of any instructions they may find it necessary to give; and, not infrequently, are so overloaded with other duties that the carrying out of the fresh duties imposed by this Regulation is a physical impossibility. Many of these persons have assumed their duties in a very lighthearted manner and have apparently regarded their new position as a sinecure. Where the Record of Inspection is well kept and the person appointed under this Regulation is indeed competent, an immense improvement has been noticed in the condition of the factory.

Mr. Garrett (Stoke).—The experience of the year has gone to strengthen my opinion of the value of this Regulation, where properly observed and used. The workpeople have a decided objection to seeing their names posted up in the shops, and since a prosecution was taken early in the year on the evidence of a works' inspector only, they have now realised that his power does not stop at posting notices. The influence of a conscientious man on the occupier has also been noticeable in several cases; for, where there is such a man, even structural alterations get completed in a much shorter time. An indirect testimony as to how this is done is revealed by an occupier who blurted out that his works inspector was always worrying him about something: "In fact, he is already a greater nuisance than the Government Inspector."

Reg. 28. Samples.—The analyses of a large number of glaze samples, collected in pursuance of this Regulation, reveal a very small proportion of irregularities, except in respect of galena glazes used in coarse ware factories. While there is no reason to believe that such glazes have been wilfully adulterated with other lead compounds, difficulties frequently arise from the use of an impure lead ore, which may contain a certain proportion of native sulphate (Anglesite) or carbonate (Cerusite); these deposits have a relatively high solubility, whereas a sample of fairly pure galena (as obtained from some mines) will show a solubility of well below 2 per cent. The supply, to potters, of ores of excessive solubility is having careful attention.

Regs. 29-36. Duties of persons employed.—Breaches of these Regulations are referred to by several Inspectors.

> Mr. Shuter (Leeds).—I find great indifference to their own interests exhibited by the employees themselves, and have had to caution individual workers for such offences as smoking in scheduled places, failing to wear the overalls, &c., provided, and bringing food into the dipping houses. If it is found that these cautions have not had the required effect, stringent measures will have to be considered.

Mr. H. R. Rogers and Mr. Garrett (Stoke) both note persistent reluctance on the part of certain adult male lead-workers to wear washable head-coverings (though this is sometimes due to the unsuitable nature of the caps supplied); neglect to use the storage places provided for overalls, head-coverings, and aprons; interference with the proper ventilation of drying stoves; and indifferent cleaning of the various workplaces and appliances. In nearly all cases the remedy is to be found in proper instruction and training of the workers in their duties, and adequate supervision by the persons appointed under Reg. 27.

CHAPTER IX.

REGULATIONS: OTHER CODES.

By W. S. SMITH, *H.M. Inspector for Dangerous Trades.*

Regulations made under Section 79 of the Factory & Workshop Act, 1901, are in force in many processes and work in addition to those dealt with in the previous chapters, but few important points have arisen and little difficulty has been met with, on the whole, in administration during the past year. Most interest, perhaps, attaches to the new Code dealing with the construction and repair of ships in shipbuilding yards, which came into force on the 1st May, 1914. The following are brief notes on the work of the year and the irregularities found as regards some of these Codes of Regulations.

Brasscasting.—There is little to complain of with regard to the observance of these Regulations in most districts. In S.W. London the ventilating fans are often found out of order; in one instance the fan motor had been removed because it was required elsewhere in the factory. In Birmingham the chief difficulties met with are the indifference and neglect on the part of the workers to make full use of the ventilating appliances and the washing conveniences. In Wolverhampton the lavatories were frequently found in faulty condition; where excellent conveniences were provided the workers preferred to wash in buckets. The methods of ventilation in this district are, in many instances, by no means perfect.

More use is now made of mechanical means for ventilating brasscasting shops, and fans have been installed in a number of large foundries which are exempt from this requirement on account of ample air-space. Mechanical ventilation, is however, not always satisfactory where the roof is low. A foundry should be fairly lofty, with a double sloping roof so as to form a natural hopper, and enable the fumes to be exhausted therefrom either by fans or by natural means. In the Sheffield district, an expensive fan plant and exhaust hoods were found to be useless on account of the low, flat ceiling of one foundry. The plant was designed to change the air of the shop 40 times an hour. Eventually a new and loftier foundry had to be built, and the difficulty in removing the fumes no longer existed.

Bronzing.—Many of the smaller printers have given up the process, or use liquid bronze, and the work has become more concentrated in larger factories, equipped with efficient modern machines and hand-bronzing benches provided with exhaust ventilation. The smaller firms who still remain under the Code have purchased small hand cabinets, or portable vacuum bronzing outfits which are quite satisfactory if properly supervised.

Owing to the high price of bronze powder, the quantity of bronzed work has diminished since the outbreak of the war. All the powder used here was imported from Germany, and the source of supply is now cut off. Up to the present time, plans for manufacturing metallic powders in this country have not matured.

Docks.—The restrictions on lighting in the Metropolitan area have intensified the danger of dock work in the South London and East London districts; in the latter area two fatalities were due to this fact. In East London the number of reported accidents still continues to increase, but this is partly due to better notification, and partly to the remarkable increase in the volume of trade at the docks during the latter part of the year. From Kent it is stated that the war has made no appreciable difference as regards observance of the Code, though conditions have been greatly different from normal, with variations according to the class and character of the port. Breaches of the Regulations have been of a minor character and accidents few, though in some cases prosecutions were necessary. In Norfolk the Code has been well observed, and irregularities were slight. The number of ships inspected during the year is much less than in previous years owing to the great curtailment of the shipping trade since August.

In the Southampton district there is little to note, as some of the large ports have been closed to mercantile traffic. In the Plymouth district, the work at the docks has been greatly disorganised owing to the war; shipments of China clay from the Cornish ports

have greatly decreased. Omission to carry chain registers on board ship and unfenced gangways were the chief irregularities noted. From Swansea few complaints have been received. Of the 385 accidents reported from the docks, none were due to breaches of the Regulations. Lack of protection at low hatchways out of use has demanded a good deal of attention in Cardiff; three fatalities occurred to workmen engaged on dock processes, owing to falls down such unfenced hatchways, and there have been numerous other fatal accidents to persons not actually employed in the processes, such as ships' officers, seamen, &c.

There is still trouble with foreign ships at the ports of Lincolnshire as they seldom carry chain registers and the gangways are often not in compliance with the requirements. In North Wales the amount of dock work at the smaller ports fell off considerably after the outbreak of war, but it has since improved.

Very little work has been carried on at the Goole docks during the latter part of the year, owing to the dislocation of the shipping trade in the North Sea. Accidents from failure of lifting tackle have increased at Hull, though they are still few in number. Foreign ships are the chief offenders at this port especially as regards provision of satisfactory gangways. Following a fatality due to a fall into the dock from a defective gangway, consisting of a horizontal ladder with hatch covers laid across, a prosecution was sanctioned, but the case could not be taken into Court, owing to dispersal of witnesses immediately on the outbreak of war. In the Newcastle district, about 25 per cent. of the British ships and 50 per cent. of the foreign ships visited were found to be irregular. Improperly fenced gangways were the principal breaches of the Regulations noted. In the Stockton district defective hold ladders and unsafe gangways formed the majority of the irregularities, and these were found on the British and foreign-owned ships visited in about the same proportions as in Newcastle.

A decrease in the work at the Manchester docks occurred in the early days of the war. A revival followed due to a diversion of traffic from the east coast. Much of the east coast trade has since gone back, but arrivals from new sources have tended to make up the lost traffic. Sailings to German, Belgian and Baltic ports have been suspended, but there have been new arrivals from Russia, Newfoundland, France and Australia. The amount of tonnage paying toll during 1914 was 5½ million tons (the same as in 1912 which was then a record year) compared with 5¾ million tons in 1913. Dock accidents for the year were 675 (including 5 fatalities), a reduction of 10 per cent. compared with 1913. The accident records from the port of Manchester appear to show that exhaustion, so often expected after long spells of arduous work, is not at these docks a fruitful source of accident. No breach of the Regulations sufficiently serious to warrant prosecution was discovered. The chief complaint was against foreign vessels for failure to provide suitable gear for lifting hatchway beams (Reg. 8). In Liverpool accidents at the docks fell to 1,567 (including 39 fatalities), a decrease of 18 per cent. compared with 1913. This fall is primarily due to the quietness of the shipping trade during the first nine months of the year. It was only during the last quarter that work at the docks became very busy owing to the war and the diversion to Liverpool of a large number of ships usually trading to other ports. The effect of the congestion of the docks, which was most marked during November and December, and the cause for much overtime, was reflected in a large increase in the number of accidents during November. Seven per cent. of the accidents occurred to persons who had been employed more than 12 hours; the average percentage is about half. Some of the shipbuilders still turn out vessels with hold ladders which contravene the Regulations. Such defects were found during the year on four large ships commencing their first voyages from this port. It was impossible to approach the ladders, except by climbing over the winch or other structures unprovided with hand-hold and foot-hold. The question of standardising the sizes of hatchways and hatch-covers might receive more attention. The hatchways are often divided unequally by the hatchway beams, and hatch-covers are in consequence not uniform in size. Several accidents (3 fatal and 7 non-fatal) were due to the fact that hatch covers had been wrongly replaced and fitted badly, forming insecure platforms.

In Glasgow the accidents were less than in the previous year, though the tonnage handled at the port was much greater, especially during the latter part of the year, owing partly to an increase in the regular trade, and partly to the closing of the east coast ports and diversion of some of this trade to the Clyde. Since the outbreak of the war the usual lighting of the docks on the east coast of Scotland has been prohibited by the Admiralty, and at Leith one fatality was due to lack of sufficient lighting at a dangerous portion. The Superintendent has since obtained permission to illuminate specially dangerous points where numerous railway crossings exist. Night work has been restricted as much as possible. General lighting of the quays is not allowed. Where loading has to be carried on

at night, the lamps are obscured above. The war has almost entirely stopped the coaling trade at the ports of Methil and Burntisland, and very adversely affected the shipping trade at the port of Dundee.

Electric accumulators.—Several new factories have been built on model lines, whilst older ones have been reconstructed and much improved. The Regulations are generally well observed; irregularities were chiefly due to lack of maintenance of washing conveniences, inefficient exhaust draught at lead melting pots, due to faulty construction of ducts, and at filling, filing and brushing benches. Owing to several slight cases of lead poisoning, due to these defects, new ventilating plants have been installed in two factories and an improved fan has been erected in another. In one works a new concrete floor was put down in the pasting shop at the instance of the Inspector. The floor was sloped to a drain leading to a large sump hole to act as a settling chamber for red lead. It was found that the amount of lead collected in the sump was a considerable set-off towards the expense of the new floor. The greater cleanliness of the shop and the ease with which the floor could be thoroughly washed down by a hose were also distinct advantages. In another works, a new device consisting of a combined mixing and pasting machine has been introduced and this is said to work satisfactorily. In consequence of cases of lead poisoning to men engaged at a machine for pressing plates filled with paste, a system of exhaust ventilation has been tried; this is a difficult matter as the exhaust has to be arranged for the edge of the press bed-plate, the only place where dust could escape, but the difficulties are being overcome. Perforated grids over water trays, to catch the heavier particles of lead, and exhaust hoods, to deal with the dust, have been installed in several works at filing and brushing benches. Only one prosecution has been necessary under the Code.

File-cutting by hand.—This is a decreasing trade, both in the Wolverhampton district and in Sheffield. In Wolverhampton this is said to be partly owing to the shortage of young labour, and partly to the fact that machine-cut files are largely taking the place of hand-cut files. In Sheffield 40 file-cutting shops have ceased to exist during the last twelve months, and a decrease is noted of 120 shops compared with two years ago. Several cases of exempted workshops, using lead "beds" were discovered in Sheffield, and the occupiers were warned. Neglect on the part of the men to wear aprons was the usual breach of the Code in Derbyshire and the Wolverhampton district; it is suggested by several of the Inspectors that overalls, both for the men and women, would be more suitable than aprons.

Flax.—The flax industry has suffered since the outbreak of war, as the Belgian output of raw flax which consists of the finest quality was cut off, and the Russian crop has been temporarily withheld. Small supplies have been obtained from Holland, and the mills have been kept going, with a certain amount of short time, with these and Irish supplies, supplemented by the stocks in hand.

Old defective exhaust systems in the country mills of Yorkshire have been considerably improved; the draught was generally poor, owing to long and contracted ducts with right-angled junctions, and propeller fans with which modern dust collecting appliances were impossible. An elaborate system of exhaust ventilation has been installed for the cards in an important works in the Edinburgh district, with very satisfactory results as regards improved cleanliness of the factory and absence of dust for the worker. Much progress has also been effected in this direction in the flax mills in the Dundee district. In one factory an entirely new ventilating plant has been installed; in another, automatic hackling machines have been introduced and each machine is exhausted by a separate fan and ducts. This system is said to be more effective and not much more expensive than a general system of ventilation for the hackling room. Other works have been greatly improved by replacing old right-angled junctions with branch ducts leading into the main ducts at an easy angle.

Grinding of metals.—In Birmingham the chief irregularities noted were dirty workbenches and windows; faults in connection with exhaust plants were observed only in small works where grinding was carried on intermittently. In a Coventry file-grinding factory the only complaint related to want of cleanliness of floors and maintenance of the water trays for collecting dust; the conditions were much improved after issue of a warning notice. The Regulations are well observed in the Wolverhampton and Walsall districts. Improved ventilating systems have been installed in a large Leicester factory in which shoe knives are ground, and at an edge tool works in Nottinghamshire. Better conditions

are reported as to the thoroughness of the weekly cleansing in the Sheffield grinding "hulls." There is an increasing tendency for the duty to be delegated, for a small consideration, to one of the workmen, usually a boy, and the work is better done in consequence. The space under the drums is, however, often neglected on account of the danger in approaching these whilst the mill gearing is in motion. Dust and other rubbish are liable to accumulate in these parts, and the loose laps of the belt throw up the dirt into the belt-race and atmosphere of the shop. As the result of instruction the grinders are gradually recognising the necessity for cleanliness, and appreciate more the value of efficient dust extraction appliances. There is still, however, negligence in cleaning the windows. One of the Inspectors, for instance, found on one sunny afternoon in mid-summer the gas lit in a cutler's shop to enable the cutlers to do their work properly.

Lead smelting.—Good compliance with the Regulations is reported from Swansea and Newcastle. In the former district, considerable improvements have been effected in some of the spelter works during the year, and the majority of the workers appear to appreciate the facilities now provided for washing and partaking of meals; they object, however, to leaving their ordinary clothing in the places required for the purpose and this is frequently found to be hanging up in rooms in which lead processes are being carried on. The provision of individual lockers with locks and keys would perhaps remove this objection. In the Wrexham district there has been further delay in the erection of improved exhaust hoods at the smelting furnaces of one works; this factory was closed for a considerable time owing to labour troubles, and after re-opening there was a scarcity of labour due to the war.

Locomotives.—Irregularities relate chiefly to non-maintenance of covers and guards for point rods and signal wires (Reg. 1), and the careless placing of materials adjacent to railway lines (Reg. 9). Several fatalities were due to failure of the shunter to accompany the first waggon, or the person in charge of the locomotive or waggons to give warning of their movement, whilst the dangerous practice of riding on coupling poles or on buffers not provided with secure hand-holds is much too common in several districts. A number of shunters have been warned that prosecutions would be taken unless the practices are discontinued. Accidents from this cause are reported from Leeds and other districts. The old pin couplings are still used in some works these give rise to occasional accidents as it is necessary to couple and uncouple by hand, and there is constant danger of being crushed between the waggons whilst so engaged. The fact that coupling poles cannot be required, unless their use is possible without structural alteration to locomotives or waggons, leads to difficulties in administration.

Paints and colours.—Few breaches of the Regulations were noted during the year and poisoning cases were not numerous; these were generally due to some defect in the dust exhaust appliances; *e.g.*—one case in East London was traced to the exhaust from the dry white lead casks being discharged on to a low roof, and in windy weather the dust was blown about and entered the factory; it is now collected. Another case was due to the inefficiency of the exhaust at a grinding mill; the ventilating plant was at once overhauled and the fan speeded up. In Lanarkshire where the greater part of the paint manufactured is leadless, some irregularities were discovered owing to several cases of poisoning. These related to periodical medical examination, defective washing conveniences, unsuitable meal rooms and improper storage of out-door clothing. The exhaust plants, though fairly efficient, were not in accordance with the best modern practice, but the standard of observance throughout the district has been raised as the result of the special attention devoted to these works.

Shipbuilding.—The Inspectors have given much time to this new Code. As they apply only to the construction and repair of ships exceeding 150 feet in length, many of the smaller yards are exempt. In Crown shipyards the requirements are said to be well observed. The same remark applies to the few private yards on the Thames, in the Edinburgh, Dundee and Swansea districts, and in North Wales where the requirements, now statutory, were previously observed voluntarily. In the Cardiff district where 16 yards are under the Code, many contravention notices have been issued, and the work of bringing the firms into full compliance is being followed up.

No difficulty has been experienced on the Clyde and Tyne in obtaining compliance with the majority of the Regulations, and ship yard managers have shown themselves very willing to carry out their obligations in a proper spirit. The standards of safety have improved, especially in connection with erection, maintenance, and moving of stages, and protection of temporary openings on decks. Progress has also been made in the lighting of ships under construction and of the yards. On the Clyde safer paraffin lamps

are but slowly replacing the dangerous naphtha lamps used by the "black squad," but the use of portable acetylene lamps is increasing amongst painters, plumbers, joiners and similar workmen engaged on board ship. In Swansea acetylene and electric lamps are taking the place of portable oil lamps, and electricity for general lighting.

The requirement of suitable means for removing injured persons and suitable arrangements for first-aid treatment (Reg. 9) appears to have caused difficulty. A case of fatal injury in the Cardiff district may be cited as showing the need for this regulation. A man fell and fractured his pelvis; he had to be carried over 100 yards by his fellow workers without the use of a stretcher, and there was no one in the yard capable of giving first-aid treatment. The doctor at the inquest stated that the man ought not to have been so carried and that his injuries and sufferings were actually increased by this procedure. In many instances on the Tyne, though the old arrangements appear fairly effective on the surface, careful investigation showed that these were bad and antiquated. An ambulance box was always provided, but through want of appreciation of the elementary principles of modern aseptic treatment this was often unsatisfactory. The box was generally placed in the corner of a store or time office, it was often in a dirty condition and bandages, plaster and linements were not clean; scissors were rusty, hot water often unobtainable, and washing conveniences were primitive. Separate and spacious well-lighted and ventilated ambulance rooms are being provided, fitted with up-to-date lavatory and dust-proof cabinet for dressings, with a suitable supply of splints, clean bandages, dressings and antiseptic fluids in charge of a trained ambulance man. "Singleton" chairs, hand stretchers and wheeled ambulances have now been provided in every case. In the larger ship yards on the Clyde, similar arrangements have always existed, but in the smaller yards, provision for storing dressings and bandages was often found to be very primitive, and washing conveniences were not always conveniently accessible. An equally high standard to that existing in the larger works has been now insisted on, and this has been enforced upon those firms who were formerly content with the corner of a store, often badly lighted, as a suitable place for attending to injured workers.

Self-acting mules.—Lack of maintenance of guards for carriage wheels and backs of headstocks appear to be the chief irregularities in some districts. Guards for faller stops are not always as satisfactory as they might be, especially on newly installed mules in the woollen districts. Complaint is made from North Wales that some of the machinery recently supplied to small occupiers consists of old reconstructed machines with little or no fencing. Attention has been given in the Leeds district to improved guarding of backs of head stocks so as to secure the covering of the drag wheels, which though not specifically included in the regulations, was embodied in the Agreement for fencing machinery in woollen and worsted mills. Many of the newer mules, recently supplied to meet the demand occasioned by the military authorities, have these parts exceedingly well protected.

Tinning of metals.—This process is still declining in the harness furniture trade of the Walsall district, and the number of men employed is less than a year ago. Progress is reported in the effort to persuade the operatives to wipe the long brass strips, after tinning, under the hoods erected over the tinning hearths, although the process is not covered by the Code if the strips exceed 18 inches in length. Where the hearths and hoods were so small that it was impossible to wipe under the hoods, these have been enlarged or rebuilt. Irregularities as to exhaust ventilation and washing conveniences were found in the Nottingham district, but these have been remedied. From Lanarkshire it is reported that the observance of the regulations imposed upon the workers, as regards cleanliness and prohibition of meals in the tinning shops, left much to be desired.

Vitreous enamelling.—The use of leadless glazes is extending. In East London a firm who previously used lead in the enamelling of baths have adopted leadless glazes, and the finish compares most favourably with the older glazes containing lead, both in colour and wearing qualities. Two firms in the Sheffield district have discontinued the use of lead.

Woolcombing and sorting.—It is reported from Bradford that the regulations have been well observed. The practice of removing blood clots and blood-stained material from the wool by the sorters is being carefully observed, as this is considered of the greatest importance by the Anthrax Investigation Board in preventing cases of anthrax. During the year a close inspection of the sorting rooms in the Yorkshire districts was made by the Inspector for Dangerous Trades at the request of the Departmental Committee on Anthrax, with a view to suggesting standards for the exhaust appliances for opening screens, sorting boards, willows, cards, and dust collecting plant used in worsted factories.

CHAPTER X.

INDUSTRIAL DISEASES.

By T. M. LEGGE, M.D., *H.M. Medical Inspector of Factories.*

INDUSTRIAL POISONING.—The table below shows the number of cases, included in the returns, which have been reported in pursuance of Section 73, 1901, during the year 1914, and enables comparison to be made with similar figures for previous years. The figures for 1914 are the lowest recorded, the diminution being most notable in the figures for pottery.

TABLE I.—NOTIFICATION OF POISONING BY LEAD, PHOSPHORUS, ARSENIC AND MERCURY, AND OF ANTHRAX (UNDER S. 73, 1901) 1900–1914.

DISEASE AND INDUSTRY.	REPORTED CASES.*										
	1914.	1913.	1912.	1911.	1910.	1909.	Average. 1906–1908.	Average. 1903–1905.	1902.	1901.	1900.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lead poisoning	**45**^{28}	**535**^{27}	**587**^{44}	**669**^{37}	**505**^{38}	**553**^{30}	**619**^{30}	**601**^{23}	**629**^{14}	**863**^{34}	**1,058**^{38}
1 Smelting of metals... ...	36^{3}	26^{3}	56^{7}	48^{3}	34^{5}	66^{5}	45^{4}	31^{1}	28	54^{3}	34^{1}
2 Brass work	6	10	5	9^{1}	7	5	9	10^{1}	5	6^{1}	3
3 Sheet lead and lead piping	4$_{2}$	7	6	12	4	9^{2}	9	9	12	17	17^{1}
4 Plumbing and soldering ...	27	34^{1}	35^{5}	37^{2}	25^{1}	28	21^{2}	24^{2}	23^{1}	23	9
5 Printing	23^{1}	21^{1}	37	32^{2}	33^{4}	21^{1}	24^{2}	16^{2}	19	23^{1}	18^{2}
6 File cutting...	11^{1}	14	13	18^{2}	9^{1}	8	11^{1}	19^{2}	27	46^{7}	40^{3}
7 Tinning	10	9	15^{1}	13	17	22	18	13	11	10	5
8 White lead	29^{1}	29^{2}	23	41^{2}	34^{1}	32^{2}	86^{3}	105^{1}	143^{1}	189^{7}	358^{6}
9 Red lead	6	7	3	13^{1}	10	10	8	9	13	14	19
10 China and earthenware }	27^{6}	62^{11}	80^{14}	92^{6}	77^{11}	58^{5}	109^{8}	96^{3}	87^{4}	106^{5}	200^{8}
10a Litho-transfers ... }	1	1	1^{1}	1	1	1	6	4	2	7	10
11 Glass cutting and polishing	3^{1}	3^{1}	1^{1}	5	—	4^{2}	4^{1}	2	8^{2}	11^{3}	7
12 Vitreous enamelling ...	11	9	5	19^{1}	17	7	6	3	3^{1}	9	11
13 Electric accumulators ...	41	44	38^{1}	24^{1}	31	27^{2}	24	29	16^{1}	49^{1}	33
14 Paints and colours ...	21	22^{1}	19	21	17^{1}	39^{2}	32	43^{1}	46	56	56^{1}
15 Coach building	57^{4}	71^{2}	84^{7}	104^{5}	70^{5}	95^{6}	75^{4}	60^{4}	63^{1}	65^{4}	70^{5}
16 Ship building	31^{5}	31^{1}	34^{2}	36^{6}	21^{2}	27^{1}	21^{1}	35^{1}	15^{1}	28^{1}	32^{2}
17 Paint used in other industries	39	49^{3}	48^{3}	56^{1}	51^{3}	42	44^{2}	41^{2}	44^{1}	61	50^{5}
18 Other industries	62^{3}	86^{1}	84^{2}	88^{4}	47^{3}	52^{2}	67^{3}	54^{1}	64	86^{1}	86^{4}
Phosphorus poisoning ...	—	—	—	—	—	3	1	1^{1}	1^{2}	4	3
Arsenic poisoning ...	2^{1}	6	5	10^{1}	7	4	12^{1}	4	5	12^{1}	22^{3}
Mercurial poisoning ...	10	14	17	12	10^{1}	9	7	6	8	18	9^{1}
Anthrax	54^{7}	70^{7}	47^{6}	64^{11}	51^{4}	56^{12}	57^{13}	52^{13}	38^{9}	39^{10}	37^{7}
Wool...	26^{5}	43^{1}	31^{6}	35^{10}	28^{3}	28^{3}	22^{5}	22^{6}	12^{2}	6^{1}	9^{2}
Horsehair	5	5^{1}	7	8^{1}	6^{1}	8^{2}	12^{3}	9^{2}	10^{2}	9^{1}	12^{3}
Handling of hides and skins	15^{1}	19^{2}	8	20	14^{3}	18^{6}	15^{3}	16^{3}	11^{5}	20^{5}	9^{1}
Other industries	8^{1}	3	1	1	3^{2}	2^{1}	9^{3}	6^{3}	5	4	7^{1}

* The principal numbers relate to cases, the small figures to deaths. Fatal cases not reported in previous years are included as both cases and deaths.

LEAD POISONING.—Comparison of the figures for the groups of industries over a number of years warrants the general conclusion that diminution is marked where periodical medical examination is required and the processes are amenable to exhaust ventilation locally applied, such as smelting of metals, tinning, white lead, pottery and paints and colours, but little alteration in the figures is shown where these precautions are only to a slight extent applicable as in printing, plumbing, coach painting, shipbuilding and paints used in other industries. Apparent exceptions to this are the manufacture of electric accumulators in the former case, and file cutting in the latter, and to them reference is made later. Nothing comes out more vividly from the close study of reported plumbism than the dependence of the symptoms on the inhalation of fumes or dust of the metal itself or of its compounds. The influence of absorption through the skin or of eating food with unwashed hands is relegated to the background.

A research into the subject of soldering, in view of the possible bearing of sections 74 and 75 (*a*), 1901, on the process, is kindly being undertaken for the Department in the Government Laboratory, and already considerable progress has been made.

I append the usual tables giving incidence according to the several processes in the main branches of the pottery trade. They are noticeable as showing that exhaust ventilation must now be most successfully applied (and maintained) to have reduced in so marked degree incidence from dust in ware cleaning and from spray in colour and glaze blowing. The figures in column (2), however, (drawn from a census of the workers in 1912) probably overstates the number actually employed in the several processes during the year judging from the figures in Table VI, p. 102.

TABLE II.—REPORTED CASES, PERSONS EMPLOYED, AND PROPORTION OF CASES TO PERSONS EMPLOYED, IN THE SEVERAL CLASSES OF EARTHENWARE AND CHINA WORKS AND IN THE VARIOUS PROCESSES.

Processes.		Persons Employed.	Cases reported in 1914 as occurring in Works for the Manufacture of							Cases reported as occurring in						Attack Rate per 1,000 Employed.					
			China.	Earthenware.	Tiles.	Jet and Rockingham.	China Furniture and Electrical Fittings.	Sanitary Ware.	Total.	Average.						Average.					
		1912.								1913.	1912.	1911.	1907-1910.	1903-1906.	1899-1902	1914.*	1913.*	1912.†	1911.†	1907-1910.†	1903-1906‡
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
In Dipping house:—																					
Dippers ...	M.	823	—	8	—	—	—	1	9	7	18	16	17	18	26	11	9	23	20	22	23
	F.	169	—	—	—	—	—	—	—	4	—	6	6	4	7	—	24	—	40	40	30
Dippers' assistants	M.	509	—	1	—	—	—	—	1	1	3	2	3	3	7	2	2	7	4	7	7
	F.	341	—	—	—	—	—	—	—	5	6	14	13	18	17	—	15	15	35	33	46
Ware cleaners	M.	140	—	—	—	—	—	—	—	1	1	—	1	2	3	—	7	9	—	9	20
	F.	501	—	—	1	1	—	—	2	8	15	15	15	18	30	4	16	33	33	33	41
Total ...	M.	1,472	—	9	—	—	—	1	10	9	22	18	21	23	36	7	6	16	13	15	17
	F.	1,011	—	—	1	1	—	—	2	17	21	35	34	40	54	2	17	21	35	34	42
Glost placers...	M.	2,559	1	7	—	—	—	—	8	21	12	17	16	12	33	3	8	5	7	7	5
	F.	110	—	1	—	—	—	—	1	1	1	2	1	1	1	9	9	8	17	8	10
Majolica painters ...	M.	22	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	45	—	—	—
	F.	318	—	—	—	—	—	—	—	1	3	4	6	8	10	—	3	7	9	13	14
Ground layers	M.	45	—	—	—	—	—	—	—	—	1	1	1	—	1	—	—	17	17	17	—
	F.	150	—	1	—	—	—	—	1	—	1	2	1	1	4	7	—	6	13	6	5
Colour and litho dusters	M.	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	F.	98	—	—	—	—	—	—	—	—	—	—	—	1	4	—	—	—	—	—	7
Enamel colour and glaze blowers ...	M.	55	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	39	—	—	—
	F.	296	—	3	—	—	—	—	3	3	11	2	3	3	2	10	10	38	7	10	14
Colour makers and millers and mixers of glaze or colour ...	M.	369	—	—	1	—	—	—	1	7	1	8	5	5	6	3	19	3	22	13	13
	F.	58	—	—	—	—	—	—	—	1	—	1	1	1	1	—	17	—	18	18	48
Other persons in contact with lead ...	M.	364	1	—	—	—	—	—	1	2	2	1	2	1	2	3	5	6	3	6	5
	F.	151	—	—	—	—	—	—	—	—	2	1	1	2	4	—	—	15	8	8	21
Grand Total	M.	4,893	2	16	1	—	—	1	20	39	41	45	44	41	80	4	8	9	10	10	9
	F.	2,192	—	5	1	1	—	—	7	23	39	47	45	57	80	3	10	17	20	19	25
	M. & F.	7,085	2	21	2	1	—	1	27	62	80	92	89	98	160	4	9	12	13	13	15

* Calculated on Returns of Employment for 1912.
† " " " " 1907.
‡ " " " " 1904.
§ " " " " 1900.

TABLE III.—NORTH STAFFORDSHIRE POTTERIES DISTRICT.—REPORTED CASES, PERSONS EMPLOYED, AND PROPORTION OF CASES TO PERSONS EMPLOYED IN THE VARIOUS PROCESSES IN EARTHENWARE AND CHINA WORKS.

Processes.	Persons Employed.	Cases Reported.								Attack rate, per 1,000 employed.							
						Average.								Average.			
	1912.	1914.	1913.	1912.	1911.	1907-1910.	1903-1906.	1899-1902.	1898.	1914.*	1913.*	1912.†	1911.†	1907-1910.†	1903-1906.‡	1899-1902.§	1898.‖
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
pping house:—																	
ppers ... ... { M.	525	8	4	15	15	12	13	19	41	15	8	30	30	24	27	38	83
F.	127	—	2	—	5	4	8	3	7	—	16	—	47	37	35	48	86
ppers' assistants... { M.	427	1	1	3	2	3	3	6	20	2	2	8	5	8	9	16	32
F.	183	—	5	5	12	9	14	13	19	—	27	19	47	35	59	62	178
re cleaners ... { M.	105	—	1	1	—	1	1	3	1	—	10	11	—	11	11	37	10
F.	408	2	6	14	13	15	18	27	58	5	15	35	33	38	46	65	127
Total ... ... { M.	1,057	9	6	19	17	16	17	28	62	9	6	20	18	17	17	29	55
F.	718	2	13	19	30	28	35	43	84	3	18	25	39	37	49	63	130
placers ... ... { M.	2,104	4	21	12	11	13	8	28	48	2	10	7	6	7	4	15	27
F.	75	1	1	1	1	1	—	1	1	13	13	12	12	12	—	19	22
ica painters ... { M.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
F.	276	—	1	3	4	5	8	7	31	—	4	8	11	13	17	16	105
nd layers ... { M.	30	—	—	1	1	—	—	1	10	—	—	20	20	—	—	21	112
F.	134	1	—	1	2	1	1	5	45	7	—	7	14	7	5	17	118
r and litho { M.	6	—	—	—	—	—	—	—		—	—	—	—	—	—	—	
ers. F.	76	—	—	—	—	—	1	4		—	—	—	—	—	8	40	
el colour and { M.	44	—	—	2	—	—	—	1		—	—	44	—	—	—	56	
e blowers. F.	274	3	3	10	1	3	2	2	32	11	11	36	4	11	10	13	288
r makers and { M.	259	1	6	1	6	4	4	5	35	4	20	4	26	18	16	24	166
lers and mixers F.	41	—	1	—	1	1	1	1		—	24	—	21	21	83	333	
glaze or colour.																	
persons in con- { M.	263	1	2	2	1	1	—	2		4	8	9	5	5	—	29	
with lead. F.	122	—	—	2	1	1	1	3		—	—	18	9	9	12	200	
M.	3,763	15	35	37	36	34	29	65	152	4	9	11	11	10	9	21	49
Grand Total F.	1,716	7	19	36	40	33	50	65	196	4	11	19	21	20	27	37	124
M. & F.	5,479	22	54	73	76	72	79	130	348	4	10	14	14	14	15	27	94

* Calculated on Return of Employment for 1912.
† " " " 1907.
‡ " " " 1904.
§ " " " 1900.
‖ " " " 1896.

Dr. F. Shufflebotham, of Newcastle-under-Lyme, has described¶ 14 cases of lead poisoning (of whom 10 were pottery workers) which had come under his notice among men who were in the Territorial Forces. Onset of symptoms varied from three to seven weeks after enlistment and is attributed not unreasonably to the increased metabolism induced by the altered conditions of life. In the worst case—one of neuritis and other symptoms in a dipper who had been suspended two years previously by the Certifying Surgeon from employment in a lead process—discharge from the battalion became necessary.

¶ *British Medical Journal*, 1915, vol. I., p. 672.

Dr. K. W. Goadby* has investigated the claim made as to the efficacy of a bi-polar electric bath as recommended by Sir Thomas Oliver in eliminating lead from the body as it were by a process of de-ionisation. In actual use the lead worker sits with his feet in the anodal bath and his arms in the cathodal, a current of 20 to 40 ma. being used at a voltage of 16. The baths are filled with salt solution. Dr. Goadby's experiments show that lead is present in the body probably as an albuminate, and as such is not acted upon or deposited by the electric current until it has been freed from its organic combination. Only when this has been accomplished and a suitable electrolyte is used can a deposit of lead take place. There is therefore no experimental evidence to show that lead is ionisable when present in the animal body. His experiments give no support to the contention that even if lead were stored up in the peripheral structures it is removable by electrical means. Dr Goadby further states " Iron is easily deposited by electrolysis ; if, therefore, Sir Thomas Oliver's contention is correct that lead is eliminated electrolytically by a double bath or any other method, the iron from the haemoglobin of the red blood corpuscles should also be removed."

Dr. W. H. F. Oxley,† Certifying Surgeon for Poplar, similarly investigated the subject not only on the practical side, but experimentally also with Dr. A. W. Stewart in the Royal Institute of Public Health, concluding that the proposed electrical treatment had no effect upon the blue line and does not extract lead from the body, and he is " forced to the conclusion that no practical good would result from the regular treatment of lead workers in this way."

This was the conclusion I was very regretfully forced to after visiting works in which the treatment had been systematically tried.

PHOSPHORUS POISONING.—No case is included in the return, but the following brief account by Dr. Collis of certain symptoms, probably due to phosphoretted hydrogen poisoning, points to a new industrial danger.

> Phosphoretted hydrogen.—Serious consequences were probably prevented by an inquiry which I made into a new method, recently introduced from France, for manufacturing hydrogen gas. In this method ferro-silicon is mixed with caustic soda ; a complex silicate is formed and hydrogen is evolved. Previous inquiry into the nature of ferro-silicon had shown that ferro-silicon is not a pure material, and that when damp it evolves phosphoretted hydrogen gas. This gas is extremely poisonous and has caused several fatalities among passengers on boats with cargoes of ferro-silicon.‡ Although those in charge of the hydrogen generating plant had no knowledge of the danger associated with ferro-silicon, fortunately no fatality had occurred ; but men employed had suffered from headache, dizziness, dryness of the throat, nausea, diarrhœa and general malaise, symptoms ascribed at first to tainted food. As, however, these symptoms agree with those experienced after inhaling minute amounts of phosphoretted hydrogen, and as the hydrogen generated smelt like acetylene, an odour to which phosphoretted hydrogen was likened in the Keadby Canal cases,§ there can be no reasonable doubt that this method of generating hydrogen is associated with grave danger and should only be carried on under precautions such as the following :—
>
> (*a*) The storage of caustic soda and of ferro-silicon should be in separate places ; (*b*) ferro-silicon in store should be kept carefully dry ; (*c*) no one with hands or clothes soiled with caustic soda should manipulate ferro-silicon ; (*d*) waste material from the hydrogen generating tank should be conveyed into the open air in a closed pipe ; (*e*) free ventilation should be provided whenever gas is being generated ; (*f*) all men employed should be warned of the danger of inhaling the gas.

The method of manufacture is carried on, on any scale, in only two places, and the occupiers have been fully informed.

ARSENIC POISONING.—The two cases reported indicate the two distinct ways in which arsenic poisoning manifests itself—(1) from inhalation of arseniuretted hydrogen gas, and (2) contact of the skin with a salt of the material. In the former, inhalation of the gas in minute doses destroys the red blood corpuscles. The haemoglobin thus thrown into the blood stream sets up, in combination with effort of the liver and kidneys to eliminate it, an intense jaundice. In the latter, the salt (in the case in point arsenic chloride) acts as a local irritant or escharotic on such portions of the skin with which it comes into contact. The fatal case of arseniuretted hydrogen poisoning is thus described by Mr. Crampton (Stirling) :—

> The poisoning appears to have been contracted during the cleaning of one of the saturators used for the manufacture of sulphate of ammonia in a shale oil works. The process of manufacture is similar to that described in the Annual Report for 1914, page 133. The saturators are made of wood, the insides being lined with lead, and it is usually found necessary to clean them out about once in every

* *Lancet*, October 3rd, 1914.

† *Ibid.*

‡ Local Government Board Report on Ferro-silicon, 1909, Wyman & Sons, Ltd. (Cd. 4958), price 1s. 11d.

§ *Ibid*, page 14.

six weeks. The particular saturator under notice had been put out of action on Monday, the 7th September, at about 6 a.m., the ammonia gas pipe and exhaust being shut off, the door of the saturator opened, and any liquor remaining blown out by the ejector which is in the ordinary way used for blowing the sulphate out. Deceased, who was foreman in the sulphate house, then poured some half-dozen pails of water into the saturator, the object of this being to melt any solid deposits in the well or adhering to the sides, so saving the necessity for "digging" out such deposits in the subsequent cleaning process, and possibly injuring the lining of the saturator. This appears to be all that was done on the Monday. On the 8th, deceased went into the saturator with a galvanised pail, and removed the water which he had put in on the previous day. On the 9th deceased was in the saturator for about an hour "scraping round about." On this occasion he was accompanied by a youth of 17, who held a candle for him. On the 10th deceased was in the saturator by himself both before and after breakfast, for about ¾-hour on each occasion. On this day he is said to have felt unwell at about 1 o'clock, before going home to his dinner, the symptoms being pain in the kidneys and small of the back. He returned to work after dinner, but left almost immediately, and when he got home noticed that his urine was reddish coloured. He was then removed to Edinburgh Infirmary, where he died on the 14th. His death was certified as due to "Poisoning by arsenic-hydrogen (6 days), acute nephritis (5 days), œdema of lungs (1 day), œdema of brain (1 day)."

How exactly this dangerous gas was generated in this and previous similar cases is still shrouded in mystery. At the principal works the view is still held that the galvanised pail was the deciding factor, but the local managers of the crude oil works hold an opposite view. The manager stated that the deceased was in the habit of remaining in too long at one time—much longer than is usual in the district.

Deceased was 50 years of age, and was described as a robust man. He had been in the oil works for the past eight years. I was surprised to hear in the course of my investigation that he had been in Edinburgh Infirmary some two years ago suffering from the same type of poisoning.

Samples were forwarded by Mr. Crampton and submitted to analysis in the Government laboratory. The report was as follows :—

The samples consisted of (1) fluid taken from the saturator, (2) deposit from saturator, and (3) a galvanised iron pail.

The fluid (1) was an acid aqueous solution of ammonium sulphate. It contained 0·86 per cent. of free sulphuric acid and a little chloride. Arsenic was present in the proportion of 0·23 per cent. or 179·5 grains per gallon calculated as arsenious oxide.

The deposit (2) was a damp mass of dark colour possessing an odour of tar oil. It consisted of impure ammonium sulphate and contained arsenic equal to 16 grains per pound calculated as arsenious oxide.

The pail (3) was rusty and consisted of ordinary galvanised iron, but most of the inner zinc coating had been eaten away.

It was found that the zinc coating reacted with the acid fluid (1) evolving arseniuretted hydrogen. The iron forming the body of the pail reacted similarly with the fluid. In the latter case 0·042 grains of arseniuretted hydrogen was evolved from 1 square inch of the surface of the iron in one hour. Assuming that the pail was filled with the liquid as far as the upper line of corrosion, the amount of arseniuretted hydrogen which would be evolved in 10 minutes from the surface of the pail in contact with the liquid would amount to 1·83 cubic inches.

It is probable that the arsenic was derived from the sulphuric acid used in the saturator.

Subsequently all occupiers of shale oil works were requested (apart from general measures during cleaning operations to ensure a constant supply of fresh air and limitation of the time a man should remain in the saturator) to substitute wooden for metal pails in the sulphate house and in tanks which had contained sulphuric or hydrochloric acid as the surest means of preventing occurrence of this fatal form of poisoning.

Mercurial Poisoning.—Of the ten cases reported in 1914 four occurred in the manufacture of thermometers; two from the dust of fulminate of mercury in filling detonators; two in the manufacture of felt hats in (*a*) forming, (*b*) feeding fur waste into a cutting machine; and one each in the manufacture of mercury cyanide and mercuric oxide paint. Both the cases in the felt hat factories had been notified in the previous year. Of one of them with marked tremor, Dr. F. G. Tylecote stated, "I attended him over a year ago in an attack from which he recovered, and he is recovering rapidly again under treatment." Of the thermometer cases Mr. Verney (North West London) says :—

Two cases of mercurial poisoning were reported from thermometer works. I am inclined to think that absorption of mercury in this trade chiefly arises from the liberation of the large quantities of vapour by the accidental breaking of large thermometer bulbs when the mercury is being boiled to expel the air.

Dr. Paddock Bate, Certifying Surgeon for Bethnal Green, noticed the number of young boys employed for whom he considered periodical medical examination would be useful. Dermatitis of the face and arms and conjunctivitis were the symptoms in the cases affected by fulminate of mercury, there being no salivation or tremor. The duration of employment in those reported is usually very short—2–4 months—before the attack developes. Susceptibility is of importance in determining whether a worker can continue or not.

The affection constitutes no menace to life. The symptoms I think are due much more to fulminate, the acid element, than to mercury, the base. Of the case due to cyanide Mr. Verney reported :—

> All possible precautions appear to have been taken. Milk was given daily, rubber gloves, goggles and overalls were used, exhaust ventilation and an antidote were provided, and the workers were excluded from the workrooms during meal times.

ANTHRAX.—Reports on anthrax numbered 54 (including 7 deaths) as compared with 70 (also with 7 deaths) in the previous year. Details of all the cases in the Returns are given below :—

TABLE IV.—PARTICULARS OF CASES OF ANTHRAX, 1914.

No.	Locality.	Sex.	Age.	Occupation.	Severity. R=Recovery. F=Fatal.	Situation and Symptoms.	Verification.	Material.	Treatment. E=Excision. S=Serum.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Wool :—										
1	Earlsheaton	M.	57	Willeyer	F.	Right cheek ..	Culture, &c.	Foreign and Colonial wool (including East Indian) and cow hair.	No special treatment.	Admitted to hospital in dying condition.
2	Dewsbury	M.	41	Willeyer	F.	Chin (cerebral hæmorrhages)	Culture, &c.	English cow hair and woolcomber's waste	E. and S.	No treatment until unconscious. Had gone to Witney, when pustule first showed.
3	Bury ..	M.	45	Carding	R.	Forehead	Culture, &c.	Cow hair	E.	—
4	Bradford ..	M.	45	Mohair sorter ..	R.	Neck	Culture, &c.	Turkey mohair	E. and S.	—
5	Savile Town	F.	13	Hanker	R.	Right forearm ..	Culture, &c.	East Indian	S.	—
6	Waterfoot	M.	44	Wool mixer ..	R.	Neck	Culture, &c.	East Indian, "Joria" and "Vicancer"	E.	—
7	Kidderminster	M.	30	Blending . ..	R.	Cheek	Clinical only	East Indian, Shropshire and German skin wool, Egyptian, Bradford waste	S.	—
8	Saltaire ..	M.	22	Wool sorter ..	R.	Right forearm ..	Culture, &c.	Turkey mohair	E. and S.	—
9	Bradford ..	M.	36	Card jobber ..	R.	Cheek	Culture, &c.	Egyptian, Bagdad, Syrian, and Oporto wools, Russian and East Indian goat hair	E. and S.	—
10	Bradford ..	M.	21	Soap boiler for washbowl	R.	Neck	Culture, &c.	Egyptian, Bagdad, Syrian and Oporto wools, Russian, East Indian goat hair	E. and S.	—
11	Shipley ..	M.	26	Card jobber ..	R.	Neck	No bacilli found microscopically	China camel, Russian camel, grey Persian	E. and S.	Doubtful case.
12	Bradford ..	M.	35	Washbowl feeder	R.	Neck	Culture, &c.	Russian camel hair, Pekin camel hair	E. and S.	—
13	Bradford ..	M.	64	Washbowl feeder..	F.	Neck	Culture, &c.	Egyptian, Bagdad, Syrian and Oporto wools, Russian and East Indian goat hair	E. and S.	—
14	Shipley ..	M.	42	Washbowl minder	F.	Forehead with subsequent gastro-intestinal infection	Culture, &c.	China camel hair, Persian, Alpaca, Scotch and English	E. and S.	200 lb. bloodstained wool removed from 22 tons of hair Persian.
15	Witney ..	M.	15	Scribbling machine feeder	R.	Right forearm ..	Culture, &c.	East Indian	Not stated	—
16	Rawtenstall	M.	26	Willeyer	R.	Neck	Culture, &c.	East Indian	Not stated	—
17	Dewsbury	M.	56	Warp warehouseman	F.	Eyelid	Culture, &c.	Australian, English, Irish, Scotch, Welsh, New Zealand, Peruvian, Egyptian and Russian	S.	Treatment not sought until too late.
18	Kidderminster	M.	50	Stoker at boilers	R.	Right hand ..	Microscopically	Persian, East Indian, Oporto, English and Colonial	S.	—
19	Kidderminster	M.	31	Card dresser ..	R.	Chin	Microscopically	East Indian, New Zealand, Egyptian	S.	—
20	Waterfoot	M.	43	Scribbling machine	R.	Cheek	Culture, &c.	East Indian	E.	—
21	Kidderminster	M.	17	Wool warehouse labourer	R.	Neck	Microscopically	English, Colonial, Persian ..	E. and S.	—
22	Waterfoot	M.	31	Scribbling machine feeder	R.	Neck	Culture, &c.	East Indian	E.	—
23	Shipley ..	F.	37	Drying machine attendant	R.	Chin	Culture ..	Russian camel hair, Persian, Alpaca, Syrian, Oporto, Egyptian	E. and S.	—
24	Shipley ..	M.	14	Doffer in spinning room	R.	Eyelid	Culture, &c.	Mohair	S.	—
25	Heckmondwike	M.	61	Willeyer	R.	Forehead	Culture, &c.	East Indian	S.	—
26	Heckmondwike	F.	17	Condenser minder	R.	Neck	Culture, &c.	East Indian, Asiatic, Khaki..	E. and S.	—
Horsehair :—										
1	N.E. London	M.	15	Opening hair ..	R.	Cheek	Culture, &c.	English cow and horse tails and pig hair	S.	—
2	Castle Cary	M.	16	Assistant curler ..	R.	Cheek	Clinical only	Goat hair from Germany ..	E. and carbolic	—
3	Castle Cary	M.	16	Cleaning hair ..	R.	Cheek	Clinical only	Goat hair from Germany ..	E. and carbolic	—
4	Castle Cary	M.	23	Disinfecting hair ..	R.	Leg	Clinical only	Goat hair from Germany .	E.	—
5	Chesham ..	F.	37	Brushmaker ..	R.	Lower eyelid ..	Culture, &c.	China	E.	An outworker.
Hides and Skins :—										
1	Todmorden	M.	35	Soaking and liming pits	F.	Neck	Culture, &c.	Buffalo hides from Singapore..	S.	Making picker skins.
2	Yeovil ..	M.	22	Soaking and liming pits	R.	Arm	Microscope	Cape sheep skins	E.	The first case reported from this glove making district.

TABLE IV—*continued.*

No.	Locality.	Sex.	Age.	Occupation.	Severity. R=Recovery. F=Fatal.	Situation and Symptoms.	Verification.	Material.	Treatment. E=Excision. S=Serum.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Hides and Skins—*continued.*										
3	Leeds ..	M.	49	Pit handler ..	R.	Eyebrow	Cultures negative	China, West Coast of India and West African hides	S.	—
4	Warrington	M.	20	Labourer in tannery	R.	Upper arm ..	Culture, &c.	Buffalo hides from Straits Settlements	E. and S.	Only worked in factory three weeks.
5	Leeds ..	M.	47	Lime drawer ..	R.	Forehead	Culture, &c.	Rangoon and Karachi hides..	E. and S.	—
6	S. London	M.	45	Handling hides and skins in warehouse	R.	Face	Culture, &c.	Mombassa hides	E.	—
7	Liverpool ..	M.	20	Labourer in tanning pits	R.	Forehead	Microscope	Mombassa, Central Africa and English hides	S.	—
8	Warrington	M.	55	Unhairing ..	R.	Cheek	Microscope	East Indian buffalo hides, Singapore, Penang	E. and S.	Dry hides placed in lime pits before any other treatment.
9	Runcorn ..	M.	38	Oil drums attendant in tannery handling finished leather	R.	Cheek	Clinical ..	China, West African, Mombassa, Abyssinian dry hides, Buffalo hides	E.	Worked at spot 200 yards away from dry hides.
10	Leeds ..	M.	55	Scudder in tannery	R.	Left forearm ..	Culture, &c.	Buffalo hides from Rangoon or Karachi, cow hides from East Africa	S.	—
11	Warrington	M.	19	Unhairing ..	R.	Eyelid	Culture, &c.	Singapore hides	E. and S.	—
12	Edinburgh	M.	42	Sorting skins ..	R.	Neck	Not stated	German and Cape goat skins..	Not stated	—
13	Warrington	M.	38	Handling hides in tannery	R.	Right arm ..	Microscope	Singapore and Pena.. hides..	E. and S.	—
14	Leeds ..	M.	72	Handling skins in tannery	R.	Finger	Culture, &c.	Mombassa hides	E.	—
15	Warrington	M.	30	Carrying hides ..	R.	Neck	Culture, &c.	South Nigerian and Abyssinian hides	E. and S.	—
16*	E. London	M.	36	Dock labourer ..	R.	Cheek	Culture, &c.	Dry hides from Rhodesia, sheep skins	E. and S.	—
17*	Liverpool ..	M.	54	Dock labourer ..	F.	Neck	Culture, &c.	Bones from Egypt	No special treatment	His son noticed resemblance of lesion to illustration on Anthrax Placard.
18*	E. London	M.	44	Dock labourer ..	R.	Neck	Culture, &c.	Cow hides from Aberdeen ..	E. and S.	—
19*	S. London	M.	48	Dock labourer ..	F.	Neck	Culture, &c.	.. ..	S.	—
20*	Liverpool ..	M.	40	Dock labourer ..	R.	Hand	Culture, &c.	Brazilian dry hides	E. and S.	—
21*	E. London	M.	35	Dock labourer ..	R.	Cheek	Cultures negative	Wool from South Africa ..	S. only	—
22*	E London	M.	26	Dock labourer ..	R.	Face	Culture, &c.	Goat and sheep skins from Morocco	E. and S.	—
23*	Liverpool ..	M.	40	Checking hides ..	R.	Neck	Culture, &c.	Dry hides, some from West Africa	E. and S.	—
Other Industries:—										
1	Dewsbury	M.	32	Rag grinder ..	R.	Cheek	Culture, &c.	Possibly waste from East Indian wool spinners	S.	—
2	Aberdeen ..	M.	28	Weighing bone meal in manure works	R.	Left shoulder ..	Microscope	East Indian bone meal ..	E. and S.	—
3	Aberdeen ..	M.	23	Loading bone manure	R.	Thoracic region ..	Microscope	East Indian bone meal ..	E. and S.	—
4	Aberdeen ..	M.	35	Carrying bags of bones in manure works	R.	Neck	Microscope	East Indian bone meal ..	E.	—
5	Aberdeen ..	F.	50	Mending bone meal bags	F.	Neck	Culture, &c.	Indian bone meal	No special treatment	Disease diagnosed too late.
6	S. London	F.	31	Office cleaner and coffee sorter	R.	Neck	Culture, &c.	Not ascertained—scheduled wools stored in warehouses	S.	—
7	Liverpool ..	M.	19	Cotton seed cleaning	R.	Chin	Culture, &c.	Cotton seed in bags from West Africa	E. and S.	—
8	Liverpool ..	M.	34	Labourer on goods received staff	R.	Chin	Culture, &c.	Cotton seed in bags from West Africa	E. and S.	—

* Cases marked with an asterisk are published for completeness but were not included in the returns as the disease was not contracted in a factory or workshop.

Wool.—The worsted industry of Bradford accounts for 10 cases, the woollen industry of the West Riding (Dewsbury and Heckmondwike) for 6, the felt industry of the Rossendale valley for 5, Kidderminster industries for 4 and Witney blankets for 1. The war in some way must have affected the figures as 42 of the total cases of anthrax were reported in the first seven months of the year of which 23 were due to wool. Nevertheless since August immense quantities of Persian and other scheduled wools have been manipulated. In no less than 10 of the cases, as shown in column 9, suspicion attached to East Indian wool. Of the Bradford cases Mr. Allen Taylor writes :—

> The wools and hairs placed in respective significance to which the cases were attributed are as follows :—Persian wool, camel hair, Turkey mohair, East Indian goat hair, Syrian wool and Egyptian wool. Persian wool has been used in larger quantities this year than in previous years. The wool of this class hitherto dealt with in Halifax is now manipulated in the Bradford district. Notwithstanding the latter fact fewer cases have occurred this year than last in the factories concerned. This satisfactory state of affairs may be claimed as a result of the keen watch that is kept over conditions that lend themselves to a spread of the disease.

Of the Kidderminster cases Mr. Mudford (Worcester) states that all the attacks yielded readily to treatment by Sclavo's serum. The Departmental Committee of which I am

a member appointed to inquire into the dangers from infection by anthrax in the worsted industry with a view to amendment of the Regulations has held numerous sittings during the year.

Anthrax Investigation Board.—Mr. J. E. Fawcett, Chairman of the Board since its formation in 1905, unfortunately felt it necessary in May to resign his position. I take this opportunity of expressing my high appreciation of the work which Mr. Fawcett has done, first in organising the methods and widening the scope of investigation, secondly in his devotion to the cause, and thirdly in the success which has attended his efforts. The Ninth Annual Report contains the results of further experiments on chemical disinfectants, unfortunately not confirming, as regards the sterilising power of cyllin and germaphoid fluid (Leach's fluid), previous favourable opinion expressed. All the information the Board has collected through its various members has been placed unreservedly at the service of the Anthrax Committee, whose work thereby has been much simplified. I received full details of the cases of anthrax investigated by Dr Eurich. In 1913 before the Royal Society of Medicine, London, Dr. Eurich dealt with "Anthrax in the Woollen Industry, with special reference to Bradford." *

Horsehair.—There is evidence that since the war there has been increased activity in the cheap brush trade for which horsehair is used. Thus in November a case of Anthrax in an outworker in Chesham was brought to our knowledge. This was the first case reported from the district where some hundred outworkers are employed by the six brush factories. I thought it not unlikely that China horsehair which had not undergone disinfection was coming into use. From Miss Whitworth's inquiries this seemed clear beyond cavil, but the difficulty of proof that this was so, in the absence of witnesses from China, was brought home to the Department in the proceedings taken subsequently by Miss Squire against the occupier. The horsehair Regulations are necessarily difficult to administer in view of the only possible definition of disinfection allowed. In 1911 a letter (Form 1510) had to be sent to vendors of horsehair because of the loose and inadequate guarantees as to disinfection which were being given. Disinfection by steam under definition (*a*) of the Regulations necessarily means the use of some special disinfecting apparatus. It is only when steam is enclosed in such an apparatus that it can maintain a temperature of 212° Fahr., at which temperature it is invisible. What is generally understood as steam, that is, condensed moisture such as is visible from the spout of a kettle, would not comply with the definition. So far as I know steam under pressure can only be applied to coloured hair as it will turn white hair yellowish. White hair must therefore be treated with some other method under definition (*b*). The advantages of steam are speed, certainty in destroying anthrax spores if properly managed, and absence of wetness in the hair. Steam only makes hair damp for a short time after the door of the disinfecting apparatus is opened. If steam is used no certificate is required. What should be done by vendors is to have printed slips which could be issued with the consignment or invoice stating "Guaranteed disinfected by steam in accordance with Definition (*a*) of the Home Office Regulations for the Use of Horsehair," or quoting the words of the definition in full.

Immersion of horsehair in boiling water cannot be described as the equivalent of dry steam. Hence when it is employed it must be by certificate under definition (*b*). Such a certificate has been submitted by Dr. Blair M. Martin, Lecturer in Bacteriology, Glasgow University, in the case of two firms. Other firms can obtain such a certificate for boiling water from Dr. Blair M. Martin or other bacteriologist qualified under the Regulations to give one, and, having obtained it, must submit it to the Secretary of State.

The case of anthrax in this outworker made me write to the Medical Officer of Health (who fortunately was also the Certifying Surgeon and gave us the first intimation we had of it) saying that in my opinion his Urban District Council could usefully extend the provisions of the Infectious Disease (Notification) Act, 1889, in their district so as to include anthrax. The Assistant Secretary of the Local Government Board, in his memorandum dated 29/10/09 to Borough and Urban District Councils, has stated that if any Council wishes to do so the Board would be prepared to entertain the application favourably. As Section 73 of the Factory and Workshop Act, 1901, only requires medical practitioners to notify to the Chief Inspector of Factories cases contracted *in a factory or workshop,*

* Transactions, May 23rd, 1913.

there is a danger of cases in outworkers escaping notice altogether. This would be regrettable seeing how much the local authority can do in rendering safe for manipulation, by steam or boiling, after a case of anthrax, the remainder of any consignment found in an outworker's home.

Hides and skins.—In addition to the cases included in the returns eight others (including two deaths) were notified among dock labourers and therefore could not properly be included in the Returns. As they have much interest the details in regard to them are given. A case—the first of its kind strange to say—was reported from a glove factory in Yeovil using Cape skins. Of the seven cases in Warrington Mr. Brothers writes :—

> As seven cases of anthrax occurred in connection with hides between January and May, and there has been no case in the last seven months, it suggests the possibility of more than one case arising at intervals from the same originally infected material. Within two months of a case of anthrax in a man employed at a wharf and warehouse where hides are received on their way to tanneries, three other cases occurred where hides were tanned or hair off hides dealt with. It is not possible to identify definitely any particular lot of hides as infected, but it seems not unlikely that the same material gave rise to more than one case of poisoning at different factories. In all seven cases the patients recovered.

Of one of the four cases in Leeds Mr. Shuter says :—

> An occupier who had sustained an insignificant burn on the little finger in lifting a kettle, proceeded to turn over and inspect a consignment of Mombassa hides. A pustule quickly developed at the burn and only prompt amputation of the finger prevented more serious trouble.

Other industries.—Four of the cases occurred in bone manure works in Aberdeen. One case in a woman engaged in mending sacks in which the bone meal arrived proved fatal. The true nature of the case unfortunately was not recognised in time for operative treatment to have been of avail. The bone meal was imported from Bombay. A further case in Liverpool was attributed to handling a consignment of Egyptian bones. The protean nature of the disease is brought out in three cases—one in rag grinding, a second in a grain warehouse and a third in sorting coffee and cleaning the office of a warehouse in Tooley Street. On the last named premises, but in a different part from that in which the affected person worked, Persian wool, mohair, etc., were stored. The coffee berries came from Mombassa and reference to the table shows Mombassa hides as the suspected material in some of the hide and skin cases.

Mr. Buchan (Liverpool) writes :—

> Five reports were received of cases of anthrax. Three occurred at the docks and two in an oilcake factory. Of the dock cases, two occurred to workers handling hides from West Africa and Brazil. Gloves are provided, but the men say that when trucking they cannot wear them as they interfere too much with the work: In one case when the son of the deceased observed the pimple on his father's neck he suspected anthrax, as he saw that it presented the same appearance as the illustrations on the Home Office Anthrax placard exhibited in the dock shed. He advised his father to have medical attention but the father delayed doing so until it was too late. The cases in the oilcake factory were probably attributable to the shipments of bags of cotton seed beside infected hides. This firm now obtains a note from the shippers when hides, wool or hair have been stowed with their consignments of meal or cotton seed.

Frequent reference has been made to outbreaks of anthrax among animals in which infection was believed to be due to contamination of water-courses into which the effluent of tanneries had been discharged. In one farm below a tannery six outbreaks of anthrax occurred last year, and 32 since 1902. An association of landlords and tenants was formed to sue the occupier of the tannery, but before the case came into Court the occupier agreed to pay full compensation for every animal that died of anthrax.

FUMES AND GASES.—The table below has been made up from reports by the Certifying Surgeons on cases reported as accidents under Section 4 of the Notice of Accidents Act, 1906, and, in the case of poisoning from such substances as nitro- and amido-derivatives of benzene (anilin, dinitrobenzol, trinitrotoluol, etc., which are absorbed by contact with the unbroken skin as well as in the form of fumes and dust) and chlorine derivatives of ethane and ethylene (tetrachlorethane, etc.) from reports forwarded by Certifying Surgeons by some voluntary arrangement or as the result of my own enquiries. Fumes differ from gases in that they are not subject to the same law of diffusion, and the term "escape of gas" in Section 4 (*b*) has to be stretched unduly if made to include poisoning by fumes or contact with the skin. The figures under the Notice of Accidents Act only relate to effects which

cause the worker " to be absent throughout at least one whole day " and do not take account of the numerous cases, to which there is reference in the reports, in which recovery took place within a few hours. In reading the reports the danger of working alone or in confined spaces where there is risk of gas poisoning, the carelessness often of those who know the risk, and the value of rescue appliances kept in a state of constant efficiency, are brought out prominently. Frequent allusion is made to recovery from unconsciousness following on administration of oxygen from cylinders provided with suitable pressure reducing devices, not only in carbon monoxide poisoning, but also in that from sulphuretted hydrogen and nitrous fumes.

In my Annual Report for 1910 I summarised briefly the facts known as to the classification of industrial poisons and described the more important of them.

TABLE V.

Nature of Gas or Fumes.	1914.	1913.	1912.	1911.	1910.	1909.	1908.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carbon monoxide	63^{9}	59^{7}	91^{13}	64^{6}	53^{9}	53^{6}	55^{5}
(*a*) Blast furnace	20^{6}	20^{3}	33^{5}	16^{2}	19^{7}	16	26^{3}
(*b*) Power (suction, producer, Mond, Dowson)	21	21	19^{4}	31^{1}	25	25^{4}	19^{2}
(*c*) Coal	7^{1}	9^{1}	29^{2}	6^{2}	4	11^{1}	9
(*d*) Other	14^{2}	9	10^{3}	11^{1}	5^{2}	1^{1}	1
Carbon dioxide	3^{1}	12^{1}	3^{2}	1^{1}	2^{1}	2^{2}	4^{3}
Sulphuretted hydrogen	22^{8}	8^{1}	6	3^{2}	2	5^{2}	8^{1}
Sulphur dioxide	1	1	5	—	2	2	1
Chlorine and hydrochloric acid fumes ...	2	1	3	5^{1}	3	1	1
Nitrous fumes	9^{2}	—	12^{1}	18^{2}	11	12^{2}	3^{1}
Ammonia	4^{1}	3	1	1^{1}	2	1	1
Benzene, naphtha and petrol	4^{2}	6^{2}	3^{1}	1^{1}	—	1^{1}	2
Nitro- and amido-derivatives of benzene	38^{2}	2	9^{1}	21	18	4	2
Trichlorethylene	1^{1}	—	—	—	—	—	—
Tetrachlorethane	25^{4}	—	—	—	—	—	—
Other	3	2	2^{1}	4	2	2	2
Total	174^{35}	94^{11}	135^{17}	123^{14}	95^{10}	83^{13}	79^{10}

The small figures relate to fatal cases, and are included in the principal figures.

Blast furnace gas.—Among the 19 cases (with 4 deaths) reported from blast furnace gas, six occurred in charging at the cupola; eight (including 4 deaths) from cleaning operations, mainly of flues; and three from escape of gas, in one case by percolation through the soil into a trench, and in another by gas blown by the wind into a boiler in which a man was working.

Power gas.—Of the 21 cases four occurred in starting the plant, two in charging, eight in cleaning and repairing parts of the apparatus such as the scrubbers, one in the sudden escape of gas on drawing a damper, and six by leakage of gas into the engine house or elsewhere. None of the cases were fatal.

Coal gas.—Of the 7 cases two occurred in a cotton mill from leakage owing to a faulty regulator in a gas pipe underneath the floor; three to escape of gas in the workroom; in one case through use of a gas blowpipe; one (in which the workman was disabled for 14 days) from escape from a main during repair, and one (fatal) from unscrewing the ball cock after gas had passed through the purifier.

Other sources of CO.—Of the 14 cases four occurred in working in confined spaces in ships under construction where anthracite or coke fires were used for drying; in one case the workman had closed up all means of ventilation. In one large shipbuilding yard on the Clyde district air is driven into the confined spaces by an electric fan. One fatal case arose from the fumes from a brazier; three cases (1 fatal) were due to escape of gas through broken tiles in the flue of a baking oven under circumstances similar to that reported last year; two from the coke fire in a galvanising machine; one (in which the symptoms appeared to be of the chronic type) from sleeping on the top of the boiler furnace in a steel works; one in repairing a crucible furnace, and one in a cement works.

Carbon dioxide.—Of the three cases, one (fatal) occurred in a fermenting vat of a brewery from failure of the workman (who had been employed 17 years) to swill it out with water before entering, and one in repairing a carbonic acid gas compressor.

Sulphuretted hydrogen.—Eight cases (2 fatal) occurred in attending on, or cleaning, the purifiers in gas works; six (1 fatal) in cleaning out pipes or stills in tar distilling works; five in chemical works (including one at a de-arsenicating plant and one at a sulphate of ammonia works); and one in cleaning out the pump hole in a gas works.

Sulphur dioxide.—The case occurred in the repairing of a sulphur kiln.

Chlorine.—Both cases occurred in the generation of chlorine gas in alkali works.

Nitrous fumes.—Last year I expressed surprise that no case had been reported from these insidious fumes. Of the nine cases this year one (fatal) occurred in the removing of packing from a Gay Lussac tower; one in cleaning a retort; one to a lithographer's apprentice only 16 years old; and three (1 fatal) in etching copper rollers for calico printing and due to the fact that an extra large roller had to be etched so that the fan provided, and sufficing ordinarily, was unable to draw away the fumes. The Chief Inspector for Alkali Works, in his report for 1906, gives as means for reducing to a minimum the danger in Gay Lussac towers:—

(1) Washing the tower with strong sulphuric acid to remove nitrous vitriol, prior to washing with water and steaming; (2) The maintenance of a downward draught to remove as directly as possible any gases present from the men engaged on the work; (3) The use of a "safety pipe." * Emphasis was laid on the need for wearing either a helmet and air tube or self-contained oxygen apparatus on page 165 of the Annual Report for 1912 by the Inspector for Dangerous Trades.

Ammonia.—Of the four cases one occurred from the bursting of a pipe; one from breakage of a vessel containing ammonia during a fire; one in repairing a refrigerator plant (where the injury was confined to the eyes); and one (fatal) from the bursting in of the bung of a drum on board ship and subsequent spilling of the material into the hold. Mr. Warren (Lincoln) recommended here provision (already made by a shipbuilding firm) of a rescue helmet where such cargoes are dealt with.

Benzene and petrol.—Of the four cases (with 2 deaths) one (slight) was due to cleaning out a tank containing petroleum, and 1 (fatal) to a lad filling seven two-gallon tins with petrol from large steel drums in a petrol shed 12 feet square, the floor of which had been sunk about 2½ feet below the level of the ground. A third (fatal) occurred to a man who had entered a benzene caffein extracting apparatus into which fumes from another similar plant at work probably passed, and a fourth from use in a confined space of a benzene lamp for soldering.

Nitro- and amido-derivatives of benzene.—In previous Annual Reports I have frequently made reference to the danger attending the manufacture and use of nitro-derivatives of benzene. Of the 38 cases included under that head 6 occurred from manufacture of dinitrochlorbenzene characterised by dermatitis developing with extraordinary rapidity in new workers before they had become acclimatised; 4 from the manufacture of nitro-derivatives of benzene which are indicative only of the effects of these compounds, as they do not take account of the 43 temporary suspensions from, or transference to other, work; and 28 (including 2 deaths) to the use of dinitro-compounds in the manufacture of a particular explosive in one factory. The symptoms of these 28 cases were cyanosis 15, vertigo or delirium 4, amblyopia (partial blindness) 4, gastritis and constipation 4, and peripheral neuritis 1. Mixing the ingredients accounted for 22 of the cases Dr. Bridge,† who

* Consisting of a metal funnel, the stem of which acts as inlet pipe. It fits like a pneumatic pad against the face (this can readily be blown up for use, being similar to that used in dentistry in administration of nitrous oxide) and is fastened on by a strap buckling behind the head. The safety pipe case contains 50 feet of pipe and is used by men engaged in cleaning out vitriol chambers, Gay Lussac towers, Chance carbonators, &c.

† Dr. J. C. Bridge was appointed an additional Medical Inspector of Factories, stationed in Manchester, in April, 1914.

investigated the conditions at the factory with Mr. C. F. Hunter, sent me the following account :—

> The explosive is largely used for mining and quarrying purposes, and is composed of a mixture of dinitrobenzene, and other substances. The process of manufacture consists of drying, grinding and mixing the substances, amalgamating and sifting the resultant powder, and finally filling the cartridges. Grinding, mixing, amalgamating and sifting are all done in one room called the mixing shed, and it is in one of these sheds that the two men who have died were employed. In this shed are two mixing and grinding machines, the process being combined in one machine. They are similar to ordinary paint grinders, and are completely enclosed, except for an opening in front and above the feeding hole, and are connected to an exhaust system of ventilation. No covering is provided for the feed hole. The resulting mixture is let out from the bottom of the machine into tins to be further treated by an amalgamator. The powder from this machine is mechanically elevated to a sifter, all of which is enclosed, the final product being removed from the sifter by an arrangement like a coffee grinder, the canister being placed below and the powder delivered into it by the workman turning a handle. Occasionally the elevator becomes blocked and the men have to open the casing to clear it, and it was in clearing such a block that the two men contracted the fatal poisoning. The floor of the shed is covered with wood meal so that it is impossible to estimate the amount of dust present. The temperature of the shed is kept at about 80° F.
>
> I was much struck by the cyanosis of all the men in the mixing houses. The manager's son was deeply cyanosed and slightly jaundiced, representing an appearance best described as the appearance of a child with congenital heart disease. He had just been engaged in clearing a block in the elevator as described above. He made no complaint. The under-manager was also cyanosed, as he had been working the previous day. He said he would be quite normal in 24 hours' time.
>
> I think that the cause of the present cases is due to pressure of work. The men have been working overtime and new hands have been taken on of a much poorer class than formerly.

Subsequently as the result of visits by Mr. Jackson and myself we satisfied ourselves that improvement in the locally applied exhaust ventilation and notably reduction to four hours per day of spells of work in the mixing room had materially reduced the danger. At the end of the year Dr. Peddie, the Appointed Surgeon, sent me the following report on this serious outbreak :—

> To account for this outbreak it is necessary to state that the composition of the explosive has been altered so as to render its use safer in the mines. This quenching was affected by the addition of a certain percentage of a deliquescent substance which incidentally rendered the product more easily absorbed by the skin of the hands. A great demand for the explosive arose, and to meet this extra rush of orders at first they worked overtime, next put on a small night shift, and as the summer progressed and the heat increased, as well as the volatility of the benzene compound, they worked more men in the night time than the day time. I did everything in my power to try and reduce the number of cases. I have always gone once a fortnight ever since I received the appointment, but during this year I went once every week, and have been as often as three times in a week. As the majority of the workers come from a distance, I have no doubt that many of them would leave home without having anything to eat, and this would render them more susceptible to the influence of the poison. Of this I am convinced, that the best way to fight this poison is through a full stomach. All the men passed by me have to be organically sound, but on account of the extra pressure of orders, I passed some whose powers of resistance were evidently low through underfeeding due to unemployment. The shifts have now been reduced to four hours and, to ameliorate lowered vitality, we now give a pint of milk in the morning and afternoon, and in a very short time we are going to give every worker, free, a freshly cooked dinner. These arrangements are in a forward condition, and are being hurried on as fast as possible. Dr. Prosser White, of Wigan, willingly came to the works at my request and gave me invaluable help.

Appended to Dr. Peddie's report were letters from Dr. H. Holmes, Ophthalmic Surgeon to the Royal Infirmary, Wigan, together with perimeter charts of the extreme contraction in the field of vision of the four cases of amblyopia, and also the results of blood examination made by Dr. Sellers, Assistant in the Public Health Laboratory, Manchester. Dr Holmes wrote :—

> I have never before seen dinitrobenzol cases with such extreme contraction of the fields of vision as in two of the cases, and find it hard to know what is the true significance of this. Usually contraction of the field of vision means atrophy or hysteria. I did not see any other symptom of hysteria or neurasthenia in these men, and do not think this is the explanation, and in none of the cases did the field for the movements of the hand appear to be greatly limited ; therefore I hope there is no real atrophy. However, this contraction with marked pallor must be considered a very serious symptom, and I think all of the men should be absolutely removed from the possibility of coming in contact with the poison, especially as there seems to have been no improvement during the three months.

Dr. Arthur Sellers' report is as follows :—

The specimens have been examined with the following results :—

Case.	Red Corpuscles per c.mm.	White Corpuscles per c.mm.	Hæmoglobin, percentage.	Colour Index.	Spectroscopic Examination.	Appearances in Stained Films
1	3,020,000	8,000	13·4	1·5	No methæmoglobin bands	Fairly normal blood. No red corpuscles with basophil granules.
2	2,400,000	7,000	12·0	1·3	Do.	Some megalocytes, microcytes and poikilocytes. A few red corpuscles with fine basophil granules.
3	3,364,000	7,000	12·8	1·1	Do.	Fairly normal blood. No red corpuscles with basophil granules.
4	2,128,000	7,000	10·2	1·6	Do.	A few megalocytes and very few red corpuscles with basophil granules. Some polychromasia.
5	3,180,000	7,000	10·2	1·1	Do.	Fairly normal blood. No red corpuscles with basophil granules.

A differential count of the leucocytes gave the following figures :—

Case.	Polynuclear Cells.	Lymphocytes.	Large Mononuclear Cells.	Transitional Cells.	Eosinophil Cells.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	66	31	1	1	1
2	78	17	2	1	1
3	72	25	1	1	1
4	72	24	2	1	1
5	79	27	2	1	1

The chief changes observed were a reduction of the number of red corpuscles and a disproportionate lowering of the haemoglobin, the colour index being consequently raised. In two instances red corpuscles containing basophil granules were found accompanied by other changes, but such changes were not of a marked kind.

With one exception the specimens of blood when taken were observed to be somewhat darker in colour than normal, and after coagulation the serum was slightly tinged. This was probably due to the presence of a little methæmoglobin, though no characteristic bands were found on spectroscopical examination.

INDUSTRIAL ECZEMA.—Cases of industrial eczema are frequently brought to my knowledge, generally local affecting the hands and arms but sometimes general. As a result of inoculation of the lesion with pathogenic organisms—staphylococci and streptococci—widespread pustular eczema may develop. Continual soaking of the hands in water or in alkaline solutions is alone sufficient to set up the condition, as in washerwoman's eczema. Some cases are due to irritating dust with specific action on the skin, others to corrosive or caustic liquids, and others again to contact with solvents which rob the skin of its natural fat produced from the sweat glands. The dermatitis varies from a simple erythema to a vesicular or bullous condition. Where exposure to the exciting agent is long continued the skin becomes infiltrated, thickened and hardened, with tendency to formation of painful fissures and much pruritis. The acute condition quickly yields to treatment on withdrawal from work, but on returning again may just as speedily return and with each successive attack treatment tends to become less and less successful, and the disease to become more and more chronic. Many patients suffering from chronic traumatic eczema thus become obliged to attend for months and even years the out-patient department of skin hospitals.

Two such skin affections were the subject of close inquiry during the year with a view to mitigating the effects of the substances causing them, namely chrome compounds and

turpentine. And the remedies suggested for them naturally have application to many others.

Chrome ulceration.—Chromic acid and bichromates of potassium and sodium cause peculiar lesions, namely, erosion of the septum of the nose from inhalation of the dust, and eczematous eruptions or ulceration of the skin when abrasions allow either the crystals or solutions containnig them to penetrate below the epidermal layers of the skin. Their principal use is:—

(1) In the manufacture of the well known chrome yellow, oranges and reds, by interaction of a solution of lead acetate and a bichromate.

(2) In dyeing and calico printing. In dyeing cotton yarn a yellow or orange colour the hanks are first soaked in lime water and transferred, after wringing, to a vessel containing lead acetate. They then pass through a dilute solution of a bichromate which develops the yellow colour on the fibre. Treatment differs according to the particular shade of yellow colour desired. In calico printing potassium bichromate is used in the discharge style for indigo blue and Turkey red when it may be printed from a paste containing 40 per cent., or, for the production of chrome lead colours, by first printing the desired pattern on the calico with a paste containing acetate of lead, and subsequently passing this through a 2 to 5 per cent. solution of bichromate. In anilin black dyeing similarly after treatment with anilin hydrochloride the calico cloth is passed through a bath containing dilute solution of bichromate.

(3) In photography and litho-etching.

(4) As an oxidising agent for the manufacture of coal tar colours especially of anthracene or alizarin, and, in solution with sulphuric acid, as a bleaching agent for oil, tallow, etc.

(5) In tanning leather by the "two bath" process. In this process the skins are first treated with a solution of chromic acid made by the action of hydrochloric acid on potassium bichromate and afterwards with a solution of sodium hyposulphite. The risk of chrome ulceration is greatest in the operation of removing the skins from the first bath, spreading them out on a wooden horse to drain and subsequently stretching them and "striking out" the excess liquor. Hyposulphite of soda is recognised as useful in the treatment of chrome sores, and use can be made of this fact by transference to work on the "hypo" bath of those suffering from chrome holes.

(6) In French polishing especially for darkening mahogany and walnut wood, the grain of which is brought out more clearly by bichromate than by any other substance. The liquid is applied generally with a cloth—more rarely with a brush.

(7) As an ingredient of safety matches and in the preparation of coloured glass and porcelain.

Effect on the skin.—Bichromate solutions do not attack the unbroken skin. The slightest break in continuity, however, especially where this is thin as over the knuckles or between the fingers, suffices to start the destructive process which, once it has begun, will penetrate gradually through the soft tissues unless means are taken to prevent further contact with the solution. The seat of election for these sluggish ulcers or "chrome holes," as they are called by the workmen, is either on the knuckles or at the root of the nail, but they may occur on any part of the hands. The tissues around the circular ulcer are heaped up, thickened, indurated and always undermined; the centre is filled by a slough. When the slough has been removed the floor of the ulcer is seen to consist of greyish yellow granulation tissue. In the majority of cases the diameter of the ulcer is not more than $\frac{1}{8}$ of an inch, but painful active chrome holes may be numerous when supervision is lax. Rarely does one fail to find small ulcers or the scars of ulcers that have healed on the hands of those employed in chrome tanning and in dyeing. Fortunately to-day penetration into joints and loss of fingers described by early writers on the subject are hardly ever seen. Sometimes, instead of taking the form described of localised ulcers, chromic acid in solution, as in the "two bath" tanning process, sets up, in susceptible subjects, an extensive vesicular eruption on the hands and forearms and sometimes on the feet and ankles accompanied by intense itching. In slub dyeing the chrome affection is found usually round the knuckles, on the palm, in the fold between the thumb and first finger, and above the wrists and forearms. Occasionally the eczematous condition extends to other parts of the body such as the face and back. Susceptibility plays an important part in disease of an eczematous nature, the skin of some persons reacting much more readily to definite known irritants such as chromic acid than that of others. Experience can alone decide whether a particular person will be able to continue at the work or not. Where the ulcerative process is serious either want of care or ignorance on the part of the sufferers is nearly always found. New workers suffer much more than the seasoned who

have had experience of the painful condition. Lads of 14 and 15 years of age who start work in chrome tanning are sure to suffer if supervision is lax. The amount of pain and inconvenience caused by chrome holes is considerable. They are never a menace to life, but I have known six men absent in one year from one works for periods varying from three to nine weeks on account of them. Even when the severity is not such as to necessitate absence from work months may elapse before they heal.

Precautionary measures.—In factories where bichromates are used it is essential that some responsible person with knowledge of first aid should be appointed to treat daily such cuts and abrasions as occur. One of the surgeons carrying out periodical medical examinations in bichromate works under Regulations writes to me as follows :—

> As chrome holes are usually produced from trifling or unseen abrasions about the hands I insist upon the foreman examining the hands of the men daily for signs of irritation which are washed and afterwards protected by dressings. This recommendation is, I consider, important in that it impresses on the men the benefit of checking at once tendency to the development of chrome holes. They can be developed in a day although the escharotic effect of the chrome may not be apparent for a day or two afterwards.
>
> In order to seal up a chrome hole and prevent further contact with the liquor I use an ointment of zinc or borax on a small piece of lint to cover the hole. I cover the lint with guttapercha tissue, the edges of which I soften with heat from a taper or chloroform and then squeeze close to the skin. Adhesive plaster may also be used as a further protection over the guttapercha tissue. Attention must be paid to see that the men are following out the treatment and that the sores are improving—otherwise there is no alternative but to remove the man from the chrome department until the wounds are healed.

When an ulcer has developed some surgeons treat by poultices or boracic fomentations, and apply yellow ointment of mercury, or clean with hydrogen peroxide solution and treat with an ointment containing ichthyol applied under an absolutely waterproof plaster.

Where the hands come into contact with bichromate solutions as in chrome tanning by the " two bath " process and in dyeing, the first essential again is daily inspection of the hands and arms of all the workers and immediate covering over of the smallest abrasion so as to protect it against further contact with the solution. For this purpose collodion (" new skin ") is invaluable, but if, as may be the case over the knuckles, it is inapplicable, a dressing under an impermeable plaster or closely fitting indiarubber fingerstall must be used instead. In chrome tanning indiarubber gloves reaching well up towards the elbow are a great protection, but it is a great mistake to think that the wearing of them renders unnecessary the treatment of abrasions. I have found them generally provided and worn, but the retention of perspiration caused by their use may tend to soften the skin in some cases. Only where discipline and supervision are thorough would it be safe to throw aside the protection of indiarubber gloves. Substitutes for them such as leather gloves are, in my experience, wholly unsatisfactory. Periodical medical examination by a surgeon of persons employed in chrome tanning is useful as it ensures choice of proper dressings, is a check on the way in which the foreman exercises supervision, and will prevent chrome holes from causing prolonged abstention from work.

Lastly, smearing the arms and hands with fat or with special ointments undoubtedly serves as a protection to the skin. The following is a preparation used in a large tannery* :—

Petrolatum (paraffinum molle of the B.P.)	3 parts.
Lanoline	1 part.

Another antiseptic ointment, suggested by Dr. Collis, of which trial has been made with fair success, consists of mineral lard 3 lbs., paraffin wax 6 ozs., cyllin 1½ ozs.

In the treatment of severe papular eczema arising from contact with ammonium bichromate used in photo-engraving application of equal parts of calamine and boracic acid lotions quickly prove efficacious. These are the cases, however, which are liable to relapse on fresh exposure and raise the question as to further continuance in the process. The precautionary measures may be summed up as follows :—

---

* This ointment was recommended by Dr. Levi, Chemist of the Pfister and Vogel Leather Company, Milwaukee. The directions he gives are :—

Melt on the water bath or stove; when melted and thoroughly mixed, add 10 to 15 drops of 90 per cent. pure carbolic acid to every 400 grammes or 5 drops to every 4 ounces of the mixture. Pour into a glass or earthenware jar and allow the mass to solidify, when it is ready for use.

The application is as follows :—Let the workman clean his hands and arms thoroughly with soap and water. Rinse with warm water, and while still moist apply the ointment. Rub in well so as to cover all exposed skin for about 2 to 3 minutes. Then take a clean cloth and wipe dry. The skin will be left entirely dry and with no greasy feeling. Lanoline is absorbed by the skin and the petrolatum forms a light coating on the surface. The application of the two inert substances prevents the action of the chrome upon the surface and at the same time the absorbed grease prevents the action of the chrome, should the outer coating of petrolatum wear off.

(1) Daily inspection of the hands and arms of all the workers coming into contact with chrome.

(2) Immediate covering over of the smallest abrasion, after first washing in running water, by (*a*) application of collodion in situations such as the back of the hand and forearm, where the skin is not liable to be stretched ; or (*b*) where the skin is liable to be stretched as on the fingers and wrist, application of a simple dressing (boracic lint or cyanide gauze) under an impervious waterproof dressing * (Leslies). The dressing should be changed daily.

(3) Wearing of long indiarubber gloves in good condition. (The wearing of these however, does not make the treatment of abrasions unnecessary.)

(4) A supply of an ointment with which the workers can smear their arms.

Turpentine eczema.—In one of the largest engineering works in the country cases of eczema from the use of turpentine came to my knowledge. The following are typical cases :—

J.R., aged 58.—His occupation was overlooker in a cartridge factory. He attributed his attack to cleaning the brass cartridge cases with turpentine—putting his hands in to take the cartridges out when covered with turpentine. He had been 30 years at the work. He said that the work as carried on up till four years ago involved much greater contact with turpentine than was the case now, and he attributed his condition to the old method of working. His first attack occurred four years ago, and he has been troubled with eczema continuously ever since. A month ago he was on the sick list with swollen and inflamed arms.

Present condition.—A dry condition of the cuticle of fingers, especially the index of both hands. Dry eczema on the right wrist.

H.R.—Employed in a cartridge factory, but his ordinary work does not bring him much into contact with turpentine. Owing to the pressure of work and during the very hot weather he was given the task of cleaning the cartridge cases with turpentine. Both his hands quickly became attacked with vesicular eczema—the remains of the circular vesicles and scaly condition still remaining on the palms, the backs and between the fingers.

A.S., aged 56.—Employed at the factory over 23 years, latterly in a cartridge factory. He is now employed in wheeling trolleys of cartridges before they have come into contact with turpentine. He attributes his illness to the old method of working. Seven years ago his work was to wring out flannel bags saturated with turpentine in which the cartridge cases had been cleaned, and hang them up to dry—an operation which is now no longer done—and these bags were not, as they are now, renewed twice a week, but used over and over again for many weeks together until they had become very dirty. For nearly six years he has suffered from eczema of the back of the hands and forearms, and has undergone many different kinds of treatment. He is attending now, and has done for many months, a hospital for skin diseases.

Present condition.—Typical chronic dry eczema of the back of the hands and arms—cuticle much thickened and skin dry and fissured. The face is very dry and scaly. There is a patch of eczema on the ear and it is evident that his whole system has been affected so that any part which suffers a lesion breaks down with an eczematous condition. He is spare and thin which may probably be due to the disturbed nights which the irritation caused by the eczema has caused him to have. He wears gloves at his work and finds great relief from the ointment given him at the skin hospital, which probably consists of solution of coal tar, ammoniated mercury and soft paraffin.

A.J., aged 62.—Employed 20 years. Was a painter (and is so classed now) until eight years ago. Eczema of the hands commenced first nine years ago when he was on the sick list for two weeks. He says that pure American turpentine had been used, but was given up for Russian. A fortnight's use of this Russian turpentine caused him to be laid up with eczema for 13 weeks. He returned to work and was laid up again, after which he was removed from paint work. He now does distempering, &c., but if ever he is brought into contact with turpentine he develops eczema. Thinks that many men suffer from turpentine eczema.

Present condition.—Slight degree of eczema rimosum on the palms of the hands and on the wrists.

At one stage in the preparation of the cartridge bees' wax is used and turpentine comes in to get rid of this. The ordinary small arms cartridge is fed by a boy into an automatic machine which carries cartridges one after another in an upright position through two cloth pads saturated with turpentine. Perhaps 15 cartridges closely packed one behind the other in an upright position are gradually pushed automatically between the pads. Once they have passed through they are ejected into a canvas receptacle. The cartridges are then lifted out of the bag and carried away in boxes. The amount of contact is thus small At one bench a different method was employed which I was informed was used solely in the case of very small cartridges for pistols. Here the cartridge cases were filled into a woollen bag which was saturated with turpentine and the operative then placing his hands on the bag pressed it backward and forwards so as to move the cartridges inside and bring them into contact with the turpentine. This method involved considerable contact and was the method universally adopted for all small arms cartridges until a few years ago.

* Leslies', Ltd., 18, Eldon Street, London, supply a pliable tape plaster *on black waterproof* which answers the purpose.

The precautions adopted are the smearing of the hands before work with a " mineral jelly " (a variety of vaseline) or rubbing the hands with the machine oil used to lubricate the machines.

On inquiry at the oil store I ascertained that American turpentine, Russian turpentine, and, to a small extent also, turpentine substitute were used. The sample I collected where the complaint had been made was obviously the Russian variety. Russian turpentine resembles American turpentine in many of its properties, but it is more variable in composition and specific gravity and in some other respects. There is no sufficient reason however, for demanding disuse of Russian turpentine on the ground that it is likely to be more injurious to the workers than American turpentine. Seeing that the use of turpentine is a necessity and that it is impracticable to expect that the worker's hands do not come into contact with it, the only thing possible is to protect the skin as much as possible from damage by it. The use of vaseline for this purpose has been referred to. I do not consider that vaseline is the best material as it is a derivative of a mineral oil which is known to have action on the skin. Moreover, turpentine dissolves it. Still trouble appears to have ceased in one department where eczema had been prevalent after the adoption of vaseline, and there is no doubt that if not the best preventative its use does good. It seemed to me that the application of an animal fat such as lanoline (adeps lanae hydrosus) would be a more suitable way of supplying the skin with natural grease to replace that dissolved out of the skin by the turpentine. After communication with Dr. Prosser White,* Certifying Surgeon of Wigan (who has given more study to the subject of traumatic eczema than anyone else) and with the authorities of the Pharmaceutical Society as to the best ointment to use, I recommended as the most suitable one made by incorporating together equal parts of lanoline and castor oil to which, in order to make it mildly antiseptic, carbolic acid was added to the extent of 1–2 per cent. The workmen were to be instructed to use just sufficient to moisten the skin of their hands and wrists. The accounts received of the use of this ointment were favourable. Owing to great rise in the price of lanoline the proportions had to be reduced to 50 parts lanoline and 100 parts castor oil, which forms a very satisfactory salve.

* "Occuptional Affections of the Skin," by R. Prosser White. H. K. Lewis, 1915.

CHAP-

RESULTS OF FIVE YEARS' NOTIFICA-

By T. M. Legge, M.D., *H.M.*

TABLE I.—ANALYSIS OF REPORTS ON LEAD POISONING BY CERTIFY-

INDUSTRY.		SEVERITY OF SYMPTOMS.								Total.	
		Severe.		Mod.		Slight.		Not stated.			
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
2.		3	4	5	6	7	8	9	10		
1. Smelting of Metals	Cases	35	—	63	—	102	—	—	—	200	—
	Per cent.	17·5	—	31·5	—	51·0	—	—	—	100	—
2. Brass	Cases	7	1	16	1	9	2	1	—	33	4
	Per cent.	21·2	—	48·5	—	27·3	—	3·0	—	100	—
3. Sheet Lead and Lead Piping	Cases	8	—	9	—	16	—	—	—	33	—
	Per cent.	24·2	—	27·3	—	48·5	—	—	—	100	—
4. Plumbing and Soldering	Cases	27	—	42	4	77	6	2	—	148	10
	Per cent.	18·2	—	28·4	—	52·0	—	1·4	—	100	—
5. Printing	Cases	27	—	32	1	80	3	3	—	142	4
	Per cent.	19·0	—	22·5	—	56·4	—	2·1	—	100	—
6. File making	Cases	10	—	19	3	23	9	—	1	52	13
	Per cent.	19·2	—	36·5	—	44·2	—	—	—	100	—
7. Tinning	Cases	5	—	19	1	30	9	—	—	54	10
	Per cent.	9·3	—	35·2	—	55·6	—	—	—	100	—
8. White Lead	Cases	24	—	42	1	78	6	2	3	146	10
	Per cent.	16·4	—	28·8	—	53·4	1·4	—	—	100	—
9. Red Lead	Cases	3	—	17	—	19	—	—	—	39	—
	Per cent.	7·7	—	43·7	—	48·7	—	—	—	100	—
10. China and Earthenware	Cases	56	20	78	67	51	66	1	—	186	153
	Per cent.	30·1	13·1	41·9	43·8	27·4	43·1	0·5	—	100	100
10A. Litho Transfers	Cases	—	1	—	2	—	1	—	1	—	5
	Per cent.	—	—	—	—	—	—	—	—	—	—
11. Glass Cutting	Cases	5	—	4	—	3	—	—	—	12	—
	Per cent.	—	—	—	—	—	—	—	—	—	—
12. Enamelling	Cases	10	1	17	—	29	4	—	—	56	5
	Per cent.	17·9	—	30·4	—	51·8	—	—	—	100	—
13. Electric Accumulators	Cases	32	—	46	—	100	—	—	—	178	—
	Per cent.	18·0	—	25·8	—	56·2	—	—	—	100	—
14. Paints and Colours	Cases	9	—	27	—	63	—	1	—	100	—
	Per cent.	9·0	—	27·0	—	63·0	—	1·0	—	100	—
15. Coach Building	Cases	54	—	120	2	203	—	7	—	384	2
	Per cent.	14·1	—	31·3	—	52·9	—	1·8	—	100	—
16. Shipbuilding	Cases	30	—	51	—	71	—	1	—	153	—
	Per cent.	19·6	—	33·3	—	46·4	—	0·7	—	100	—
17. Paints used in other Industries	Cases	43	2	79	8	101	8	2	—	225	18
	Per cent.	19·1	—	35·1	—	44·9	—	0·9	—	100	—
18. Other Industries	Cases	65	2	109	27	129	27	7	1	310	57
	Per cent.	20·9	3·5	35·2	47·4	41·6	47·4	2·3	1·7	100	100
Total	Cases	450	27	790	117	1,184	141	27	6	2,451	291
	Per cent.	18·4	9·3	32·2	40·2	48·2	48·5	1·1	2·1	100	100

TER XI.

TION OF LEAD POISONING—1910-1914.

Medical Inspector of Factories.

ING SURGEONS, FROM JANUARY 1ST, 1910, TO DECEMBER 31ST, 1914.

NUMBER OF ATTACK.								MAIN SYMPTOMS.																			
1st.		2nd.		3rd or Chronic.		Not stated.		Gastric.		Anæmia.		Head-ache.		Paretic.		Nervous.		Encephal-opathy.		Rheu-matic.		Other.			Not stated.		
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	F.	M.	F.	
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
146	—	30	—	24	—	—	—	139	—	65	—	17	—	32	—	10	—	3	—	33	—	20	—	—	2	—	
73·0	—	15·0	—	12·0	—	—	—	69·5	—	32·5	—	8·5	—	16·0	—	5·0	—	1·5	—	16·5	—	10·0	—	—	1·0	—	
24	4	5	—	3	—	1	—	26	4	19	3	1	—	6	—	1	—	1	—	1	1	2	—	—	1	—	
72·7	—	15·2	—	9·1	—	3·0	—	78·8	—	57·6	—	3·0	—	18·2	—	3·0	—	3·0	—	3·0	—	6·1	—	—	3·0	—	
30	—	1	—	2	—	—	—	32	—	12	—	5	—	3	—	1	—	—	—	6	—	3	—	—	—	—	
90·9	—	3·0	—	6·1	—	—	—	97·0	—	36·4	—	15·2	—	9·1	—	3·0	—	—	—	18·2	—	9·1	—	—	—	—	
110	9	17	1	18	—	3	—	111	8	40	2	17	2	21	—	6	1	2	—	27	1	14	—	—	7	1	
74·3	—	11·5	—	12·2	—	2·0	—	75·0	—	27·0	—	11·5	—	14·2	—	4·1	—	1·4	—	18·2	—	9·5	—	—	4·7	—	
104	4	26	—	9	—	3	—	110	3	43	2	20	—	17	—	6	—	1	—	16	—	9	—	—	9	—	
73·3	—	18·3	—	6·3	—	2·1	—	77·5	—	30·3	—	14·1	—	12·0	—	4·2	—	0·7	—	11·3	—	6·3	—	—	6·3	—	
30	9	11	2	11	1	—	1	23	10	21	6	5	2	10	—	1	—	2	—	5	—	4	—	—	4	1	
57·7	—	21·2	—	21·2	—	—	—	44·2	—	40·4	—	9·6	—	19·2	—	1·9	—	3·8	—	9·6	—	7·7	—	—	7·7	—	
38	9	5	1	11	—	—	—	33	10	21	1	3	—	6	—	11	—	—	—	10	2	1	—	—	2	—	
70·4	—	9·3	—	20·3	—	—	—	61·1	—	38·9	—	5·6	—	11·1	—	20·3	—	—	—	18·5	—	1·9	—	—	3·7	—	
126	6	11	1	8	—	1	3	103	6	57	—	13	1	12	1	13	—	10	—	10	2	4	—	—	5	3	
86·3	—	7·5	—	5·5	—	0·7	—	72·6	—	39·4	—	8·9	—	8·2	—	8·9	—	6·8	—	6·8	—	2·7	—	—	3·4	—	
31	—	2	—	5	—	1	—	33	—	12	—	4	—	2	—	3	—	—	—	3	—	3	—	—	2	—	
79·5	—	5·1	—	12·8	—	2·6	—	84·6	—	30·8	—	10·3	—	5·1	—	7·7	—	—	—	7·7	—	7·7	—	—	5·1	—	
132	142	20	4	33	7	1	—	100	109	46	57	65	63	34	9	10	5	9	8	26	13	54	12	—	1	—	
71·0	92·8	10·8	2·6	17·7	4·6	0·5	—	53·8	71·3	24·7	37·3	34·9	41·2	18·3	5·9	5·4	3·3	4·8	5·2	14·0	8·5	29·0	7·8	—	0·5	—	
—	4	—	—	—	—	—	1	—	2	—	3	—	1	—	—	—	—	—	1	—	1	—	—	—	—	1	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
7	—	—	—	5	—	—	—	8	—	5	—	1	—	1	—	3	—	—	—	1	—	5	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
46	5	6	—	4	—	—	—	47	5	21	2	3	1	4	—	2	—	2	1	6	1	1	—	—	2	—	
82·2	—	10·7	—	7·1	—	—	—	83·9	—	37·5	—	5·4	—	7·1	—	3·7	—	3·7	—	10·7	—	1·9	—	—	3·7	—	
162	—	13	—	3	—	—	—	163	—	46	—	14	—	12	—	7	—	5	—	5	—	2	—	—	2	—	
91·0	—	7·3	—	1·7	—	—	—	91·6	—	25·8	—	7·9	—	6·7	—	3·9	—	2·8	—	2·8	—	1·1	—	—	1·1	—	
83	—	11	—	5	—	1	—	78	—	37	—	9	—	11	—	8	—	—	—	9	—	3	—	—	1	—	
83·0	—	11·0	—	5·0	—	1·0	—	78·0	—	37·0	—	9·0	—	11·0	—	8·0	—	—	—	9·0	—	3·0	—	—	1·0	—	
279	2	49	—	46	—	10	—	295	2	135	1	49	1	61	—	11	—	4	—	60	—	23	—	—	14	—	
72·7	—	12·8	—	12·0	—	2·6	—	76·8	—	35·2	—	12·8	—	15·9	—	2·7	—	1·0	—	15·6	—	6·0	—	—	3·6	—	
126	—	16	—	10	—	1	—	128	—	59	—	19	—	26	—	7	—	5	—	13	—	9	—	—	6	—	
82·3	—	10·5	—	6·5	—	0·7	—	83·7	—	38·6	—	12·4	—	17·0	—	4·6	—	3·3	—	8·5	—	5·9	—	—	3·9	—	
156	16	36	2	30	—	3	—	182	18	81	8	27	2	35	2	9	2	4	—	30	3	16	—	—	4	—	
69·4	—	16·0	—	13·3	—	1·3	—	80·9	—	36·0	—	12·0	—	15·6	—	4·0	—	1·8	—	13·3	—	7·1	—	—	1·8	—	
233	50	46	6	24	—	7	1	242	48	105	27	31	8	40	3	29	—	5	—	32	4	13	—	—	14	2	
75·2	81·7	14·8	10·5	7·7	—	2·3	1·7	78·1	84·2	33·9	47·4	10·0	14·2	12·9	5·3	9·4	—	1·6	—	10·3	7·2	4·2	—	—	4·5	3·5	
1,863	260	305	17	251	8	32	6	1,853	225	825	112	303	81	333	15	138	8	53	10	293	28	186	12	—	76	8	
79·0	89·4	12·5	5·8	10·2	2·7	1·3	2·1	75·7	77·3	33·7	38·5	12·4	27·8	13·6	5·2	5·6	2·7	2·2	3·4	12·0	9·6	7·6	4·1	—	3·1	2·7	

In the Annual Report for 1909 I analysed 6,638 cases of lead poisoning which had been reported in the ten years 1900–1909 in respect of (1) increase or decrease in recorded amount in each one of the 18 classes of industries; (2) severity of attack; (3) number of attack (*i.e.* whether first, second, third or chronic); and (4) main symptoms. After that period (owing to the scope of certain Regulations having been widened) the classification was slightly modified and made more comprehensive of the wide range of industries into which lead enters as a possible cause of illness. While the principal 18 industries dealt with remain unaltered, the sub-division of some of them was carried very far. Thus, cases under the general heading " other industries " were classified under 13 separate subheads. Figures relating to 2,742 cases have been obtained during these five years, 1910–14, which repay examination and comparison with the 6,638 of 1900–1909 (Table I.). Although with a disease like lead poisoning there must be failure to report some cases which occur, the official figures published from year to year have, at any rate, the great merit of being comparable one with another. The data supplied by the Certifying Surgeon after his enquiry and report form the basis of the tabulation. Cases include all attacks reported in a year, and not previously reported in the preceding twelve months; no name appears twice in the same year. Taking the figures as a whole the most noticeable feature is the reduction in the number of " severe " and " third or chronic " cases estimated on the number reported.

TABLE II.

	Severity of Attack.										Number of Attack.									
	Severe.		Moderate.		Slight.		Not stated.		Total.		1st.		2nd.		3rd or chronic.		Not stated.		Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Total 1900–1909																				
Cases	1,588	204	1,389	269	2,522	496	138	32	5,637	1,001	3,800	799	871	119	758	46	208	37	5,637	1,001
Per cent.	28.2	20.4	24.7	26.9	44.7	49.5	2.4	3.2	100	100	67.4	79.8	15.5	11.9	13.4	4.6	3.7	3.7	100	100
Total 1910–1914																				
Cases	450	27	790	117	1,184	141	27	6	2,451	291	1,863	260	305	17	251	8	32	6	2,451	291
Per cent.	18.4	9.3	32.2	40.2	48.2	48.5	1.1	2.1	100	100	76.0	89.4	12.5	5.8	10.2	2.7	1.3	2.1	100	100

When Table I is compared with that on pages 198–9 of the Annual Report for 1909 (to which reference must be made as exigencies of space do not permit of its reproduction here) the diminution in " severity of attack " is found to affect all the 18 groups with the exception of the Pottery industry. In file cutting the proportion of severe cases fell from 48.9 per cent. in the 1900–1909 cases to 19.2, in white lead from 27.2 to 16.4, in paint and colour works from 27.9 to 9.0, and in paints used in other industries from 31.4 to 19.1. And the figures as to the number of chronic cases of plumbism reflect the same change. Thus, the proportion of chronic cases to the cases reported fell in Printing from 17.4 per cent. for the 1900–1909 cases to 6.3 for the 1910–1914 cases; in File cutting from 44.8 to 21.2 and in several others, although less marked, a fall is apparent. In seeking to ascertain the cause for this reduction in severity of the cases it is necessary to look to the next table which gives the symptoms recorded. Usually a combination of symptoms is stated, and when this is the case each one of them has been entered under the appropriate heading. The total number of symptoms, therefore, greatly exceeds the number of cases, but this does not affect the correctness of the estimate of each one as a proportion on the total number reported. The symptoms which generally lead to a report of a case as " severe " (apart from the fatal cases due to chronic nephritis and cerebral haemorrhage which are included under the heading " Other ") are paralysis and cerebral symptoms (encephalopathy). The table shows how both these symptoms have diminished in the figures for the period under review as compared with those of 1900–1909.

TABLE III.—TABLE SHOWING TOTAL OF SYMPTOMS.

	Main Symptoms.													
	Gastric.		Anæmia.		Headache.		Paretic.		Edcephalo-pathy.		Rheumatic.		Other.	
	M.	F.	M.	F.	M	F.	M.	F.	M.	F.	M.	F.	M.	F.
Total 1900–1909—														
Cases	4,512	770	1,473	325	539	255	1,190	153	200	62	568	107	176	16
Per cent.	80.0	77.8	26.1	32.5	9.6	25.5	21.1	15.3	3.5	6.2	10.3	10.7	3.1	1.6
Total 1910–1914—														
Cases	1,853	225	825	112	303	81	333	15	53	10	293	28	186	12
Per cent.	75.7	77.3	33.7	38.5	12.4	27.8	13.6	5.2	2.6	3.4	12.0	9.6	7.6	4.1

In estimating paralysis, however, use of vague terms such as " weakness of " or " loss of power in " the wrists complicates tabulation. In the period 1900–1909 all such reports were regarded as instances of paralysis, but since 1910 distinction between them and definite paralysis has been made whenever possible. This distinction will account for some of the reduction in the symptoms of paralysis, as during the last five years only paralysis has been included when so definitely stated. In a disease causing so much debility as lead poisoning some degree of weakness of the muscles will generally be present.

TABLE IV.—FORMS OF PARALYSIS, 1910–1914.

Form of Paralysis.	1914.			1913.			1912.			1911.			1910.		
	Paralysis.	Weakness of arms or loss of power.	Total.	Paralysis.	Weakness of arms or loss of power.	Total.	Paralysis.	Weakness of arms or loss of power.	Total.	Paralysis.	Weakness of arms or loss of power.	Total.	Paralysis.	Weakness of arms or loss of power.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Arms and leg { Complete	1	—	1	1	—	1	2	—	2	2	—	2	—	—	—
Arms and leg { Partial	2	7	9	3	6	9	4	7	11	1	4	5	4	6	10
Legs ... { Complete	2	—	2	—	—	—	1	—	1	—	—	—	—	—	—
Legs ... { Partial	1	2	3	—	—	—	1	8	9	—	6	6	4	4	8
Both forearms { Complete	18	—	18	16	—	16	26	—	26	27	—	27	15	—	15
Both forearms { Partial	11	18	29	29	29	58	21	40	61	20	44	64	19	30	49
Right forearm { Complete	6	—	6	6	—	6	5	—	5	5	—	5	8	—	8
Right forearm { Partial	1	4	5	5	1	6	6	4	10	4	7	11	6	4	10
Left forearm { Complete	—	—	—	3	—	3	1	—	1	2	—	2	3	—	3
Left forearm { Partial	—	1	1	3	4	7	4	3	7	1	7	8	2	1	3
Fingers	2	1	3	3	2	5	4	1	5	7	—	7	3	—	3
Neuritis (including numbness of hands or arms).	1	—	1	2	—	2	5	—	5	5	—	5	5	—	5
Other (including paralysis of deltoid, muscles of speech, locomotor ataxy, and general paralysis).	6	—	6	1	—	1	2	—	2	4	2	6	1	—	1
	51	33	84	72	42	114	82	63	145	78	70	148	70	45	115

Similarly to achieve reduction in the severe cerebral symptoms is very important as their occurrence must be regarded as evidence of inhalation of lead dust or fumes in excessive amount and points to failure, therefore, at some point or other in needed precautionary measures.

TABLE V.—ENCEPHALOPATHY, 1904–1914.

Symptom. (1)	1914. (2)	1913. (3)	1912. (4)	1911. (5)	1910. (6)	1909. (7)	1908. (8)	1907. (9)	1906. (10)	1905. (11)	1904. (12)
Epilepsy, etc. ...	4	4	9	6	16	12	15	14	11	12	15
Mental defect ...	4	3	2	5	2	2	1	6	3	1	2
Optic neuritis ...	—	—	—	2	3	3	2	3	7	5	4
Total ...	8	7	11	13	21	17	18	23	21	18	21

Reference to table I. brings out the regrettable fact that the continued diminution in cases has not been accompanied relatively by corresponding fall in the number of deaths reported. This seeming anomaly is the result of more frequent association now than formerly, following on the operation of the Workmen's Compensation Act, 1906, of lead poisoning on death certificates of lead workers suffering from not only chronic nephritis but also, for reasons not sufficiently clear, phthisis and pneumonia. This fact alone, although inclusion of all such fatal cases has not masked the notable diminution in the number of cases in the Pottery industry, does account for the apparent increased severity in the period 1910–1914 (20.8 and 30.1 respectively). The following figures of deaths taken from the Registrar General's Report sufficiently support the views stated as they show a fall in the fatality from lead poisoning down to the year 1906, when the Act came into force, and a rise afterwards :—

1900	1901	1902	1903	1904	1905	**1906**	1907	1908	1909	1910	1911	1912	1913
114	101	83	90	87	78	**74**	92	105	91	86	110	106	81

The following table has interest as showing (approximately only) the attack-rate per thousand among those exposed to lead poisoning in some of the principal lead industries. In the first seven the figures in columns (2) and (3) have been made out from the number of examinations by the Certifying Surgeon in industries where periodic medical examination is required. The drop in the figures for Pottery in 1914, as compared with 1913, is significant as showing lessened exposure to lead.

TABLE VI.

Industry	Approximate Number of Persons Employed in Lead Processes.		Number of Reported Cases.				Attack-rate per Thousand.			
	1913.	1914.	1911.	1912.	1913.	1914.	1911.	1912.	1913.	1914.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
White lead	1,201	1,119	41	23	29	29	29	17	24	26
Vitreous enamelling ...	933	768	19	5	9	11	22	5	10	14
Tinning of metals ...	878	492	13	15	9	10	21	17	10	20
Electric accumulators ...	1,475	1,543	24	38	44	41	21	30	30	27
Paints and colours ...	1,400	1,287	21	19	22	21	14	13	16	16
Pottery	7,085	4,661	92	80	62	28	15	13	9	6
Smelting of metals ...	2,878	2,827	48	56	26	36	17	23	9	13
Coach painting ...	29,308	29,308	104	84	71	57	4	3	2	2
File cutting	5,556	5,556	18	13	14	11	3	2	3	2
Printing	58,777	58,777	32	37	21	23	0·5	0·6	0·4	0·4

Smelting of Metals (1) in the five years under review includes 200 cases, of which 121 occurred in lead smelting proper, 11 in desilverising, and 64 in the manufacture of spelter. The danger in lead smelting lies in fume and dust inhaled at the blast and refining furnaces, in desilverising from fume given off at the cupola furnace, where the temperature is necessarily high, and from dust in subsequent preparation of litharge; and in spelter (zinc) manufacture from the fumes given off from the small amount of lead (2-3 per cent.) which comes off as fume in the distillation of the charge of zinc containing material and anthracite. The proportion of cases of paralysis is rather higher (21.9 per cent.) in spelter making than in either lead smelting or desilverising. The Regulations, which came into force in 1911, requiring periodical medical examination and localised ventilation as far as possible in the processes, have demonstrated their value, although, owing to the exposed manner in which operations have necessarily to be carried on, local application of the draught is often difficult of attainment, especially under adverse weather conditions. Dr. G. Arbour Stephens, the Appointed Surgeon at the five principal spelter works under Regulations, has done much good in emphasising the importance of sound teeth in protecting against risk of lead absorption.

Brass (2) is sub-divided, according as incidence in the industry is noted, into (*a*) polishing, (*b*) chandelier fitting, and (*c*) casting, &c. In the making of all alloys of brass a small quantity of lead (1 to 5 per cent.) is added to soften the metal. In casting, during the five years, 11 cases were reported, no doubt due to inhalation of fumes; in polishing, 19 from the small amount of lead in the abraded dust when locally applied exhaust was inefficient, and in chandelier fitting 7. Only seven of the 19 cases due to polishing were reported from Birmingham.

The Brass Regulations, with their requirements for exhaust ventilation, have largely transformed this industry. In the year 1902 I made detailed inquiry into the health of brass workers in Birmingham, examining for this purpose 233 casters and 210 polishers. The main details of this inquiry were published in the Annual Report for 1905, pages 388-97. The inquiry was carried out in 21 factories. The conclusion at which I arrived was that work in the casting shop was more trying and attended with greater injury to health than work in polishing. About 65 per cent. of the casters stated they had more or less frequently suffered from the train of symptoms—malaise, weakness, shivering and extreme feeling of cold—characteristic of brass founder's ague. Evidence of lead absorption was noted in 4 casters and 16 polishers. The Regulations apply in Birmingham alone to 860 casting shops, of which about 320 are exempted by the exception with regard to air space per person. Many small and unsuitable shops have been discontinued during the past few years. Although from time to time I had when in Birmingham seen admirable instances of the success of the Regulations, it was not until the beginning of this year

that I had opportunity of revisiting the factories in which I had made my original inquiry. I found in every casting shop not exempted by reason of air space suitable provision made in one way or another for speedy removal of the fumes. Several of the casting shops were small and incidence of brass founder's ague formerly had been severe, but the same men whom I had examined under the old condition were insistent as to the striking improvement in the conditions of work which had resulted. Brass founder's ague in their experience had almost disappeared, thanks to the exhaust ventilation installed.

Sheet lead and lead piping (3) is sub-divided, according to the process carried on at which the attack was attributable, into (*a*) melting pot, and (*b*) elsewhere. During the five years 16 cases were classed under the former head and attributable, therefore, to dust arising in skimming off the dross, and 17 in the latter which includes handling the (frequently) old and dusty oxidised lead piping, cisterns, tea lead, &c.

Plumbing and Soldering (4) is sub-divided into (*a*) handling red and white lead for jointing, and (*b*) soldering, under which term is included, in addition to ordinary soldering with a bit, lead burning with oxyhydrogen or oxyacetylene blow-pipe—operations extensively carried on in chemical works. In the former 70 cases were reported and in the latter 88, of whom 9 were females. Use of the oxyacetylene flame is comparatively new and appears to be employed largely in shipbreaking operations. Mr. Evans (Swansea) thus refers to it:—

> As a general rule, the burners "chip" off the paint before attempting to "burn" the plate, but occasionally, owing to the difficulty of position, and probably more often owing to laziness, this precaution is neglected, and consequently considerable risk of poisoning is run when carrying out the operation in a confined space."

Some solvents (viz., caustic soda, caustic potash, &c.) have been since tried to avoid chipping, but these were found to be slow in their action.

The following is an instance of lead poisoning from oxyhydrogen welding described by Mr. Evans (Swansea):—

> The materials welded were made either of pure lead, or of an alloy consisting of lead, antimony (7 per cent.), and tin (small quantities). No visible fumes or vapour were given off when burning a plate of pure lead, and, when burning the alloy, only small traces of white fumes (probably antimony oxide) were evolved—apparently from the surface of the metal in the immediate vicinity of the part burnt—but from the colour of the flame, it was quite evident that antimony vapour was being given off at least in small amounts, and was passing into the air in an invisible form. It is probable that small quantities of lead are given off in the process of oxy-hydrogen welding. The oxy-hydrogen is a reducing flame, and that, coupled with the fact of the high temperature produced by the flame, would probably have the effect of volatilising the lead as such, and would be a source of danger to anyone working in close proximity to such an operation.

So far as the reports show the proportion of severe cases and of chronic plumbism is greater from use of the paste of red and white lead than in soldering—the figures being 27.5 and 17.4 per cent. as compared with 10.1 and 7.6 respectively.

Printing (5) includes 146 cases of whom 69 were compositors, 54 stereotypers, electrotypers or linotypers, and 23 employees in other processes. Much has been done by the staff in recent years in this industry in urging adoption of methods of vacuum cleaning of type cases in place of blowing the dust out with bellows. The following report of a case by Mr. Verney (North West London) has interest:—

> A case of lead poisoning was reported from a printing works, the victim being a labourer engaged in limewashing and other odd jobs. The works are well kept and the occupier was at first disposed to attribute the poisoning to the man's previous employment. It transpired, however, that he had recently limewashed the "foundry" where plates for photo-engraving are cast and prepared, and had brushed down the walls before doing so. A sample of some dust which he had neglected to remove was taken from a ledge near the ceiling over the metal pot and was found to be rich in lead. The quantity likely to be inhaled and swallowed while brushing down walls, beams and ceiling was sufficient to account for the poisoning. Obviously the dust in such places should never be disturbed with the brush (at any rate in a dry condition), but should be removed by a vacuum cleaner.

File-making (6) includes 53 cases among cutters and 12 among hardeners, *i.e.*, tempering the steel by plunging the file into a bath of molten lead at a temperature at which development of fume is possible.*

Tinning (7) includes 64 cases, of whom 36 were employed in tinning of hollow-ware with a mixture of (usually) half tin and half lead, 18 in the manufacture of iron drums and kegs and 10 in the manufacture of harness furniture (harness, bits, bridles), these being the processes to which the Regulations of 1909 apply. The figures for this branch of industry are not therefore strictly comparable with the figures for 1900–1909 which refer to tinning of hollow-ware as well as porcelain enamelling of baths and stoves, now classed under enamelling. Full inquiry was recently made by Dr. Collis into the working of the Regulations in the hollow-ware and harness furniture branches; he was satisfied as to the great improvement in the conditions which had resulted.

White and Red Lead (8) *and* (9) include only factories in which carbonate of lead is manufactured and the cases arising in smelting works from manufacture of red lead. The red lead cases, therefore, since the process in many factories comes under the Smelting Regulations might have been added to the 200 included under (I). The white lead cases number 156 and the red lead 39. The great diminution in the reports of lead poisoning from white lead factories (from 399 in 1899 to 29 in 1914) is due mainly to (1) improved structural conditions ; (2) adoption of mechanical means (cranes, rails, hoists, &c.) for conveyance of material in substitution for hand carrying ; (3) exhaust ventilation where dust arises as in packing and paint mixing; (4) periodical medical examination; (5) diminution in height of the stoves or adoption of mechanical drying stoves; and (6) conversion of white lead into paint by means of direct mixture with oil while in the pulp stage. Reduction of the figures for red lead is due to adoption of automatic mechanical methods in which pig lead enters at one point and emerges as the finished article at the other.

Pottery (10).—The great drop in 1914 (28 cases as compared with 260 in 1899) in the figures for this large industry, employing some 60,000 workers, of whom about 7,000 are in normal times engaged in lead processes and 344 in litho-transfer making, seems to be due in some measure to the adverse influence on the trade of the war, but much more to (1) improved conditions (notably use of exhaust ventilation, and (2) increase in the use of low solubility and leadless glazes. Administration of the new Regulations for Pottery is dealt with in Chapter XI by Mr. Pendock and Mr. Werner.

Glass cutting (11).—Twelve cases are included under this heading. This was an industry reported on by the Miscellaneous Lead Industries Committee because of incidence of lead poisoning from the spray of putty powder (lead oxide) necessary in polishing cut glass. Following on adoption of their recommendation as to exhaust ventilation in the process cases are now few.

Enamelling (12) includes 61 cases, of which 10 were due to the enamelling of sheet iron for advertisement signs (in this industry leadless glazes have replaced lead almost entirely), 1 in enamelling copper letters, 3 in enamelling opal signs, and 47 in the porcelain enamelling of cast iron baths and stoves. In the last named branch powdered glaze is sprinkled over the cast iron bath while it is for a minute withdrawn red hot from the furnace, and the uprush of hot air carrying particles of glaze is with difficulty caught completely by any hood and fan. Small articles can be dealt with successfully in automatic closed apparatus. Leadless glaze can be used when a white colour is required, but lead is at present indispensable for the greens, mauves, yellows and reds of gas stoves.

Electric accumulators (13) accounts for 178 cases which may be classified thus:—

Casting	17
Pasting (including mixing and dressing)	52
Lead burning	30
Trimming, filing, sawing, wire brushing, and cleaning	35
Trucking and handling plates	18
Smelting and handling old accumulator plates	8
Other (including formation, sweeping, erecting outside, &c.)	18
	178

* See the investigation on this point by Mr. S. R. Bennett in the Annual Report for 1910, p. 172.

The industry involves much handling of red lead, litharge, and peroxide of lead and use of a wire brush and the file is frequent in assembling. Moreover, the workman's face is often close up to the work. Recently introduction of locally applied exhaust ventilation at the lead burning and filing (points not required in the Regulations dating from 1902) has been insisted on with good results. The industry is constantly developing, and in many works the need for extension of the processes outgrows the capacity of the exhaust originally installed. Thus from a new firm 8 cases were reported in 1914. Another firm which in 1901 reported 23 cases reported only 1 in 1914. These facts show that the diminution effected in incidence in one firm is unfortunately counter-balanced by unsatisfactory conditions in another in which the manufacture has been recently begun.

Paints and colours (14).—The cases number 100 and were reported from factories under the Regulations for the manufacture of paints and colours with dry carbonate of lead or red lead, or where chromate of lead is produced by boiling. Comparison with years before 1907, when the Regulations came into force, shows how effective they have been.

Coach building (15).—The cases number 386, of which 185 relate to persons employed in building and painting of (*a*) railway carriages and engines and tramcars; 78 of (*b*) motor cars; 21 of (*c*) perambulators; and 102 of (*d*) ordinary carriages, carts and the like. There is evidence of a considerable amount of chronic plumbism characterised by wrist drop in groups (*a*), (*c*), and (*d*), and very much less so in (*b*) which is a comparatively new industry and in which, therefore, there has hardly been time for such symptoms to develop. Of the favourable conditions in the motor car industry Mr. Good (Coventry) writes:—

> Although the motor body and side-car body trades have grown enormously in Coventry during recent years, cases are not very numerous, and there should be fewer in future as leadless paints or paints which contain very little lead are being used to a greater extent than before. One large motor firm decided to change from lead to practically leadless paint in February when I produced figures to show that more cases occurred in their works than in all the other motor works in Coventry combined. Many visits were paid to the numerous small side-car body works which sprang into existence during last winter, in order to urge the use of leadless paints and to enforce adequate precautions where lead paint was used. The occupiers of these places—mostly small workshops—were, as a rule, unacquainted with the substitutes for lead; some knowing how to manipulate lead paint, and the results which could be obtained, hesitated to make a change; but the action of the large firm mentioned above was a powerful lever in such cases.

Shipbuilding (16) includes 153 cases of which 46 were reported from Government Dockyards and 107 from others. No less than 29 were contracted in the Glasgow district, and the great majority of these within the last two years. Analysis of the figures shows that in the Government Dockyards the proportion of severe cases is less than in the others, the result no doubt of the supervision now exercised in them over this class of work. Effort is being made in the Glasgow district in the same direction. Poisoning in this industry arises from sandpapering painted surfaces in cabins, &c., in chipping and scraping off old lead paste often in confined spaces such as double bottoms, tanks, bilges, and the like, and occasionally from fumes given off in inserting red hot rivets into holes containing yarn soaked in red lead and oil.

Paints used in other industries (17) includes 243 cases. In the three industries (coachbuilding, shipbuilding and other use of paints) the only impression that can be made by way of reduction lies in the discovery and use of a substitute for white lead paints. The reports of Inspectors not infrequently make reference to disuse of lead paints after occurrence of a case.

Other industries (18) includes 367 cases. The importance of distributing the cases under this vague heading led me to tabulate them over a period of five years in the following way which gives an easy key to the source of poisoning:—

TABLE VII.

—	Males.	Females.	Total.
Tempering springs	10	—	10
Other contact with molten metal	87	4	91
Metal sorting	7	—	7
Handling lead	10	2	12
Shot making	2	—	2
Other contact with metallic lead	13	14	27
Indiarubber	26	—	26
Glass making	3	—	3
Yarn dyed in yellow chromate of lead	6	26	32
Other lead compounds	110	6	116
Other tinning	7	—	7
Coopering	4	—	4
Other	25	5	30
Total	310	57	367

Tempering springs (*a*) is carried on in Sheffield and poisoning results both from fume from (or dust in drossing) the bath of molten lead into which the steel spring is plunged and, subsequently, from the scaling off of the thin film during testing under hydraulic pressure. *Other contact with molten metal* (*b*) covers the numerous cases where poisoning has attended skimming operations which could not be brought under any of the other classified industries. Under this heading come cases which have occurred in motor car beading. Dr. Collis visited six factories and thus describes the process :—

> A semi-circular strip of brass or white metal, about ⅝ inch in diameter and 6 feet to 8 feet long, is placed with its concavity uppermost in a groove prepared for it. The concave surface is either wiped over with a solution of zinc chloride (often made by neutralising muriatic acid spelter) if the strip is made of white metal, or powdered with ammonium chloride crystals if the strip is of brass. The edge of a red hot soldering iron previously dipped in powdered ammonium chloride is run along the concavity of the strip with one hand, while, following up the soldering iron, a molten mixture of lead and antimony or of lead and tin is poured from a ladle held in the other hand into the concavity. As the lead alloy comes into contact with the flux, fumes arise which the operative, as his face is over the work, is in danger of inhaling. This process closely resembles that of common tinning, and there can be little doubt that the fumes contain volatile lead chloride. Nine men out of 14 employed at this process in six factories showed definite signs of lead absorption. Owing to the length of the metal strips localised removal of the fumes before they get into the air is difficult, but the possibility of inhaling them can be largely avoided by the following arrangement :—An alley or tunnel is fitted with an exhaust fan at one end and an air inlet at the other, so that a current of air is constantly passing along the alley to the fan ; the worker as he pours then walks away from the fan and fumes as they rise are carried past him to the fan.

Metal sorting (*c*) covers the cases contracted from collecting old scrap lead, &c., very often carried on alongside (*b*). *Handling lead* (*d*) may be considered at the same time as (*f*) *other contact with metallic lead.* These two together include only 39 out of the total 2,742 in which the evidence pointed to possible manipulation of metallic lead (and so contamination of the hands) as the cause. In *shot making* (*e*) considerable risk appears to me to be run owing to the necessity of grading the shot according to size and sifting operations giving rise to dust. The number of cases (2) in the five years is surprisingly few. In mixing *indiarubber* (*g*) litharge is nearly always added to the batch of mineral substances to give resiliency and other qualities. Sometimes it is sprinkled over the rubber as it passes through hot calender rolls—an operation in which poisoning is sure to result if local exhaust ventilation is not applied. The cases (very few) arising from the necessary addition of red lead to the mixture for *glass making* (*h*) required a separate heading as they could not be included under " glass cutting " where the process giving rise to poisoning was so different. The dust in the heading of *yarn dyed in yellow chromate of lead* (*i*) gave rise to 32 cases of which 26 were females. Frequent reference has been made in Annual Reports* to this industry now controlled by Regulations. *Other lead compounds* (*j*) includes 116 cases due to inhalation of dust of compounds of lead not included in the special groups. And similarly *other tinning* (*k*) includes the small number (7) of cases in which the danger is the same as in Tinning (7) but the articles treated are not those scheduled. In *coopering* (*l*) I was struck several years ago by the severity of the symptoms in cases of plumbism contracted from the breaking up of old lead casks which had contained lead compounds and thought it desirable to tabulate them separately. Owing to adoption generally of wet methods the danger now appears to be much mitigated.

* See Annual Reports for 1907, pp. 281-3; and 1909, pp. 188-9

CHAPTER XII.

TETRACHLORETHANE POISONING.

By T. M. Legge, M.D., *H.M. Medical Inspector of Factories.*

Poisoning by chlorine derivatives of ethane and ethylene.—Before the illnesses due to inhalation of tetrachlorethane, of which jaundice has been so prominent a symptom, came to my notice, occurrence of jaundice as a symptom of industrial poisoning has been familiar to me as following on, first, inhalation of arseniuretted hydrogen gas in chemical works, and secondly, absorption of nitro-derivatives of benzene in factories for the manufacture of explosives. Poisoning by arseniuretted hydrogen, of which some 70 cases have come to the knowledge of the Factory Department during the last 15 years, is characterised by the rapid development, in the course of a few days, of an intense coppery jaundice, no doubt haemo-hepatogenous in character. In the first instance a destruction by the gas of the elements of the blood takes place with subsequent increased formation, from the haemoglobin liberated, of bile pigments in the liver which lead to increase in the viscidity of the bile and temporary obstruction of the ducts. Onset of the symptoms is usually within a few hours of exposure. The jaundice observed in cases of absorption of nitro derivatives of benzene is of the same kind, and is caused by the haemolytic action of the compound on the blood with formation of methaemoglobin. I have never seen or heard of jaundice produced industrially from phosphorus.

On thinking over whether there was any other process in my experience which had given rise to jaundice, I recalled having once, on complaint, examined a number of women engaged in an indiarubber factory, obtaining from them evidence of gastric derangement and, in addition, from one of them a history of "yellow jaundice." The solution which they were using was a mixture of carbon tetrachloride and chloride of sulphur in equal parts.

The chlorine derivatives of ethane and ethylene have recently been produced by an inexpensive process, and as they are non-inflammable, non-combustible and non-explosive the reason for their use as solvents of fat, resins and rubber, in preference to benzene, carbon bisulphide, alcohol, ether and turpentine, is obvious. Explosions from benzene in industrial premises as, for example, that a few years ago at a large Oil Cake works at Liverpool, from naphtha, and from carbon bisulphide have been attended with loss of life and much damage to property.

Of these derivatives *trichlorethylene* (C_2HCl_3) is that which has come most into use, mainly for the extraction of oil from seed and for the removal of grease spots in dry cleaning. In one oil extracting works where the process of extraction was done automatically in closed iron chambers, and every effort made to remove the last traces of trichlorethylene before the seed was withdrawn, no case of jaundice had occurred among the seven men employed. The conjunctivae, however, were muddy and injected, and one of them, six weeks before I saw him, after working a short time was seized with vomiting and removed to the infirmary. The physician's notes were briefly—"vomiting—very violent and excited on admission—could give no account of himself—appeared dazed and had both pupils contracted." His condition was put down to epilepsy. Another worker, in charge of the reservoir in the basement, stated that he had been once rendered insensible by the fumes, and one of the principals of the firm suffered from a severe bilious attack the first day he took over the management of the department. So far I have visited but few premises in which trichlorethylene is used in other than small quantities and so cannot express further opinion as to its toxic quality. No case of jaundice has come to my knowledge.

A paint containing trichlorethylene, used almost exclusively in the brewing industry for coating the inside of fermenting vats and casks, caused the death of a man engaged in applying it. The paint has the merit of non-inflammability. Directions for its use

issued by the makers recommend (1) the workman to wear " an indiarubber tube, one end of which is fitted to a mouthpiece and the other end secured to a point above and outside the vessel undergoing treatment," of which they supply a special form, and (2) application of a " suction pump to the cleaning-out vent in the bottom of the vessel, whereby the heavier fumes are withdrawn."

Tetrachlorethane $C_2H_2Cl_4$ is used mainly as an ingredient of the varnish or " dope," as it is called, for covering the wings of aeroplanes to make them impervious to moisture and air. This " dope " consists of powdered acetate of cellulose dissolved in various organic solvents such as acetone, amyl-acetate, benzene, carbon tetrachloride, tetrachlorethane and others, in order to bring the cellulose to the needed dilution. Acetone is the best solvent apparently, but the current price of it is about £100 per ton, whereas tetrachlorethane is only £28 per ton. And, moreover, tetrachlorethane seems to have the remarkable property of tightening up the fabric which is stretched to form the wing in a way that nothing so far tried can do.

The development in the manufacture of areoplanes has been rapid, carried on as it is now in at least 27 factories employing roughly some 6,500 workers. In one factory alone 1,500 hands are employed. Perhaps 300 persons—men and women in equal proportions —are engaged in doping operations, but before the recent occurrence of poisoning a far greater number than this was exposed to the fumes as in only a few factories was the process separated off from the general atmosphere of the usually large shed in which the wood working, fitting and erecting processes were carried on. Further, in order to keep the fabric dry—considerable importance being attached to this as the fabric, if moist, tends to rot under the varnish—the air was kept at a temperature of about 65° Fahr. or more, and ventilation intentionally reduced to a minimum unless the air introduced was warmed. The wing surfaces vary in size—from 20 to 30 feet long by 6 to 8 feet wide in biplanes, and perhaps 20 by 10 in monoplanes, thus affording many square yards of evaporating surface. Four to six coats of varnish are applied, each coat being allowed to dry before the next is applied. In order to secure finish two men work simultaneously opposite one another on either side of the plane. Each carries the " dope " mixture in a can in his left hand and brushes it on to the wing supported on trestles with his right. In large factories where the output amounts to, say, three aeroplanes a week, as much as 80 gallons may be used per week, and as the dope is of value in proportion to the rapidity with which it dries, the amount of fume evaporated may be imagined. On the outbreak of the war not only was the personnel largely increased but overtime also was worked in the large factories, the hours being from 6 a.m. to 9 p.m. with half an hour's break for breakfast, one hour for dinner, and half an hour for tea. In the factory where incidence has been greatest there was no available place for the messroom, so meals even had to be taken in the shop, and the sanitary accommodation (sufficient for the needs before the war) became inadequate, plans for extension having to be submitted to the Urban District Council.

It may be well to deal first with this factory as Dr. W. H. Willcox and I found it early in December. The premises consisted of one large shed of a superficial area of about 32,400 square feet with a double ridged roof. There were windows in the walls; the main lighting, however, came through the whole length of the ridged roof. Natural ventilation was arranged for by three large lantern openings at intervals along the two ridges. Mechanical ventilation which, it is important to note, played a part in the outbreak was arranged on a plenum system—a high pressure fan distributing warmed air near the ground level through well arranged tapering trunks with subsidiary branch ducts.

" Doping " was carried on by about five men in the part of the shed furthest from the main entrance. The portion of the room where it was done was not screened off from the general atmosphere of the shed, nor was there any attempt at local removal of the fumes. The peculiar smell given off by the " dope " was distinctly perceptible on entering the building. In the vicinity of actual " doping " it was very strong. The head " doper," however, who had done the work for nearly a year only complained of drowsiness caused by it. Questions addressed by Dr. Willcox and myself to men and women (about half a dozen women only are employed in sewing strips of fabric together) at the benches on the carpenter's landing elicited evidence of recent gastric attacks which, however, had not caused absence for more than a day or two and had been unattended by obvious jaundice. Some of them looked poorly. The accompanying list gives the order in which the cases succeeded one another, the precise occupation, the date of illness, the date of return to work, and subsequent further absence either from renewed illness or because of the decision of the firm not to re-employ them at that time :—

No.	Date started.	Department.	When left.	When returned.	When left. (2nd time)	Remarks.
1	5·6·14	Fuselage shop	15·9·14	—	—	—
2	15·9·14	Assembling plane	17·10·14	2·11·14	20·11·14	—
3	12·8·14	Front elevator	17·10·14	—	—	—
4	12·8·14	Spars	17·10·14	27·11·14	30·11·14	Left by order.
5	8·8·14	Fabric doping	24·10·14	—	—	Died, 25·11·14.
6	31·8·14	Ailerons gallery	27·10·14	30·11·14	30·11·14	Left by order.
7	13·8·14	Do.	7·11·14	—	—	—
8	22·9·14	Assembling plane	10·11·14	—	—	—
9	19·6·14	Panel beating	11·11·14	26·11·14	27·11·14	Paid off, 30·11·14.
10	6·10·14	Fitters	11·11·14	23·11·14	30·11·14	Left by order.
11	12·8·14	Spars	12·11·14	30·11·14	30·11·14	
12	13·8·14	Fuselage shop	14·11·14	27·11·14	—	Paid off, 27·11·14.
13	22·9·14	Assembling plane	14·11·14	—	—	—
14	22·9·14	Fabric	23·11·14	—	—	—
15	22·8·14	Assembling plane	30·11·14	—	—	—
16	26·8·14	Fitters	30·11·14	—	—	—

Incidence was greatest in the neighbourhood of the doping area where 8 of the cases (including the fatal case and the two which have proved most severe) were employed. Cases 3, 4, 6, 7 and 11 are also not difficult to account for in the same way. It is more difficult to explain cases 9, 10 and 16, who were working quite fifty yards away. They did not appear to me to have been severe attacks. There is free communication between the erecting shop and the fitters shop, where they worked, both above the general and private office and by a wide opening between the private office and the main entrance. The vapour of the dope is twice as heavy as air and it has therefore had a tendency to keep near the floor level. I believe the plenum system of ventilation served simply to stir up the vapour and to distribute it in all parts of the shed.

The "dope" used was that known as Emaillite No. 1, and contained about 12 per cent. of tetrachlorethane. Other varieties contain a considerably higher proportion. I visited the premises where the mixture was prepared. The quantities having been weighed out are placed in revolving drums. While mixing in these revolving drums goes on no smell is noticeable in the room. No chemical action is believed to take place. When the acetate of cellulose has been dissolved the material is emptied into large jugs and transferred from there to barrels where it is stored.

I examined the three men employed. Work here was commenced two years ago. One man had been employed for the whole two years; another for four months, and the third for 4 months. None showed any sign of effect from the fume. The short duration of employment of one of the men was due to his taking the place of a workman who enlisted. A volume fan electrically driven was placed in the wall of the room in which the drums were placed, and was in action at the time of my visit. The foreman spoke of the value of the fan in removing the fumes. Subsequently on the 4th December I visited the premises again and took samples of "dope" No. 1 and of each of the ingredients separately and delivered them personally to Dr. Willcox at the Medical Department of St. Mary's Hospital.

I ascertained that another firm manufactured a dope in common use known as Cellon. On going there I obtained all the information I wanted. As in the case of Emaillite the mixing is done in closed in revolving cylinders; the shed is well open to the air and no sign of illness in the two men employed has ever been noted. The composition of the dope varied only slightly from that of Emaillite No. 1, and contained about 11.5 per cent. of tetrachlorethane.

I obtained the addresses of the 16 men absent on account of jaundice and saw 8 of them in their homes. I tried also whenever possible to see the medical man in attendance. I arranged for six of these subsequently to attend at Dr. Willcox's out-patient department, St. Mary's Hospital. The symptoms in all were remarkably uniform. The rapidity with which the attacks followed one another when pressure of work became abnormal—a considerable amount of overtime had been worked since the beginning of August—was remarkable. The jaundice showed itself in about six week's time. The symptoms appear to have been accompanied by little, if any, fever. The men complained at first of drowsiness and of a nasty taste in the mouth and of effects on the throat. There was a sickly feeling and marked distaste for food. In at least two of the cases seen by me meals taken to the factory could not be eaten, so that a condition of semi-starvation was set up. There was as a rule very obstinate constipation, and in some cases vomiting. With the onset

of jaundice the stools became clay coloured, and the urine thick and very dark in colour. Pain over the region of the liver and stomach was a prominent symptom in some. Two of the men seen reported that on recovery from the jaundice they went back to work, but after a few days jaundice returned in a more pronounced form.

In very severe cases haematemesis or convulsions may occur. Coma supervenes, and death results with suppression of urine. All but two of the 8 men seen by me were convalescent. All the cases examined by Dr. Willcox on the 12th December showed signs of enlargement of the liver. None of the men had obvious anaemia, and the condition in this respect, therefore, differs from the haematogenous jaundice not infrequent in workers coming into contact with nitro-derivatives of benzene, which cause haemolysis of the red blood cells. They bore no resemblance to workers coming into contact with anilin or dinitrobenzol.

The post mortem changes have been most marked in the heart, liver, kidneys and mesentery. The notes of one typical case, a female aged 19, are as follows :—

The skin was intensely jaundiced. The liver was hard and firm; it was very yellow and showed marked congestion; weight 34½ ozs. The kidneys showed marked yellow staining of the cortex, the pyramids being intensely congested. The medulla was yellow and congested. The kidneys weighed each 5 ozs. The heart weighed 7½ ozs. The muscle showed yellow staining; some pink staining of endocardium. Numerous petechiæ were present over surface of left ventricle. The small intestine showed intense petechial hæmorrhage over the surface. There was marked congestion of the small intestine. The spleen weighed 8 ozs.; it was hard and firm. Microscopical examination of the liver showed extensive necrosis, and in the kidney fatty degeneration was present.

Experiments were instituted by Dr. W. H. Willcox,* at the request of the Home Office, to test each of the constituents of the dope and the dope itself as regards the toxic action of the vapour on the liver. His report on this aspect of the subject which interested him exceedingly—an interest which has been of the greatest help and value to the Factory Department—was as follows:—

"For each experiment a large glass chamber (desiccator) was used. In the bottom of this were placed daily 10 c.c. of the liquid to be tested. A perforated zinc platform was stretched across the middle of the chamber—*i.e.*, half way up. On this were placed the animals (white rats) to be experimented upon. The top of the chamber was covered with a perforated zinc roof. Rats were selected as the most suitable animals. The animals were kept in the glass chamber for eight hours a day for a week."

"The liquids tested were dope, tetrachlorethane, acetone, benzene, and methylated spirit respectively. Two rats were placed in each chamber, five experiments being carried out together."

"The rats thus exposed to dope vapour and tetrachlorethane vapour became very drowsy and slept all day. After removal from the chamber they remained drowsy for some little time, and on some occasions they were quite ataxic in gait, falling over on to their sides. After an hour or more usually they fed and became active. These animals did not gain in weight during the week's treatment."

"In the experiments with acetone, benzene, and methylated spirit the animals were drowsy while exposed to the respective vapours, but on removal from it they immediately became lively and fed well. No ataxic symptoms were observed. All these animals gained markedly in weight during the week."

"After seven days' treatment the animals were killed and post-mortem examinations were made on them by Dr. Spilsbury and myself. The tetrachlorethane rats showed marked changes in the liver to the naked eye, there being fatty degeneration and bile-staining present. The "dope" rats showed similar changes but less marked. The rats exposed to the vapour of benzene, acetone, and methylated spirit showed no changes in the liver to the naked eye."

"Careful microscopical examination of the organs showed marked fatty degeneration and cloudy swelling in the liver and kidneys of rats exposed to dope vapour and tetrachlorethane vapour, but no abnormal change in the animals exposed to the other vapours. Rats were also exposed to the action of dope vapour and tetrachlorethane vapour for five weeks. Marked diminution in size in the liver occurred in each case. The liver and kidneys were pale on section. They showed cloudy swelling and fatty degeneration."

The above experiments showed conclusively that tetrachlorethane is a powerful liver poison, and also they show that dope vapour is a liver poison, and that the poisonous property of dope vapour is due to tetrachlorethane being present in it.

* An outbreak of toxic jaundice due to tetrachlorethane poisoning, by W. H. Willcox, *Lancet*, March 13th, 1915.

I have visited several of the aeroplane factories and examined all the persons in them employed in doping and certain others working near them. Having already dealt so fully with the conditions in the factory where incidence has been highest, I summarise merely the conditions found in the others. Nearly all the premises were new, cubic space ample and the conditions for normal work not involving exposure to poisonous fumes excellent. The seaplane works are on the edge of the sea, and the natural through ventilation in them was in itself almost sufficient to neutralise the effect of the fumes. Inquiry in one factory brought to light the significant fact that as long ago as February, 1913, one man employed in doping had died, the symptoms being those of acute yellow atrophy of the liver. Here also a fellow worker, whom I saw, had also suffered at the same time from jaundice and other typical symptoms although he had not given up work. Work had been carried on in a confined space, and probably with a dope containing high proportion of tetrachlorethane. In another factory a man testing the engine suffered in the middle of the year, and in yet a third I saw a man who had had jaundice in August last—all these cases, therefore, dating from a time anterior to the war pressure.

Altogether I have traced 25 cases, including 4 deaths,* in which jaundice has been the prominent symptom; many others have suffered from gastric and intestinal symptoms without jaundice noticeable to themselves or their friends, and from symptoms diagnosed as "influenza" and "tonsillitis."

The fact that the vapour is twice as heavy as air has had noticeable effect in affecting workers engaged at sitting work near the place where doping was carried on. One seamstress died partly no doubt as the result of her relatively lower position. In another factory six men engaged in wire splicing and seated on benches in a portion of the doping room screened off by a low wooden partition, exhibited more marked effect than the dopers who were standing.

As soon as the danger was recognised the Factory Department in conjunction with the Admiralty and War Office took prompt action. All firms were asked (1) to carry out doping in a separate shop or portion of a larger shop screened off so as to limit the number of persons exposed to the fumes; (2) to provide exhaust fans at the floor level to remove the vapour which is heavier than air directly into the outside atmosphere; (3) to permit no workmen or women to remain in the doping shop during meal times.

It has interest to follow the steps taken to minimise the danger. The person who experiments with the ingredients with a view to perfecting the dope wears a smoke helmet, that is, a mouth piece fitting over the nose and mouth and communicating with the outside air by a long flexible pipe. Through this he inhales fresh air, breathing of the contaminated atmosphere being prevented by a valve through which he exhales only. Workpeople, however, cannot be expected to wear such an apparatus except for short periods for cleaning operations or rescue work. Seeing that the vapour of tetrachlorethane is considerably heavier than air (the specific gravity is 1·6) District Inspectors recommended through ventilation of the room with mechanical exhaust below the breathing level drawing the air down and away from the workers. As it was thought possible that under certain conditions the vapour arising from the varnish might form an explosive mixture with air, attention had to be directed to this danger in connection with the installation of power for the exhaust ventilation. Locally applied exhaust ventilation was not thought possible at first owing to the size of the aeroplane wings, the general guiding principle being to introduce air (preferably warmed) at a point on one side of the room considerably above the workers' heads and extract it by volume fans placed at the ground floor opposite the air inlet. In some cases the downward exhaust was arranged through gratings in the floor. As, however, two men are doping at the same time the one nearest to the fan could not escape inhaling some of the vapour. To avoid this and to reduce still further the amount of vapour in the atmosphere, one firm successfully arranged for actual doping to be done on the wings placed on trestles in long boxes with flap sides, the bottom of the box being connected up with a volume fan. Thus the whole surface of the wing was swept by moving air which constantly passed to the exhaust.

The use of tetrachlorethane and of other substances such as carbon tetrachloride (which might be expected to have similar detrimental effect on the health) has been entirely dispensed with by one or two firms; others maintain that no substance so far tried gives such flexibility and durability as a dope containing some proportion of tetrachlorethane.

After occurrence of the outbreak in this country I ascertained that late in 1913, and in the beginning of 1914, the same trouble had been experienced in Germany. In one factory among 15 persons employed in doping 12 were affected, of whom two had died. The symptoms fell into two clearly defined types. In the one the symptoms had been

* One further death of a woman (with considerable length of employment before exhaust ventilation was installed) occurred in February, 1915.

nausea and vomiting, feeling of general discomfort, pains in the stomach and marked jaundice with enlarged liver. In one instance basophil granules were observed in the red blood cells. In the other group, in addition to loss of appetite and nausea, nervous symptoms predominated—marked tremor of the hands, pins and needles feeling in the hands and feet, diminution or loss of the knee jerks, headache, pains in the limbs and excessive sweating. The dope contained from 30 to 50 per cent. of tetrachlorethane. In 1911, Professor K. B. Lehmann made comparative experiments as to the poisonous nature of a number of chlorinated hydro-carbons, amongst them being tetrachlorethane. Commencement of narcosis was taken as the measure of the poisonous nature. Slight narcosis was caused in cats with a proportion of 5·7 mg. per litre within 4½ hours, and severe narcosis in 5¼ hours. With stronger proportions the animals were generally clearly ill on the following day. Judging by this standard of the commencement of narcosis, when compared with other chlorine derivatives of hydro-carbons, tetrachlorethane comes out as much the most poisonous, *e.g.*, 9 times as poisonous as carbon tetrachloride and 4 times as poisonous as chloroform. In experiments on chronic poisoning the animals exposed to air containing 1-2 mg. of tetrachlorethane per litre for four weeks over a period of 67 hours showed slight or severe drowsiness and a not inconsiderable diminution in body weight. No post-mortems were made.

Even if, as is to be hoped, use of tetrachlorethane may be eliminated from the dope, I am still of opinion that exhaust ventilation will be necessary to prevent ill effects (dryness of throat, headache, giddiness, amblyopia and even unconsciousness) from such solvents and diluents as benzene, acetone and methylated spirit which must necessarily continue to be used.

APPEALS.

JAMES KEITH, LTD. *v.* KIRKWOOD.

High Court of Justiciary, 9th June, 1914.

Justiciary Cases—Statutory Offences—Factory and Workshop Acts—Non-textile Factory—Factory and Workshop Act 1901 (1 *Edw. VII, cap.* 22), *sec.* 149 (1) (*b*) (*c*), *and Schedule VI, Part II, sec.* 28.

ON the premises of a firm of wholesale and retail grocers and wine merchants and Italian warehousemen there was situated on one floor a portable bottle-filling machine actuated by electricity, whereby beer taken from casks was filled into bottles, and on another floor a bottle washing machine actuated by electricity. The machines were used solely in connection with the business of the firm. *Held* that the use of the premises did not constitute them, nor any part of them, a non-textile factory in the sense of section 149 (1) (*b*), and Schedule VI, Part II, section 28, or of section 149 (1) (*c*), of the Factory and Workshop Act 1901.

The Factory and Workshop Act 1901 (1 Edw. VII, cap. 22) enacts—Section 128 (1)—"There shall be affixed at the entrance of every factory and workshop, and in such other parts thereof as an inspector for the time being directs, and be constantly kept so affixed in the prescribed form and in such position as to be easily read by the persons employed in the factory or workshop—(*a*) the prescribed abstract of this Act. . . ." Section 149 (1)—". . . The expression 'non-textile factories' means . . . (*b*) any premises or places named in Part II of the said Schedule (sixth) wherein or within the close or curtilage or precincts of which steam, water, or other mechanical power is used in aid of the manufacturing process carried on there; and (*c*) any premises wherein or within the close or curtilage or precincts of which any manual labour is exercised by way of trade or for purposes of gain in or incidental to any of the following purposes, namely— . . . (iii) the adapting for sale of any article, and wherein or within the close or curtilage or precincts of which steam, water, or other mechanical power is used in aid of the manufacturing process carried on there. . . ."

Schedule VI (Part II) gives a list of non-textile factories and workshops, including (section 28)—"Dry-cleaning, carpet-beating, and bottle-washing works."

James Keith, Limited, 86 Cadzow Street, Hamilton, were charged in the Sheriff Court at Hamilton, at the instance of William Dennett Kirkwood, His Majesty's Inspector of Factories, 74 York Street, Glasgow, on a summary complaint which set forth—"That being the occupiers of a factory within the meaning of the Factory and Workshop Act 1901, situated at 86 Cadzow Street, Hamilton, they did, on Tuesday, 20th January 1914, fail to keep constantly affixed at the entrance to the said factory the prescribed abstract of the said Factory and Workshop Act 1901, contrary to section 128, sub-section 1 (*a*), of the said Act."

The Sheriff (HAY SHENNAN) on 25th February 1914 found the accused guilty, and at their request stated a case for the High Court of Justiciary, which stated, *inter alia*—"The following *facts* were admitted or proved:—The appellants are wholesale and retail grocers and wine merchants and Italian warehousemen in Hamilton.

"Their premises extended to six storeys. In the lowest flat (ground floor) there are two cellars, containing respectively 1509 square feet and 1364 square feet. In the former there is a bottle-washing machine covering an area of 45½ square feet, which is worked by electricity. On the flat above this (first floor) there is a wine store extending to 1364 square feet, and a beer-bottling department extending to 1509 square feet. In the latter there is a portable bottling-machine, covering 12 square feet, worked by electricity. The next floor (second floor) is devoted to wine bins and wine bottling, which is done without mechanical power. The floor above this (third floor) contains stores and cellars and a stout-bottling department covering 208 square feet, the work here being also done without mechanical power. The fourth floor contains shop, saloon, and offices, and loading premises. The highest floor (fifth floor) consists of store. The conditions of employment are considerably more favourable than the Factory Acts require. The respondent treats the appellants' premises as a factory because of (1) the electrically driven bottle-washing machine on the ground floor, and (2) the electrically driven beer-bottling machine on the first floor.

"There was not evidence to show what proportion of the appellants' business the bottle

washing represents. It is merely carried on incidentally to the business of wholesale and retail grocers and wine merchants and Italian warehousemen. It includes among much else the washing of bottles, which are afterwards filled by the appellants with wine or beer. Three women and one man work for about twenty-four hours and a half per week at bottle-washing, and cleaning up the premises in which the bottle-washing is carried on. Only bottles used in the appellants' business are washed, and the bottle washing is a mere ancillary branch of their business.

"The beer-bottling machine on the first floor occupies an area of about 12 square feet, is moveable, and could be shifted to another floor if the necessary electrical connection was made. There is a circular pan to which the beer is conveyed from the cask by gravitation. To this circular pan syphon tubes are attached, and the pan is revolved slowly by electrical power. A woman puts each empty bottle on to the syphon tube as the pan revolves. When the bottle is filled a man removes it and places it in a holder on an adjoining disc. This latter disc is revolved by electrical power, by which also the bottle is corked, after which it is removed from the machine. The beer is simply bottled, no special treatment being applied to it. In this process the bottler does not alter the beer or 'finish' it. He merely puts it under the conditions favourable to the development of certain qualities potential in the beer. Probably some process of fermentation takes place within the sealed bottles. Bottled beer is an article of commerce distinguished from draught beer. Draught beer is ready for drinking practically at once when sold. Bottled beer must be kept from six to eight weeks to mature before it is ready for consumption.

"The said beer-bottling machine is used solely for the bottling of Bass's beer, the sale of which by the appellants constitutes about one-sixtieth part of their business. Bass's beer is never sold by the appellants by retail except in bottle.

"On these facts I *held* (1) that no part of the appellants' premises were a bottle-washing work within the meaning of the Factory and Workshop Act 1901, the bottle-washing being merely an ancillary part of their business, and (2) that the bottling of beer above described brought the appellants' premises (or part thereof) under the third category of branch (*c*) of the definition of non-textile factory contained in section 149 of the said Act, viz., 'the adapting for sale of any article.' I was of opinion that the proportion of the beer-bottling work to the total business of the appellants was immaterial and irrelevant to the question raised.

"Accordingly I convicted the appellants of a technical breach of the Act, and found them liable in £1 3s. 6d. of expenses."

The *questions of law* for the opinion of the Court were—"1. Are the appellants' premises or any part thereof (1) a bottle-washing work within the meaning of the Factory and Workshop Act 1901, or (2) a non-textile factory within the meaning of the said Act? 2. On the facts stated, was I right in convicting the appellants?"

Argued for the appellants—(1) This was not a factory but a shop. In the intention of the Legislature the same premises could never both be a shop and a factory. This was shown in the different regulations for meals contained in the Factory and Workshop Act 1901 (1 Edw. VII. cap. 22), sec. 33, and the Shops Act 1912 (2 Geo. V, cap 3)., Schedule I. The use of mechanical power did not of itself make the premises a factory —*Nash* v. *Hollinshead*, (1901) 1 K.B. 700. In the ordinary sense there was here neither "an adapting for sale" nor a "manufacturing process." The phrase "manufacturing process" was the keynote of the Factory and Workshop Act just as "handicraft" was of the Shops Act. The phrase "adapting for sale" only fell to be construed if it was first held that there was a "manufacturing process"—*Johnston v. Lalonde Brothers and Parham* (1912) 3 K.B. 218. In any event there was no "adapting for sale," because the beer remained the same after as before bottling. The fact that the process of bottling was merely ancillary to the main business of the firm took the case outside the Act—*Caledonian Railway Company* v. *Paterson*, November 17, 1898, 2 Adam 620, 1 F. (J.) 24, 36 S.L.R. 60; *Henderson* v. *Corporation of the City of Glasgow*, July 5, 1900, 2 F. 1127 (L. P. Kinross at 1134), 37 S.L.R. 857; *Law* v. *Graham and Another*, (1901) 2 K.B. 327. In both *Fullers Limited* v. *Squire*, (1901) 2 K.B. 209, and *Hoare* v. *Robert Green, Limited*, (1907) 2 K.B. 315, the circumstances were different from the present. (2) The question whether the premises constituted a bottle-washing works was purely one of fact on which the Sheriff's finding was final. In any event the case was ruled by the decisions in *Kavanagh* v. *Caledonian Railway Company*, July 14, 1903, 5 F. 1128, 40 S.L.R. 812, and *Caledonian Railway Company* v. *Paterson* (*supra*).

Argued for the respondent—A factory must be viewed in a broad and general sense, and section 149 (1) of the Act of 1901 must be viewed in the light of what it intended to enact. The bottling and bottle-washing departments should not be dissociated, and the

premises as a whole must be viewed as a factory. If any part of the business corresponded to a factory, then it was subject to the Act—*Petrie* v. *Weir*, June 19, 1900, 2 F. 1041, 37 S.L.R. 795. The popular meanings of terms were not always the correct ones—*Doswell* v. *Cowell*, 95 L.T. 38 (Collins, M.R., at 40). The statutory provisions for shops and factories in fact sometimes overlapped—Factory and Workshop Act 1901, sec. 31 (4). In *Law* v. *Graham and Another* (*supra*) and *Fullers Limited* v. *Squire* (*supra*) the term " adapting for sale " got a wide construction. The only way in which beer could be adapted for sale was by bottling. The meaning of " manufacturing process " was considered in *Owner* v. *Cottingham Sanitary Steam Laundry Company*, 102 L.T. 571 (Lord Alverstone, C.J., at 572). " Manufacturing process " had a technical meaning in the Act of 1901 and might apply to work carried on in aid of the general work of the premises—*Johnston* v. *Lalonde Brothers and Parham* (*supra*); *Hoare* v. *Robert Green Limited*, (1907) 2 K.B. 315 (Lord Alverstone, C.-J., at 319). In *Fullers Limited* v. *Squire* (*supra*) the words unless used in this sense would be meaningless. The reasoning in *Kavanagh* (*supra*) would not stand against that in the later English cases. In the present case the bottle-washing department was much greater proportionally than in *Kavanagh* (*supra*). The case of *Law* v. *Graham and another* (*supra*) was decided before the Act of 1901 was passed. The key to the intention of section 149 (1) lay in the words " any premises . . . wherein . . . any manual labour is exercised."

At advising—

Lord Justice-General—In this case we have had the advantage—denied, I observe, in more than one of the cases cited from the King's Bench—of listening to an excellent argument from both sides of the bar. The question we have to consider and decide is whether the appellants' premises fall within the Factory Acts, and that again resolves itself into two separate and distinct questions—(first) Do the premises on the first floor constitute a non-textile factory in the sense of the Factory and Workshop Act 1901? and (second) Do the premises on the ground floor constitute a bottle-washing work in the sense of that statute? for I cannot agree with the Solicitor-General, for the reason I shall presently give, that the premises on both the first and ground floors must be regarded as forming only one set of premises, and that the operations conducted on both these floors must be considered as forming only one operation in the sense of the statute.

The appellants are wholesale and retail grocers and wine merchants and Italian warehousemen in Hamilton. Their premises extend to six storeys. With the four uppermost storeys we are not concerned in this case. But on the first floor it appears there is a portable bottle-filling machine where beer taken from casks or other receptacles is filled into bottles, the operation being conducted by means of a machine actuated by electricity. The question whether the first floor premises, because of the existance and the operation of this machine actuated by electricity, are a non-textile factory in the sense of the statute depends upon the construction to be placed upon section 149 (1), which read short, is as follows—Non-textile factory means any premises wherein any manual labour is exercised by way of trade incidental to adapting for sale any article, and wherein mechanical power is used in aid of the manufacturing processes carried on there.

Now it appears to me that there are two pre-requisites—statutory pre-requisites—to the inclusion of premises within the category of non-textile factory—(first) in the premises there must be manual labour exercised for the adaptation of articles for sale, and (second) the premises must be premises in which mechanical power is used in aid of the manufacturing processes carried on there. Accordingly the question we have to consider is, whether in premises where there is in use a machine for bottling beer such as is described in the case—in other words a machine for transferring beer from one receptacle into another—there is in progress an adaptation of an article for sale and—for it is not alternative—a manufacturing process aided by mechanical power. I am of opinion that we have no such premises here, for I cannot assent to the argument that merely transferring an article from one receptacle into another can be said to be adapting it for sale.

Reference was made to the case of *Hoare* v. *Robert Green Limited*, (1907) 2 K.B. 315, in the Court of King's Bench, and Lord Alverstone's judgment there, where he said that by straining the words of the Act he could place such an interpretation upon the Act that this operation of transferring beer from one receptacle to another might be considered such an adaptation. We are not asked, and we are not entitled I think, to strain the words of this or any other Act of Parliament. Our duty is to put a fair interpretation upon the words used by the Legislature. And as I pointed out during the argument, if it were legitimate to strain the words of the Act of Parliament for the purpose of giving effect to what we had reason to believe was its purpose, this is not a case in which the Court is encouraged to take that course, because we are distinctly informed that the conditions

of employment in these premises are considerably more favourable than the Factory Acts require. But it is upon a fair construction of the Act of Parliament that I consider that the transference of beer from one receptacle to another is not an adaptation of the article for sale.

It appears to me that the case of *Hoare* is a typical case of the adaptation of an article for sale, and although the case of *Fullers Limited* v. *Squire*, (1901) 2 K.B. 209, is somewhat nearer the line as Lord Alverstone pointed out, it is also a typical case. But as was pointed out in the course of the argument the case of *Fullers Limited* related to a workshop and not to a factory, and accordingly the words to which I now come were not construed in *Fullers Limited.*

The words I now come to are those at the conclusion of the clause—the premises must be premises wherein mechanical power is used in aid of the manufacturing processes. Now I do not think that in any reasonable sense of the word it can be said that transferring an article from one receptacle to another is a manufacturing process. It was argued, no doubt, that carpet beating and laundry work were not manufacturing processes any more than transferring beer from a barrel to a bottle is a manufacturing process, and yet they are there in the Act of Parliament. But the answer is they are there *per expressum*, and if they were not there in express terms, they would not be included within the limits of the Factory Acts. I observe, therefore, that all the cases that have been cited to us seem to me to be in complete harmony with one another. I see no conflict in the decisions, and following them and placing upon the words of this statute the plain ordinary meaning of language, I have come without hesitation to the conclusion that the Sheriff-Substitute was wrong in finding the premises on the first floor to be a non-textile factory within the meaning of the statute.

The second question is whether we find here a bottle-washing work on the ground floor? Now we are not left to grope in the dark with reference to the operations conducted on the ground floor. We are told that the bottle washing is carried on merely incidentally to the business of wholesale and retail grocers and wine merchants. "It includes among much else the washing of bottles which are afterwards filled by the appellants with wine or beer." And again, "only bottles used in the appellants' business are washed, and the bottle washing is a mere ancillary branch of their business." In these circumstances it appears to me to be vain to contend that we are here dealing with a bottle-washing work in the sense of the Act. Mr. Gillon told us, no doubt, that when you ransacked the Glasgow Directory, or I suppose the Edinburgh Directory, you would not find under trades or professions any category which embraces bottle-washing works alone. That may be so, but their absence from the directory does not appear to me to be a sufficient reason for putting a strained and unnatural interpretation upon the words used in the statute. Indeed, to hold that this was a bottle-washing work would, I think, be inconsistent with the cases of *Kavanagh* v. *Caledonian Railway Company*, 5 F. 1128, and of *Caledonian Railway Company* v. *Paterson*, 1 F. (J) 24, 2 Adam 620, both of which cases I consider to have been well decided. The principle of these two cases and the reasoning of the learned judges seem to me to be directly in point here. Accordingly I come without hesitation to the conclusion, upon the second question debated before us, that the Sheriff-Substitute gave a right decision.

I propose to your Lordships, therefore, in accordance with these views, that we should answer the first and second parts of the first question in the negative, and the second question also in the negative.

LORD MACKENZIE—I am of the same opinion. The Sheriff-Substitute has dealt with this case as raising two separate and independent points, and in that view of the matter I agree, because I cannot follow the argument of the Solicitor-General that the two parts of the case are to be taken in combination in order to make an offence under the Act.

The first finding of the Sheriff-Substitute I agree with—that no part of the appellants' premises was a bottle-washing work; and it was frankly admitted that to reach any other conclusion would be to go directly counter to the decisions already pronounced in the cases of *Kavanagh*, 5 F. 1128, and of *Paterson*, 1 F. (J) 24, 2 Adam 620. Not only do I not find myself entitled to do that, but I entirely agree in the view that was taken by the Lord President in the case of *Kavanagh.*

In regard to the second point, I am unable to take the same view as the Sheriff-Substitute, and for the reason which has been fully explained by your Lordship. I am unable to agree with him, even taking the case as he puts it, and as though the whole question for our consideration was whether there was any adapting for sale of any article in pouring beer into bottles. If that was the whole point, even then I should take the view that that was not adapting for sale. But I think it is impossible to stop there because of the language of section 149 (*c*) which introduces other elements that we must take into consideration.

We must consider whether any manual labour is exercised by way of trade or for purposes of gain in or incidental to (and then I pass to sub-head (iii)) "the adapting for sale of any article." Not only, however, has that question to be considered, but the concluding part of the section is just as important as the first part, "wherein or within . . . the precincts of which steam, water, or other mechanical power is used in aid of the manufacturing process carried on there."

The argument on behalf of the conviction really amounted to this, that either we must read out of the section altogether the words "manufacturing process," or else we must give those words a meaning which they certainly never would receive in ordinary parlance. We are told that we must give that unnatural meaning to this expression in consequence of a decision relating to carpet-beating works, and it was argued that although carpet-beating cannot be said to be a manufacturing process in the ordinary acceptation of the term, yet because carpet-beating works are included in the list of non-textile factories given in the statute, therefore when you come to consider the applicability of the term "manufacturing process" to some other doubtful operation you must give to the words the same forced and unnatural construction. As I followed the judgment in the case of *Johnstone* v. *Lalonde Brothers and Parham* (1912) 3 K.B. 218, which was read by the Solicitor-General, it appeared to me that that case was inapplicable to the present circumstances, because in *Johnston* the Court were compelled by the terms of the statute and by the inclusion of carpet-beating in the schedule to give to the expression "manufacturing process" a highly technical meaning, whereas in the present case, where we are dealing with bottling which is not mentioned in the schedule, we are not constrained to give any construction to the words which is not in accordance with ordinary common sense. Accordingly I am unable to see that pouring beer into bottles can by any stretch of language be called a "manufacturing process." I therefore agree with your Lordship.

In regard to the other point that was made by Mr. Murray, viz., that in any event the bottle washing and beer bottling were merely ancillary to the business proper of the premises, I should prefer at present not to express any opinion.

Lord Anderson—I agree. The debate which we have heard was concerned mainly with section 149 of the statute of 1901, but I think it is not unimportant to keep in view what the appellants are actually charged with in the complaint. They are charged that they, being the occupiers of a factory, did fail to keep constantly fixed at the entrance to the said factory the prescribed abstract of the Factory and Workshop Act of 1901, contrary to section 128 (1) (*a*) of the said Act.

Now the appellants are shopkeepers and nothing else, and accordingly, if the Sheriff-Substitute is right, they will have to put up at the entrance to their grocers' shop in Hamilton the lengthy abstract of the provisions of this Factory Act. Well, that is a somewhat startling proposition; and as Mr. Murray very properly pointed out, the appellants, in respect that they are shopkeepers, are already subject to the provisions of the Shops Act 1911—an Act whose purposes are the same as those of the Factory and Workshop Act 1901, to wit, to compel employers of labour to conform to certain provisions with regard to the conditions of labour under which their employees fulfil their duties.

Now the Sheriff-Substitute has dealt with this case by discriminating between the work which was done on the upper floor, namely, bottling beer, and the work which was done in the cellar, namely, washing bottles, and I agree with your Lordship that he took a right course in so discriminating, and that the Solicitor-General was wrong when he suggested that these were really parts of one operation.

With regard to the bottling process, the prosecutor undertakes to prove that this is a non-textile factory, and he says that he does so by reference to the section of the Act which has been alluded to, namely, section 149 (1) (*c*). Now it seems to me that, in order to make out that any premises are a non-textile factory in the sense of that section it is essential that three circumstances should concur—In the first place, there must be manual labour exercised by way of trade in the premises for one or other of three specified purposes. Now it is common ground that the first of these purposes is out of the case, because it is not said that any article was being made in the premises. The Sheriff-Substitute, by his finding that the beer was neither altered nor finished, has ruled out the second sub-head, and accordingly we are left with the third sub-head, and the prosecutor maintains that the manual labour by way of trade was concerned with the adapting of the beer for sale. That is in the first place. Secondly, there must be mechanical power exercised in the premises; and in the third place, there must be a manufacturing process carried on there.

It is agreed by both sides that there was mechanical power employed, but the appellants dispute that there was either manual labour exercised by way of trade for adapting

an article for sale or that there was anything in the nature of a manufacturing process carried on in transferring beer from casks to bottles.

I take the view that on both these points the argument of the appellant is well founded. I am unable to affirm the proposition of the Crown that the beer by what was done was adapted for sale, and I do not think there was anything of the nature of a manufacturing process connected with that operation giving to these words their ordinary signification. I think we are bound to give them that ordinary signification, with this explanation—that the Legislature has provided, with reference to certain special occupations dealt with in the schedule, that they may be treated as if they were manufacturing processes. Accordingly I agree with your Lordships with regard to the process of beer bottling, and the result is that we must reverse the decision of the Sheriff-Substitute on that point.

Upon the matter of bottle washing I think the Sheriff has come to a right conclusion. He has stated that this is ancillary to the main business of the establishment, and the case accordingly is ruled by *Paterson*, 1 F. (J.) 24, 2 Adam 620, and *Kavanagh*, 5 F. 1128.

The Court answered both branches of the first question in the negative and the second question in the negative, and quashed the conviction.

BENNETT *v.* WELCH MARGETSON AND COMPANY, LIMITED.

High Court of Justice in Ireland, King's Bench Division, 12th June, 1914.

CASE stated by Justices for the Petty Sessions District of Londonderry.

The respondents, Welch Margetson and Company, Limited, were charged on informations laid by the appellant, an Inspector of Factories, that they, being the occupiers of a factory within the meaning of the Factory and Workshop Act 1901, and being the employers of certain women, workmen within the meaning of the Truck Acts 1831 to 1896, did, on certain dates in 1913, unlawfully make deductions from the sums contracted to be paid by the said employers to the said women for or in respect of bad or negligent work or injury to materials, inasmuch as particulars in writing showing the acts or occasions in respect of which the deductions were made, and the amount thereof, were not supplied to the said women when the deductions were made, contrary to the said Acts (Section 2, sub-section 2 (*b*) of the Truck Act 1896).

The facts proved or admitted were as follows:—The women were stampers in the employment of the respondents. Their business was to stamp certain names or figures on collars that had previously been cut out. On a day in September 1913 they stamped several collars with the wrong name or figure. On the next pay day deductions were made from their wages, and entered in their wages books as for damaged goods. Similar amounts were deducted and entered in the wages books on subsequent pay days. The wages books were all the time in the custody of the respondents. No particulars of the deductions were furnished except those contained in the entries in the wages books, which were seen when the books were handed to the women once a fortnight prior to receiving their wages. The total amount to be deducted was only disclosed to them when they were leaving the firm's employment.

The complainant contended that these entries in the wages books were not the particulars in writing prescribed by the Section, and that particulars in writing should have been handed to the workers at the time the first deduction was made, setting out the acts or omissions in respect of which the deduction was made, the date of those acts or omissions and the total amount of the deductions to be made in respect of the alleged injury, and the other particulars prescribed by the Statute.

The Justices, by a majority, held that the respondents by the entries in the wages books had complied with the Statute, and dismissed the cases.

The question for the opinion of the Court was whether the opinion of the Justices on the point of law was correct.

The appeal was allowed, and the Lord Chief Baron in delivering the Judgment of the Court intimated that the Court was prepared to issue a separate order of conviction in respect of each of the breaches of section 2, sub-section 2 (*b*) of the Truck Act 1896, except the first breaches in each case.

On behalf of the appellant only one order in each case was asked for.

VINES *v.* INGLIS.

High Court of Justiciary, November 7th, 1914.

Justiciary Cases—Statutory Offences—Factory and Workshop Act 1901 (1 *and* 2 *Edw. VII, cap.* 22), *secs.* 6 *and* 149 (1) *and* (4)—*Room, Communicating with Factory, Used for Independent Process, and in which No Mechanical Power Used.*

A building consisting of three floors, with internal communication, occupied by a person for the purposes of his business, contained on the ground floor a retail shop, on the

next floor a millinery room in which no mechanical power was used, and on the top floor a non-textile factory for dressmaking in which mechanical power was used but not in aid of the work carried on in the millinery room.

The occupier was charged with a contravention of the Factory and Workshop Act 1901 (1 and 2 Edw. VII, cap. 22) in respect that he had failed to maintain in the millinery room, while persons were employed therein, the temperature required by the Act to be maintained in factories.

Held that the millinery room in question was not a factory or part of a factory in the sense of the Act.

The Factory and Workshop Act 1901 (1 Edw. VII, cap. 22) enacts—Section 6 (1)—"In every factory and workshop adequate measures must be taken for securing and maintaining a reasonable temperature in each room in which any person is employed. . . ." Section 149—"(1) . . . The expression 'non-textile factories' means . . . (c) any premises wherein or within the close or curtilage or precincts of which any manual labour is exercised by way of trade or for the purposes of gain in or incidental to any of the following purposes, namely—(i) the making of any article or of part of any article, or (ii) the altering, repairing, ornamenting, or finishing of any article, or (iii) the adapting for sale of any article, and wherein or within the close or curtilage or precincts of which steam, water, or other mechanical power is used in aid of the manufacturing process carried on there. . . . The expression 'factory' means textile factory and non-textile factory, or either of these descriptions of factories. (4) Where a place situate within the close, curtilage, or precincts forming a factory or workshop is solely used for some purpose other than the manufacturing process or handicraft carried on in the factory or workshop, that place shall not be deemed to form part of the factory or workshop for the purposes of this Act, but shall, if otherwise it would be a factory or workshop, be deemed to be a separate factory or workshop, and be regulated accordingly. . . ."

James Inglis, 267 Argyle Street, Glasgow, *respondent*, was charged in the Sheriff Court there, at the instance of Mabel Mary Vines, His Majesty's Inspector of Factories, *appellant*, on a complaint in the following terms:—"You being the occupier of a factory within the meaning of the Factory and Workshop Act 1901, situated at 267 Argyle Street, Glasgow, are charged at the instance of the complainer, that on Friday the sixteenth day of January 1914, between 10 o'clock and thirty minutes past 10 o'clock in the forenoon, you did fail to take adequate measures for securing and maintaining a reasonable temperature in the millinery room on the first floor of the said factory, while persons were employed therein, and so as not to interfere with the purity of the air of such room, contrary to section 6, sub-section 1, of the Factory and Workshop Act 1901, the temperature in said room on said day at such time being 45 degrees Fahrenheit, and the said factory therefore being deemed, in pursuance of section 6, sub-section 3, of the said Act, not to be kept in conformity with said Act, Whereby you are liable as said occupier to the penalties set forth in section 135 of the said Act. . . ."

The accused pled not guilty, and after evidence had been led the Sheriff-Substitute (CRAIGIE), on 9th March 1914, found the charge not proven.

The prosecutor appealed, and the Sheriff-Substitute stated the case thus—". . . I held the following *facts* proved:—That the respondent James Inglis is occupier of premises at 267 Argyle Street, Glasgow; that the ground floor of the premises is used by him as a shop; that the floor (hereinafter called the first floor) immediately above is used partly as a shop, partly as a stock room, and partly as a millinery room, and that in this millinery room (which is a small portion of the first floor partitioned off from the rest of the floor), in which there is no fireplace or heating apparatus, women work without the aid of mechanical power at the trimming or altering of hats bought by customers in the shop; that said millinery room is the millinery room referred to in the complaint; that said millinery room was visited on 16th January 1914, between 10 o'clock and 10.30 o'clock forenoon by the appellant and her assistant; that they found two women at work there engaged in trimming or making alterations on hats; that they were sitting with rugs round their knees; that the temperature in said millinery room at the time of the visit was 45 degrees Fahrenheit; that the floor or floors above the first floor are used for the purpose of a non-textile factory, viz., for dressmaking, within the meaning of section 149 of the Factory and Workshop Act 1901; that mechanical power is there used; and that the mechanical power there used is not used in aid of the work carried on in the millinery workroom. On the foregoing facts I *found* that said millinery room was not a factory or part of a factory within the meaning of the Factory and Workshop Act 1901. I therefore found the charge not proven. Had I found that said millinery room was a factory or part of a factory in the sense of the Act, I should have found that adequate measures had not been taken for securing and maintaining a reasonable temperature in said millinery room."

The *question* for the opinion of the Court was—" On the facts proved, was I right in holding that the millinery room referred to in the complaint was not a factory or part of a factory within the meaning of the Factory and Workshop Act 1901 ? "

In answer to a remit " to amend the case by stating the facts proved in regard to the structural divisions, if any, of the premises at 267 Argyle Street, Glasgow, occupied by the respondent, and generally any facts proved which bear on the question whether the millinery room and shop referred to in the case are or are not situate (*a*) within the premises used as a factory, or (*b*) within the close, curtilage, or precincts forming such factory," the Sheriff-Substitute reported—" (1) That the respondent occupies part of a block of buildings about 90 feet square. . . . This block is let to eight tenants, of whom the respondent is one. (2) The part of the block occupied by the respondent consists of four floors, with an entrance from 267 Argyle Street, and another from 84 Oswald Street. The ground floor is used as a shop, the first floor partly as a shop, partly as a stockroom, and partly as a millinery room ; the second floor as a non-textile factory ; and the third floor as a storeroom. The area of the ground floor is 2,250 square feet ; the area of the first floor is 5,530 square feet, of which 150 square feet represent the area of the millinery room ; the area of the second floor is 5,530 square feet ; and the area of the third floor is 3,600 square feet. (3) That there is no yard or court outside the four walls of the block of buildings. (4) That there are forty shop assistants employed on the ground and first floors in addition to two women employed in the millinery room, and that on the second floor there are sixty workers. (5) Parties also agree to accept as correct the accompanying rough sketches of the block of buildings and the floors." The sketches showed internal staircases from each floor to the one above it, and no structural separation of the four floors.

Argued for the appellant—As one floor of this building was admittedly a non-textile factory, the Act applied to the whole building, including the room in question. There was internal communication, but even that was not necessary to the application of the Act —*Hoyle* v. *Oram*, 1862, 12 Com. Bench (n.s.), 127. The expression " premises " used in section 149 (1) was a wide word, and covered the whole of the building occupied by the respondent for his business purposes, together with its close or curtilage. The Act was so applied in *Petrie* v. *Weir*, June 19, 1900, 2 F. 1041, 37 S.L.R. 795. None of the exceptions provided by the section applied to this case. Particularly the exception in subsection (4) was excluded, as it applied only to the " close curtilage or precincts " of the premises. In the present case it was not disputed that the operations carried on were for purposes of gain, and therefore *Nash* v. *Hollinshead*, (1901) 1 Q.B. 700, did not help the respondent. If this room were treated as a " workshop " and not as part of the factory great inconvenience of administration would result.

Argued for the respondent—This room had none of the attributes of a factory. It was merely a " workshop " in the sense of the Act. If it were held to be a part of the factory above, it followed that the shop below was also included in the factory and subject to factory regulations. But the Act was not intended to apply to shops. In *Nash* v. *Hollinshead*, *supra*, it was held not to apply to a farm. The word " premises " used in the Act was not limited by or co-extensive with any particular building. Its application depended on the industrial purpose to which a building or buildings were put. One building might contain several different " premises," and, on the other hand, " premises " might include more than one building not necessarily even near one another—*Hoyle* v. *Oram*, *supra* ; *London County Council* v. *Tubbs*, July 16, 1903, 68 J.P. Reports 29. The millinery room was an adjunct of the shop, not of the factory, and the staff of the room was quite distinct from that of the factory. Counsel also referred to *Henderson* v. *Corporation of Glasgow*, July 5, 1900, 2 F. 1127, 37 S.L.R. 857.

At advising—

Lord Dundas—The facts in this case have been clearly and concisely stated by the learned Sheriff-Substitute, and the question of law for our decision is short and sharp. I have found it difficult to arrive at a confident opinion, but I have come to agree with the view taken by the Sheriff-Substitute. It is clear, on the one hand, that the ground floor of the subjects occupied by the respondent consists of a shop, and is not a factory ; and, on the other hand, that the floor above the room in question is a non-textile factory within the meaning of the Act. It is further plain that the room in question is not by itself a factory, but it is said to be part of a factory. The difficulty, to my mind, arises from the fact that the word " premises " is nowhere defined in the statute. I am not prepared to hold that because one part of subjects which are occupied by a tenant and covered by the same roof (even when there is internal communication throughout) constitutes a factory within the statutory meaning, it must follow that the whole subjects are to be regarded as

a factory. To affirm so general a proposition might easily lead to results both anomalous and inconvenient, and I think the Court must endeavour to exercise a reasonable discrimination. Upon these short but, as I think, sufficient grounds I am for answering the question in the affirmative.

LORD MACKENZIE—I agree with the opinion of Lord Dundas.

LORD SKERRINGTON—The question which we are asked to answer, is whether on the facts proved the Sheriff-Substitute was "right in holding," or, as I prefer to phrase it, was entitled to hold, "that the millinery room referred to in the complaint was not a factory or part of a factory within the meaning of the Factory and Workshop Act 1901?" No objection was stated to the regularity of the procedure, and accordingly the real question which we have to answer is, whether the learned Sheriff-Substitute's decision involved any error on his part "in point of law" (8 Edw. VII, cap. 65, sec. 60).

The appellant's counsel argued that the Sheriff-Substitute has on his own statement fallen into an error of law, seeing that in the body of the Stated Case he describes the whole subjects occupied by the respondent as "premises" of which the millinery room in question forms a part. This argument is a purely verbal one. The statement in the Stated Case to the effect that the respondent is occupier of certain "premises" in Glasgow means, in my opinion, no more and no less than that he is the occupier of certain "heritable subjects" which constitute a separate and distinct portion of a large building situated at the corner of Argyle Street and Oswald Street, Glasgow. The question which we have to decide is whether the Sheriff-Substitute was bound in respect of the structure and occupation of these subjects to treat them as forming a single set of premises every part of which must be regarded as a dressmaking factory. Counsel for the appellant admitted that if the millinery room situated on the first floor of the subjects occupied by the respondent must be deemed to be part of the dressmaking factory carried on by him on the second floor of the said subjects, it must by parity of reasoning be held that the ground floor of the subjects which is occupied by the respondent as a shop is also part of the factory carried on upon the second floor.

There are two important facts which are in favour of the view that the four floors in question constitute a single set of premises—(1) The whole four floors are in the occupation of the respondent himself, and no part of the subjects has been sublet by him to anyone else; and (2) there is no structural separation between the four floors. The door of the shop is in Argyle Street. From the shop (as appears from the rough sketches produced) one can ascend by an internal staircase to the stockroom and the millinery room on the first floor; an internal staircase leads from the first floor to the dressmaking factory on the second floor; and an internal stair leads from the second floor to the storeroom on the third floor. There is also a separate stair giving access from Oswald Street to the portions occupied by the respondent of the first and second floors of the large corner building in question. On the other hand, the four floors are separated from each other by what I am entitled to assume to be a substantial difference of level. Moreover, they are used for purposes which are different and distinct from the point of view both of law and of ordinary parlance and of good sense. The ground floor is used as a shop, and is within the purview of the Shops Act 1912, 2 Geo. V, cap. 3. The stockroom on the first floor is an appanage of the shop, while the millinery room on the same floor, in which hats are trimmed or altered without the aid of mechanical power, is probably a workshop within the meaning of section 149 of the Factory and Workshop Act 1901, 1 Edw. VII, cap. 22, though there is no express finding to the effect that the manual labour exercised in that room is "by way of trade or for purposes of gain." Lastly, the third floor is used as a storeroom, and is not said to be used in connection with the factory on the floor below. Upon these facts I am of opinion that the Sheriff-Substitute was entitled to hold that the millinery room and, by parity of reasoning, the shop did not form part of the factory. The opposite conclusion, at least as regards the shop, would have shocked the common sense of ordinary people, and would have led to legal results of a puzzling character. At the same time I admit that section 149 of the Factory and Workshop Act 1901 is expressed in such terms, both as regards its definition of the expression "non-textile factories" and also as regards its exceptions in sub-sections (2), 3), and (4), as lend some support to the contention of the appellant's counsel.

LORD HUNTER—The Sheriff-Substitute found the charge against the respondent not proven upon the ground that the millinery room referred to in the complaint was not a factory or a part of a factory within the meaning of the Factory and Workshop Act 1901. According to the Sheriff's findings the respondent is an occupier of a building No. 267 Argyle Street, Glasgow, of several storeys in height.. The ground floor is used as a shop,

the first floor is used partly as a shop, partly as a stockroom, and partly as a millinery room where women work without the aid of mechanical power at the trimming or altering of hats bought by customers in the shop. The floor or floors above the first floor are used for the purposes of a non-textile factory, but the mechanical power there used is not used in aid of the work carried on in the millinery workroom.

The appellant maintains that as the shop and the place where mechanical power is used are under the same roof and in the occupation of the same individual, the whole premises being internally connected, constitute one factory.

In terms of the Act of 1901 it is provided, section 149, that non-textile factory means " any premises wherein or within the close or curtilage or precincts of which any manual labour is exercised by way of trade or for purposes of gain in or incidental to any of the following purposes, (i) the making of any article or part of any article . . . and wherein or within the close or curtilage or precincts of which mechanical power is used in aid of the manufacturing process carried on there." No definition or description of what is meant by premises is given. The appellant founded upon the recent Scots case *Petrie* v. *Weir*, (1900) 2 F. 1041, where premises consisting of a yard in which stones were dressed by manual labour, and including an engine-house where the workmen's tools were sharpened on a grindstone driven by a gas engine, were held to be a factory. Other similar cases were cited. These decisions afford authority for the proposition that where one business is carried on in a building all the rooms are part of the factory premises although mechanical power is used in only one of the rooms. They do not appear to me to necessitate the same conclusion where separate businesses are carried on in separate parts of the same building occupied by the same individual. If the appellant's contention were sound, the whole of a large retail shop of several storeys and many rooms would fall to be treated as a factory because in one room—it might be at the very top of the building—mechanical power was used. Many of the provisions of the Factory Acts, *e.g.*, hours of employment, time allowed for meals, notices, etc., are not necessarily appropriate to a retail business, and if insisted in might hamper a trader in a way not intended by the Legislature. I do not think the language employed in the section precludes the Sheriff from holding that the premises of a factory are one or more floors of a building of several floors in which one occupier carries on several businesses. If that is a sound view of the statute it does not appear to me in the present case that the Sheriff necessarily drew a wrong conclusion from the facts, and I therefore think that we ought to find that the Sheriff was entitled to reach the conclusion which he did.

LORD JUSTICE-GENERAL—I agree with your Lordships. There being no definition of the expression " premises " in the statute I find it very difficult to discover a question of law in this case. It appears to me rather to be a question of fact and of good sense; and, on the facts before him, I have no doubt the Sheriff-Substitute was entitled to reach the conclusion—which in effect he did—that the millinery room here was a workshop or part of a workshop and not part of a non-textile factory. And accordingly I doubt for my part whether we have any power to disturb this finding, and I am certain we ought not to do so.

I propose, therefore, in conformity with your Lordships' opinion, that we should answer the question put to us in the affirmative.

The Court answered the question in the case in the affirmative.

TABLE 1.—Inspectors' Districts, 1914.

District.	Area. Square Miles.	Census Population. 1911.	Factories.	Workshops.	Prosecutions.	Accidents. Reportable to Certifying Surgeons. Fatal.	Accidents. Reportable to Certifying Surgeons. Other.	Accidents. Total.	Dangerous Occurrences.	Cases of Poisoning.	Notices to District Councils
(1)	(2)‖	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S. London	1,215	1,986,657	3,844	5,111	100	31	1,264	3,461	37	30	331
S.W. London	1,031	1,361,863	2,114	3,534	32	11	379	1,098	8	5	261
*W. London	888	1,549,527	3,133	4,633	86	29	841	2,319	13	32	1,025
‡*West London (Special)*	(25)	...	420	3,370	39	—	25	44	1	—	487
N.W. London	263	752,625	2,132	3,141	61	9	391	905	10	3	326
N. London	499	1,239,898	4,820	7,198	82	16	828	1,786	38	11	866
N.E. London	827	821,299	1,638	3,600	16	5	411	938	15	3	772
E. London	335	1,184,133	2,342	4,620	77	52	1,359	4,936	77	30	1,180
Kent	1,525	1,045,591	2,244	3,035	52	16	890	3,447	8	11	424
†Reading	1,474	470,278	1,011	1,674	1	—	83	244	2	1	164
Northampton	1,837	598,680	2,312	2,296	20	4	781	1,403	2	1	299
Norwich...	3,024	761,578	1,979	4,603	15	6	323	933	8	2	448
Ipswich	1,758	472,492	1,221	1,622	17	7	314	933	3	1	104
Bristol	2,287	995,768	2,739	4,238	31	13	1,054	2,945	14	12	496
Gloucester	1,084	323,630	902	1,380	7	6	287	617	8	3	76
Yeovil	1,745	339,823	1,007	1,464	3	1	84	245	3	4	185
Southampton	1,957	1,031,702	2,207	3,695	53	17	551	2,153	9	9	659
Plymouth	3,748	991,667	2,187	4,261	20	8	279	1,112	7	6	357
Swansea...	3,535	669,460	2,126	3,329	8	28	846	5,208	6	27	758
Cardiff	1,252	1,239,291	2,139	3,700	72	54	774	4,912	7	2	598
Dublin	15,191	1,856,994	1,920	2,123	50	18	358	1,173	9	2	345
Cork	8,815	951,529	1,269	1,615	19	4	103	289	3	—	283
Birmingham	504	1,083,865	5,100	3,813	77	19	2,576	6,319	40	27	848
Coventry	454	302,579	896	906	12	3	682	1,673	17	5	151
Worcester	1,534	363,646	1,023	1,465	8	4	229	565	—	6	240
Wolverhampton ...	1,495	687,874	2,493	4,918	21	17	1,301	4,054	10	16	447
Walsall	312	303,457	977	1,042	4	11	744	2,057	4	6	175
Stoke	709	533,710	1,736	1,775	63	19	559	2,367	11	25	350
Leicester	985	496,899	2,024	2,110	27	8	853	1,608	4	5	381
Nottingham	844	604,098	2,158	2,303	39	9	496	1,325	6	3	488
Derby	815	608,944	1,841	1,435	100	13	816	2,886	17	9	568
Lincoln	2,665	563,960	1,621	2,097	53	18	551	1,805	152	2	205
Wrexham	3,225	512,170	1,355	2,607	10	4	213	1,134	9	1	646
Leeds	2,069	1,148,763	3,560	2,285	20	34	1,540	4,138	32	11	693
‡*Leeds (Special)*	(2,222)	...	571	1,412	21	—	60	89	—	—	277
Hull	992	413,806	1,251	1,560	24	21	579	2,139	35	4	359
Sheffield...	641	996,002	4,365	2,273	38	41	2,322	6,658	1,115	16	393
Huddersfield	147	341,049	2,050	1,552	23	31	857	1,612	17	7	203
Halifax	143	224,213	1,599	975	14	6	487	977	7	2	148
Bradford	153	399,559	2,176	1,320	40	13	720	1,376	16	14	286
Keighley	756	155,400	995	592	30	4	388	645	1	2	150
Newcastle	2,572	1,694,528	2,696	3,622	35	80	2,594	10,670	566	20	684
Stockton	1,622	659,662	1,494	1,450	15	48	1,496	7,560	42	5	351
Manchester	87	1,131,478	4,249	4,304	91	54	2,338	6,341	15	32	497
Stockport	700	563,027	2,061	1,928	26	10	1,036	2,933	11	5	213
Oldham	81	371,799	1,401	943	354	17	1,581	3,539	11	2	112
Bolton	108	367,253	1,403	1,045	161	22	1,071	2,523	2	5	81
Rochdale	94	227,348	1,132	699	326	8	830	1,674	4	4	86
Wigan	213	402,754	841	1,002	21	12	617	1,577	4	2	118
Warrington	508	451,893	1,011	1,146	26	13	958	4,599	15	23	220
Liverpool	342	1,302,405	2,617	3,928	36	88	1,414	4,900	22	9	493
Blackburn	126	254,387	1,146	942	24	13	522	1,122	5	3	188
Burnley	107	267,194	1,461	959	33	6	343	706	13	—	179
Preston	3,053	800,608	2,064	2,892	22	31	1,095	3,378	16	4	323
Glasgow...	4,446	1,077,119	2,666	3,119	39	128	2,380	9,580	13	27	479
Lanarkshire		873,550	1,917	1,632	4	42	1,564	5,415	22	—	321
Kilmarnock	3,810	429,713	1,299	1,671	14	12	359	1,111	1	2	174
Edinburgh	2,370	667,614	1,743	2,216	69	15	427	1,176	7	2	174
Stirling	737	301,444	720	768	3	9	405	985	2	4	72
Dundee	3,871	673,493	2,018	2,172	20	35	869	1,708	5	2	122
Aberdeen	2,983	414,587	1,446	1,978	3	6	335	900	15	4	294
Inverness	11,581	323,379	719	1,399	13	1	28	57	3	—	89
Belfast	4,625	1,129,869	2,532	2,320	16	23	720	2,224	15	—	309
Londonderry	3,956	451,827	952	834	16	3	86	191	5	—	119
‡*Institutions (Special Districts)*	...	...	54	146	—	1	10	16	---	—	—
§England...	50,328	33,649,571	98,225	122,301	2,496	904	41,808	123,347	2,473	438	18,367
§Wales	8,012	2,420,921	5,620	9,636	90	86	1,833	11,254	22	30	2,002
Scotland...	29,798	4,760,904	12,535	14,966	165	249	6,368	20,935	68	41	1,725
Ireland	32,587	4,390,219	6,678	6,894	101	48	1,267	3,877	32	2	1,056
United Kingdom ...	**120,725**	**45,221,615**	**123,058**	**153,797**	**2,852**	**1,287**	**51,276**	**159,413**	**2,595**	**511**	**23,150**

* Area altered during 1914. † New district, formed in 1914. ‡ Under the charge of Lady Inspectors.
§ Monmouthshire is included in Wales.

TABLE 2.—Complaints Received, 1914.

Complaint.	Division or Branch. South Eastern.	South Western.	Midland.	North Eastern.	North Western.	Northern.	Lady Inspectors.	Textile Inspectors Particulars.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Source:—									
Anonymous ...	574	172	181	101	271	154	427	4	1,884
Official	278	25	51	46	28	24	114	8	574
Operatives	123	68	76	151	174	127	432	88	1,239
Other	178	83	91	82	95	29	296	—	854
	1,153	**348**	**399**	**380**	**568**	**334**	**1,269**	**100**	**4,551**
Subject:—									
Forms, &c.	94	11	25	12	12	8	40	—	202
Sanitation	347	102	159	117	221	106	590	—	1,642
Safety	96	38	42	38	40	34	61	—	349
Employment ...	591	181	135	200	287	148	590	—	2,132
Particulars	23	3	18	4	5	5	43	100	201
Truck	15	10	19	10	12	20	109	—	195
Other (including those outside Acts)	162	43	28	35	39	34	379	—	720
	1,328	**388**	**426**	**416**	**616**	**355**	**1,812**	**100**	**5,441**
Number verified ...	**562**	**181**	**185**	**228**	**274**	**150**	**851**	**44**	**2,475**

TABLE 3.—Contravention Notices issued to Occupiers, 1914.

Subject.	Division or Branch. South Eastern.	South Western.	Midland.	North Eastern	North Western.	Northern.	Lady Inspectors.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Forms, &c.:—								
Notice of Occupation ...	4,514	2,808	2,648	1,566	1,265	1,060	450	14,311
Notice of Accident ...	1,757	1,130	1,464	1,458	1,380	1,437	67	8,693
Notice of Overtime ...	516	327	283	274	442	410	378	2,630
Abstracts, registers	10,101	7,384	7,857	5,913	3,771	5,593	425	41,044
Use of prescribed form ...	4,323	1,406	2,671	1,603	1,098	4,091	142	15,334
Other	2,800	2,465	1,931	1,712	1,251	2,906	599	13,664
Sanitation:								
Limewashing	2,297	1,525	2,726	1,389	1,112	2,212	435	11,696
Ventilation General ...	277	119	500	223	125	205	174	1,623
Ventilation Exhaust ...	457	193	761	354	201	547	61	2,574
Temperature	845	321	202	184	190	357	438	2,537
Humidity	—	4	—	38	70	38	6	156
Washing conveniences ...	301	262	634	260	139	129	64	1,789
Sanitary conveniences ...	255	147	194	129	64	1,765	277	2,831
Overcrowding	34	6	11	16	2	7	14	90
Other	345	207	799	530	319	747	205	3,152
Safety:—								
Fencing	7,812	5,638	6,087	6,467	6,696	5,480	1,037	39,217
Steam boilers	678	396	542	296	245	289	19	2,465
Fire	227	41	51	55	27	80	83	564
Other	1,571	1,076	1,376	1,078	1,037	813	203	7,154
Employment:—								
Certificate of fitness	2,978	1,199	1,569	1,522	1,265	1,188	760	10,481
Employment of child or young person to be discontinued (s. 67)	6	1	10	6	4	—	3	30
Overtime — excess of occasions	135	74	52	82	85	123	36	587
Other	1,082	598	425	571	462	550	807	4,495
Miscellaneous:—								
Particulars	999	193	503	185	241	850	415	4,217
Obstruction, &c.	10	2	4	12	3	3	5	39
Truck	59	62	100	22	33	43	309	628
	44,379	**27,584**	**33,400**	**25,945**	**21,527**	**30,923**	**7,412**	**192,001**

TABLE 4.—Notices and Reports received, 1914.

Description. (1)	Section. (2)	Number received. (3)
Special Exception Notices:		
Overtime:		
Ordinary	49	3,533
Laundries	2[1b], 1907	220
Perishable articles	59	28
Incomplete process	51	1
Water mills	52	1
Prevention of damage	53	1
Fruit preserving	41	40
Period of employment:		
9 a.m. to 9 p.m.	36	46
Eight hours on Saturday	30	2
Turkey-red dyeing on Saturday	44	—
Jewish works	47	2
Fish curing	41	124
Creameries	42	28
Laundries — *Different periods*	2[1c], 1907	96
Laundries — *Extended periods*	2[1a], 1907	849
Women's workshops	29	80
Male young persons. — *Glass works*	55	29
Male young persons. — *Lace factories*	37	20
Male young persons. — *Bakehouses*	38	125
Male young persons. — *Newspaper printing*	56	25
Male young persons. — *Other works*	54	75
Substitution of short day	43	4,990
Substitution for Sunday	48	547
Separation of sets — *Holidays*	45	53
Separation of sets — *Meal hours*	40	692
Employment in meal hours	40	208
Five-hour spell in certain textile factories.	39	92
Exemption, limewashing	1	2,101
Notices of Change of Hours	32, 2, 1907	3,228
Notices of Change in System of Employing Children.	32	—
Holiday Notices	35	17,987
Occupation Notices	127	20,637

Description. (4)	Section. (5)	Number received. (6)
Accidents (Tables 7–10) — Occupiers' notices	4, 1906	159,413
Accidents (Tables 7–10) — Certifying Surgeons' reports.	20	52,563
Dangerous Occurrence Notices (Table 7).	5, 1906	2,595
Poisoning (Table 6) — Occupier	73	433
Poisoning (Table 6) — Certifying Surgeon	73	511
Poisoning (Table 6) — Practitioner	73	312*
Poisoning (Table 6) — Registrar	—	36
Notices under Regulations and Special Rules:		
Proposing additional Special Rules.	—	—
Excess of Humidity — *Cotton Cloth factories.*	—	21
Limit of Humidity — *Flax*	—	2
Limit of Humidity — *Hemp and jute*	—	—
Plans	—	—
Exemption — *Heading of yarn*	—	1
Exemption — *Brass*	—	207
Exemption — *Bronzing*	—	88
Exemption — *Pottery*	—	109
Annual Reports. — Certifying Surgeons	122	1,891
Annual Reports. — Appointed Surgeons	—	91
Annual Reports. — Medical Officers of Health (for 1913).	132	2,245
Notices from Medical Officers of Health.	133	1,818
Notices of Inquests	21	1,711
Notices of Time Lost in Water Mills.	52	28
Humidity — Beginning	93	15
Humidity — Ceasing	93	2
Humidity Records	92	10,092

* In addition to 241 notices of poisoning among house painters and plumbers, not employed under the Acts.

TABLE 5.—Notices to District Councils, 1914.

District.	Representations (ss. 5, 14).												Occupation of Workshops. (s. 127.)
	Air Space: overcrowding	Ventilation.	Effluvia.	Cleanliness.	Sanitary Conveniences.*		Drainage of Floors.	Fire.		Other.		Total.	
					F.	W.		Over 40.	40 and under.	F.	W.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. London	6	15	2	46	32	15	2	4	3	4	12	141	190
S.W. London	1	6	2	7	14	7	2	3	1	4	1	48	213
†W. London	17	19	4	126	133	53[2]	4	7	88	7	9	467	558
West London (Special)	15	16	3	13	9	68	—	—	5	—	8	137	350
N.W. London	4	6	2	45	43	7	1	17	24	7	2	158	168
N. London	9	8	—	84	26	42	1	15	237	—	3	425	441
N.E. London	12	12	20	110	50[2]	104	—	—	44	9	105	466	306
E. London	43	9	1	78	41	130	1	17	38	3	65	426	754
Kent	9	15	1	90	43[4]	39	—	2	13	6	9	227	197
‡Reading	—	—	—	12	8	9	1	1	1	—	2	34	130
Northampton	5	—	4	11	30	10	—	2	7	—	12	81	218
Norwich	4	1	—	92	17	40[3]	6	4	6	1	10	181	267
Ipswich	—	3	1	12	4[1]	3	—	1	—	1	1	26	78
Bristol	3	3	1	93	53[1]	10	3	7	2	1	1	177	319
Gloucester	—	—	—	26	12[5]	6[2]	—	1	1	—	—	46	30
Yeovil	1	1	—	56	25[4]	8	—	—	3	—	4	98	87
Southampton	4	12	3	85	53[1]	24	3	—	—	4	35	223	436
Plymouth	9	17	—	85	137	12[6]	—	—	—	—	13	149	208
Swansea	7	4	11	125	55[27]	20	2	—	1	1	8	234	524
Cardiff	14	6	—	30	116	6	—	4	7	2	4	189	409
Dublin	1	3	4	119	43[1]	21	1	1	5	1	5	204	141
Cork	1	1	—	42	10[19]	9[21]	—	—	16	—	—	79	204
Birmingham	2	7	2	110	244[1]	24	4	24	33	1	6	457	391
Coventry	1	10	1	32	20[1]	9[1]	—	1	5	—	—	79	72
Worcester	1	1	1	89	9[3]	4	—	2	—	—	—	107	133
Wolverhampton ...	3	17	3	60	61[10]	16	2	1	2	1	2	168	279
Walsall	—	6	1	12	33	39	2	—	4	—	3	100	75
Stoke	—	6	—	24	123	17	—	9	4	—	—	183	167
Leicester	1	—	1	109	21	25[1]	—	10	31	—	1	199	182
Nottingham	—	8	3	51	56	42	—	8	1	1	2	172	316
Derby	1	15	39	161	111[2]	25	2	8	3	11	21	397	171
Lincoln	2	3	1	35	34[1]	20	2	3	3	—	3	106	99
Wrexham	1	6	3	118	15	6	1	1	2	—	2	155	491
Leeds	3	9	98	70	36	31	—	10	4	1	3	265	428
Leeds (Special) ...	6	5	1	—	103	16	—	11	49	1	1	193	84
Hull	3	5	—	28	27[2]	30	—	—	3	1	2	99	260
Sheffield	2	16	5	30	31	1	2	1	7	6	10	111	282
Huddersfield	—	3	—	20	44[1]	2	—	16	1	6	4	96	107
Halifax	—	6	1	14	25[5]	5	—	2	1	—	—	54	94
Bradford	—	1	4	28	41[1]	5	1	7	10	2	—	99	187
Keighley	2	5	—	12	31	10	—	24	—	-	—	84	66
Newcastle	3	5	9	113	76[1]	34[2]	—	—	1	—	11	255	429
Stockton	2	18	6	20	18[1]	40	1	2	—	1	3	111	240
Manchester	3	6	4	22	112	28	—	28	20	3	—	226	271
Stockport	—	—	—	3	69[4]	1	—	9	—	—	—	82	131
Oldham	—	1	—	4	29[2]	2	—	11	1	—	1	49	63
Bolton	—	—	—	2	41	—	—	—	—	—	—	43	38
Rochdale	—	—	—	—	49	—	—	1	—	—	2	52	34
Wigan	—	1	—	6	47[3]	8	—	—	3	—	1	66	52
Warrington	—	—	—	27	50[9]	7	—	7	1	1	4	97	123
Liverpool	—	30	—	48	35	23	1	2	28	—	6	173	320
Blackburn	1	1	—	56	12	9	—	5	—	—	5	89	99
Burnley...	—	6	1	50	11[15]	—	—	1	1	1	7	78	101
Preston	—	—	—	35	32[2]	10[3]	—	3	2	—	9	91	232
Glasgow	3	6	1	149	—[12]	13[34]	1	8	9	—	14	204	275
Lanarkshire	6	10	3	81	2[87]	26[29]	—	20	12	3	24	187	134
Kilmarnock	3	1	1	70	—[7]	—[5]	1	—	—	—	—	76	98
Edinburgh	1	2	1	17	—[46]	—[2]	—	7	2	—	—	30	144
Stirling	—	1	—	40	1[22]	—	1	—	—	—	—	43	29
Dundee	1	12	—	34	—[65]	2[10]	1	15	1	—	5	71	51
Aberdeen	2	13	6	84	3[24]	20 [3]	4	—	3	—	17	152	142
Inverness	—	—	—	1	5[9]	8[19]	—	—	2	—	1	17	72
Belfast	2	6	3	85	90[36]	16	1	17	12	6	18	256	53
Londonderry	—	9	2	54	10[21]	14	1	1	1	3	6	101	18
§England	181	334	225	2,342	2,237[89]	1,07	41	287	691	84	309	7,891	10,476
§Wales	22	16	14	273	186[27]	32	3	5	10	3	14	578	1,424
Scotland	16	45	12	476	11[272]	69[375]	8	50	29	3	61	780	945
Ireland	4	19	9	300	15[377]	6[39]	3	19	31	10	29	640	416
United Kingdom ...	**223**	**414**	**260**	**3,391**	**2,587[465]**	**1,231[451]**	**55**	**361**	**764**	**100**	**503**	**9,889**	**13,261**
‖*Lady Inspectors* ...	2	32	6	45	67[2187]	152[22]	6	97	66	2	13	1,120	434

* The notices represented by the small figures at the right of cols. 6 and 7 are not statutory, s. 9 being in force; they are sent merely for the information of the Local Authority. The numbers are additional, and are not included in col. 14.

† Area altered during 1914.

‡ New district, formed in 1914.

§ Monmouthshire is included in Wales.

‖ Also included in district summaries above.

TABLE 6.—Reported Cases of Poisoning (s. 73), 1914.

The *principal numbers* are those of attacks (fatal or otherwise) reported during the year, and not reported, so far as is known, in the 12 months preceding such attacks. The *small figures* at the right are those of deaths ascertained during the year, whether included (as attacks) in previous tables or not. Information as to fatal issue is received from the local Registrars of Deaths, and from the Coroners if an inquest is held.

Of the 511 reported attacks, 312 were notified by medical practitioners (s. 73^1), and 433 by occupier (s. 73^3).

Further details will be found in the Report of the Medical Inspector and in Table 1.

Disease and Industry.	Adults.		Young Persons.		Children.	Total.	
M.—Males } F.—Females }	M.	F.	M.	F.		1914.	*1913.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lead Poisoning	415 27	23 1	4	3	—	445 28	*535* 27
Smelting of Metals	36 3	—	—	—	—	36 3	*26* 3
Brass Works	6	—	—	—	—	6 0	*10* 0
Sheet Lead and Lead Piping...	4 1	—	—	—	—	4 1	*7* 0
*Plumbing and Soldering ...	24 2	3	—	—	—	27 2	*34* 1
Printing	23 1	—	—	—	—	23 1	*21* 1
File Cutting	7 1	2	—	2	—	11 1	*14* 0
Tinning of Metals	7	3	—	—	—	10 0	*9* 0
Vitreous Enamelling	10	—	—	1	—	11 0	*9* 0
White Lead	27 1	2	—	—	—	29 1	*29* 2
Red Lead	6	—	—	—	—	6 0	*7* 0
China and Earthenware ...	19 5	7 1	1	—	—	27 6	*62* 11
Litho-transfers	—	1	—	—	—	1 0	*1* 0
Glass Cutting and Polishing...	3 1	—	—	—	—	3 1	*3* 1
Electric Accumulators ...	40	—	1	—	—	41 0	*44* 0
Paints and Colours	21	—	—	—	—	21 0	*22* 1
Coach and Car Painting ...	56 4	—	1	—	—	57 4	*71* 2
Ship-building	31 5	—	—	—	—	31 5	*31* 1
*Use of Paint in other industries	35	3	1	—	—	39 0	*49* 3
Other Industries	60 3	2	—	—	—	62 3	*86* 1
Mercury Poisoning	9	—	1	—	—	10 0	*14* 0
Barometer and Thermometer making	3	—	1	—	—	4 0	*2* 0
Furriers' and Felt Hat Works	2	—	—	—	—	2 0	*3* 0
Other Industries	4	—	—	—	—	4 0	*9* 0
Phosphorus Poisoning ...	—	—	—	—	—	—	—
Arsenic Poisoning	2 1	—	—	—	—	2 1	*6* 0
Paints, Colours and Extraction of Arsenic	—	—	—	—	—	—	*1* 0
Other Industries	‡ 2 1	—	—	—	—	2 1	*5* 0
†**Anthrax**	43 6	3 1	5	2	1	54 7	*70* 7
Wool	21 5	—	2	2	1	26 5	*43* 4
Horsehair	1	1	3	—	—	5 0	*5* 1
Hides and Skins	15 1	—	—	—	—	15 1	*19* 2
Other Industries	6	2 1	—	—	—	8 1	*3* 0
	469 3	26 2	10	5	1	511 36	*625* 31

* In addition to those included in the Table, 241 39 cases of lead poisoning were reported among house painters and plumbers, not employed under the Acts.

† In addition, 81 cases among dock labourers were reported.

‡ One due to arseniuretted hydrogen.

TABLE 7.—All Reported Accidents, 1914: Causation.

Causation. (1)	Accidents. Fatal. (2)	Accidents. Non-fatal. (3)	"Dangerous Occurrences." (4)
Machinery moved by mechanical power	**427***	**42,596†**	**2,150**
Lifting appliances breaking: Hoists	4	40	2,031‖
Lifting appliances breaking: Cranes	21	151	
Lifting appliances breaking: Winches, &c.	4	45	
Hoists ‡	42	583	
Cranes, Winches, &c. ‡	106	3,821	
Grindstones: With fracture	1	24	46
Grindstones: Without fracture	1	589	
Emery wheels bursting	7	70	62
Revolving vessels and wheels bursting	2	28	11
Circular saws	10	2,614	
Lathes	9	3,593	
Presses (excluding punches)	—	1,199	
Shuttles§	1	299	
Self-acting mules	5	1,199	
Rolling stock on lines	61	513	
Mill gearing: Shafts	39	241	
Mill gearing: Pulleys and drums	8	338	
Mill gearing: Belts	19	1,227	
Mill gearing: Other	5	107	
Other	82	25,915	
Machinery not moved by mechanical power	**13**	**1,947**	
Cranes	13	694	
Presses for metal articles	—	435	
Other	—	818	
Struck by falling body ‡	**121**	**24,142**	
Persons falling ‡	**401**	**19,160**	
Struck by tools in use ‡	**7**	**6,598**	
Fire	**4**	**60**	**445**
Other	**314**	**63,623**	
	1,287	**158,126**	**2,595**

* Including 2 caused by cleaning machinery in motion.
† Including 1,755 caused by cleaning machinery in motion, in 131 instances contrary to the Acts.
‡ Other than those included in above items.
§ Distributed thus:—Cotton 163; Wool and Shoddy, 30 (1 fatal); Worsted, 25; Silk, 1; Flax, 53; Jute, 24; Other, 4.
‖ Including 29 caused by breakage of ropes, and 1,944 by breakage of chains.

TABLE 8.—Accidents Reported to Certifying Surgeons, 1914: Degree of Injury, Age, Sex.

The principal numbers are those of Accidents in all classes of works; the small figures at the right are those of Workshop Accidents only.

Injury.* (1)	Adults (Over 18). Males. (2)	Adults (Over 18). Females. (3)	Young Persons (13—18) Males. (4)	Young Persons (13—18) Females. (5)	Children (12—14). Males. (6)	Children (12—14). Females. (7)	All Ages. Males. (8)	All Ages. Females. (9)	All Ages. Total. (10)
Accidents reported to Certifying Surgeons as well as Inspectors:—									
Fatal	1,162[4]	21	96	8	—	—	1,258[4]	29	1 287[1]
Loss of right hand or arm	64	7	20	6	1	—	85	13	98
Loss of left hand or arm	54	4	11	4	—	—	65	8	73
Loss of part of right hand	1,077	195	434	139	9	3	1,520	337	1 857
Loss of part of left hand	1,079	133	384	106	7	1	1,470	240	1,710
Loss of part of leg or foot	80	2	27	—	1	—	108	2	110
Fracture of limb or of bones of trunk.	639	40	195	24	5	—	889	64	953
Fracture of hand or foot	597	53	141	37	2	1	740	91	831
Loss of sight of one or both eyes.	48[1]	2	7	2	—	—	55[1]	4	59[1]
Other injury to eyes	1,991	54	375	21	2	1	2,368	76	2,444
Injury to head or face	2,522[1]	335	427	114	9	6	2,958[1]	455	3,413[1]
Burn or scald	5,643[2]	260	1,202[1]	249	17	7	6,862[3]	516	7,378[3]
Wounds, bruises, and other injuries not specified above	19,615[1]	3,284	7,094	2,315[1]	106	36	26,715[1]	5,635[1]	32,350[2]
TOTAL	**34,521[9]**	**4,390**	**10,413[1]**	**3,025[1]**	**159**	**55**	**45,093[10]**	**7,470[1]**	**52 563[11]**
Accidents reported to Inspectors only.	86,904[36]	3,738[11]	13,566[9]	2,498[5]	99	46	100,568[45]	6,282[16]	106,850[61]
All reported accidents	**121,425[45]**	**8,128[11]**	**23,978[10]**	**5,523[6]**	**258**	**101**	**145,661[55]**	**13,752[17]**	**159,413[72]**

* An accident causing two or more of the specified kinds of injury is recorded under that which is named first in col. 1.

TABLE 9.—All Reported Accidents, 1914: Industry, Age, Sex.

In all the Accident Tables the injured person is the unit.

The principal numbers are those of accidents, fatal and non-fatal; the small figures at the right are those of fatal accidents only.

The cases recorded as *fatal* are those reported to the Department as such, whether in the Occupier's notice of accident or in the Certifying Surgeon's report, or by notification by the Coroner in pursuance of s. 21.

Industry.	Adults.		Young Persons.		Children.		All Ages.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Textile Factories	**6,150** 53	**3,611** 11	**2,192** 12	**2,251** 3	**208**	**94**	**8,550** 65	**5,956** 14	**14,506** 79
Cotton { Spinning	3,113 26	1,344 2	1,131 4	1,159 3	143	48	4,387 24	2,551 5	6,938 29
Cotton { Weaving	842 8	726 3	219 1	302	20	27	1,081 7	1,055 3	2,136 10
Wool, Worsted, Shoddy ...	1,410 18	699 2	418 4	352	33	12	1,861 22	1,063 2	2,924 24
Silk, Lace, Hosiery... ...	264 1	161	107	102	1	—	372 1	263	635 1
Flax, Hemp, Jute	494 8	667 4	301 3	321	11	6	806 11	994 4	1,800 15
Other	27	14	16	15	—	1	43	30	73 0
Non-Textile Factories ...	**104,065** 803	**4,456** 7	**21,608** 71	**3,250** 5	**50**	**7**	**125,723** 874	**7,713** 12	**133,436** 886
Printing, Bleaching, Dyeing	1,124 11	89 1	248	58 1	—	—	1,378 11	147 2	1,525 16
Laundries	124 3	260 3	30	117 1	—	—	154 3	377 4	531 7
Gas	2,165 25	1	49	1	—	—	2,214 25	2	2,216 26
Electrical Generation Stations.	452 11	1	17	—	—	—	469 11	1	470 11
Wood	3,415 31	16	835 7	18 1	3	—	4,253 38	34 1	4,287 39
Clay, Stone, &c.	2,058 39	120	440 3	74	2	—	2,500 42	194	2,694 42
Glass	1,009 2	35	290 1	34	—	1	1,299 3	70	1,369 3
Metals { Extraction ...	3,726 40	4	201 3	1	—	—	3,927 43	5	3,932 43
Metals { Conversion (including Rolling Mills)	15,974 97	208	2,547 5	228	4	—	18,525 102	436	18,961 102
Metals { Founding... ...	5,973 26	42	1,233 1	40	2	—	7,208 27	82	7,290 27
Metals { Galvanizing, &c....	1,255 12	80	300 1	57	—	—	1,555 13	137	1,692 13
Machines, Appliances, &c.:									
Marine Engineering ...	2,331 22	1	520	—	—	—	2,851 22	1	2,852 22
Shipbuilding	14,043 133	3	2,499 16	1	1	—	16,543 149	4	16,547 149
Locomotives, Automotors.	6,817 12	17	1,468 3	9	14	—	8,299 15	26	8,325 15
Other	28,083 141	725	6,947 12	520	10	2	35,040 156	1,247	36,287 156
Chemicals, &c.	3,716 59	150	370 5	140	—	1	4,086 64	291	4,377 64
Furniture, &c.	1,132 5	129	378 2	118	—	—	1,510 7	247	1,757 7
Food...	2,298 45	575	416 4	318	3	—	2,717 49	893	3,610 49
Drink { Aerated Waters ...	164 1	230 1	71 1	34	—	—	235 2	264 1	499 3
Drink { Other	1,702 31	333	543	111	1	1	2,246 34	445	2,691 34
Clothing	1,001 7	396	558 2	364 1	1	2	1,560 9	762 1	2,322 10
Paper, Printing, &c. ...	2,143 14	355	794 2	382 1	2	—	2,939 16	737 1	3,676 17
Explosives	202	18	16	6	—	—	218	24	242 0
Other	3,158 23	668 2	838 3	619	1	—	3,997 26	1,287 2	5,284 28
Workshops	**45** 4	**11**	**10**	**6**	—	—	**55** 4	**17**	**72** 4
Places under ss. 104-105	**11,165** 302	**50** 3	**168** 13	**16**	—	—	**11,333** 315	**66** 2	**11,399** 318
Docks, &c.	9,025 153	5	77 4	2	—	—	9,102 157	7	9,109 157
Warehouses...	427 11	1	14 1	3	—	—	441 12	4	445 12
Construction, &c., of Buildings.	1,524 131	3	45 6	2	—	—	1,569 140	5	1,574 140
Buildings under s. 105 (2b)	189 4	41 3	32 2	9	—	—	221 6	50 3	271 9
	121,425 1162	**8,128** 21	**23,978** 96	**5,523** 3	**258**	**101**	**145,661** 1258	**13,752** 29	**159,413** 1287

TABLE 10.—All Reported Accidents, 1914: Industry, Causation.

The principal numbers are those of accidents, fatal and non-fatal; the small figures at the right are those of fatal accidents only.

Industry.	Machinery, moved by Mechanical Power.	Molten Metal, Hot Liquid.	Explosion.	Escape of Gas or Steam.	Electricity.	Machinery not moved by Mechanical Power.			Struck by falling body.	Persons falling.	Struck by tools in use.	Other Causes.	Total.
						Cranes.	Presses for metal articles.	Other.					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Textile Factories:	**7,127 [45]**	**257**	**34**	**43**	**10**	**14**	**1**	**33**	**823 [6]**	**1,489 [12]**	**302**	**4,373 [illegible]**	**14,506**
Cotton: Spinning ...	3,009 [17]	140	6	17	5	4	—	15	320 [3]	731 [3]	146	2,545 [6]	6,938
Cotton: Weaving ...	1,035 [5]	32	1	3	2	4	—	2	153 [1]	183 [3]	32	689 [1]	2,136
Wool, Worsted, Shoddy...	1,670 [15]	58	18	17	1	4	1	3	198 [1]	352 [2]	62	540 [6]	2,924
Silk, Lace, Hosiery ...	330 [1]	11	1	1	2	—	—	5	40	74	18	153	635
Flax, Hemp, Jute ...	1,046 [7]	13	8	5	—	2	—	7	110 [1]	144 [4]	37	4:S [3]	1,800
Other	37	3	—	—	—	—	—	1	2	5	7	18	73
Non-Textile Factories:	**33,693 [303]**	**6,087 [44]**	**946 [40]**	**945 [28]**	**413 [21]**	**631 [10]**	**434**	**768**	**20,532 [80]**	**15,677 [234]**	**6,073 [7]**	**47,237 [112]**	**133,436**
Printing, Bleaching, Dyeing	517 [3]	136 [3]	10	24 [2]	2	4	—	6	152 [1]	238 [5]	21 [1]	415 [1]	1,525
Laundries...	322 [3]	36 [1]	9	4	—	1 [1]	—	10	11 [1]	56	2	80 [1]	531
Gas	196 [5]	122	48	102 [4]	2	7	—	6	263 [4]	494 [7]	51 [1]	920 [5]	2,216
Electrical Generation Stations	71 [2]	7	8 [2]	10 [1]	62 [4]	1 [1]	—	3	55 [2]	97 [2]	12	144	470
Wood	2,928 [19]	12	3	21	3 [1]	31 [3]	—	11	352 [5]	259 [10]	139	528 [1]	4,287
Clay, Stone, &c.	487 [13]	38 [1]	20 [2]	23	—	20	—	51	484 [8]	443 [5]	62	1,066 [8]	2,094
Glass	79	26	1	9	—	4	1	3	79	165 [1]	15	987 [2]	1,369
Metals: Extraction ...	314 [11]	449 [7]	41	82 [5]	6	19	6	6	837 [4]	503 [8]	90	1,579 [8]	3,932
Metals: Conversion (including Rolling Mills).	3,153 [50]	829 [7]	99 [11]	198 [3]	73 [3]	87 [1]	7	34	3,213 [9]	2,266 [10]	599 [1]	8,403 [7]	18,961
Metals: Founding.	787 [7]	2,517 [6]	29 [1]	33 [1]	9 [1]	86 [1]	7	11	1,025 [2]	460 [2]	175	2,151 [6]	7,250
Metals: Galvanizing, &c.	474 [3]	133 [3]	8	6	3 [2]	12	26	13	193 [2]	126 [1]	19	679 [2]	1,692
Machines, Appliances, &c.: Marine Engineering ...	606 [5]	45	20 [5]	8	8	7	—	6	572 [1]	372 [16]	229	979 [1]	2,852
Shipbuilding	2,104 [20]	120	112 [2]	36	55 [4]	47	—	20	3,062 [16]	3,271 [83]	1,354	6,366 [19]	16,547
Locomotives, Automotors	1,875 [7]	111	32	34	21	38 [1]	3	25	1,484 [1]	863 [3]	591	3,248 [3]	8,325
Other	11,091 [73]	571 [2]	170 [3]	144 [2]	144 [2]	209 [2]	220	168	6,465 [7]	3,138 [42]	1,986 [3]	11,981 [20]	36,257
Chemicals, &c.	584 [15]	269 [7]	66 [12]	72 [5]	3 [1]	15	—	37	573 [7]	743 [6]	123 [1]	1,892 [16]	4,377
Furniture, &c.	776 [3]	56	8	7	1	6	30	42	163 [1]	136 [1]	103	429 [2]	1,757
Food	1,132 [24]	304 [3]	20	29 [1]	4	7	1	43	302 [3]	544 [10]	72	1,152 [8]	3,610
Drink: Aerated Waters	166 [1]	4	122 [1]	—	—	1	—	3	10	17 [1]	1	175	499
Drink: Other	541 [8]	99 [4]	62	29 [4]	4	8	—	25	251 [3]	515 [15]	35	1,122 [3]	2,691
Clothing	1,528 [4]	23	4	9	2	—	51	34	48 [1]	126 [4]	116	381 [1]	2,322
Paper, Printing, &c. ...	1,771 [11]	79	19 [1]	25	6	7	2	114	372	373 [2]	71	837 [5]	3,676
Explosives...	44	2	2	6	—	—	—	1	28	36	8	115	242
Other	2,147 [11]	99	33	34	5 [3]	14	80	96	533 [2]	436 [4]	109	1,608 [8]	5,281
Workshops...	1	6	—	—	—	—	—	8	5 [2]	7 [2]	7	38	72
Places under ss. 104–105:	**2,202 [79]**	**22**	**21 [2]**	**22 [2]**	**11**	**62 [3]**	**—**	**9**	**2,903 [33]**	**2,388 [153]**	**223**	**3,536 [48]**	**11,399**
Docks, &c....	1,970 [65]	8	9 [1]	12 [1]	5	37 [1]	—	9	2,451 [13]	1,652 [50]	160	2,706 [38]	9,109
Warehouses	68 [1]	1	1	—	1	6	—	—	115 [3]	80 [4]	2	162 [1]	445
Construction, &c., of Buildings	144 [17]	6	8 [1]	8 [1]	4	19 [2]	—	—	317 [17]	532 [94]	58	478 [8]	1,574
Buildings under s. 105 (2b)	20 [3]	7	3	2	1	—	—	—	20	115 [5]	3	100 [1]	271
	43,023 [127]	**6,372 [41]**	**1,001 [illegible]**	**1,010 [30]**	**434 [21]**	**707 [13]**	**435**	**818**	**24,263 [121]**	**19,561 [401]**	**6,605 [7]**	**55,184 [181]**	**159,413**

TABLE 11.—Prosecutions, 1914: District, Offence.

Case means each item of prosecution, *e.g.*, a summons for employing three women beyond legal hours is entered as three cases
Col. 3 (Convictions) includes all cases, other than withdrawals, in which defendants were mulcted in costs only.
Col. 6 (Dismissed, &c.), includes all cases withdrawn otherwise than as in cols. 4 and 5.
The small (included) figures in col. 2 relate to prosecutions by Lady Inspectors, and those in col. 5 to cases in which costs were paid by defendants.

District.	Cases.	Result.				Convictions, &c. (Cols. 3, 4, and small figures in 5).								
		Convictions.	Withdrawn. On payment of costs.	Withdrawn. For amendment or on conviction on alternative charge.	Dismissed, &c.	Employment. Forms.	Sanitation.	Safety.	Adults.	Young Persons	Children.	Particulars.	Obstruction.	Truck Acts.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
S.London	100 [15]	87	6	5 [5]	2	7	3	10	42	36	—	—	—	—
S. W. London	32	32	—	—	—	3	2	—	5	22	—	—	—	—
*W. London	86 [3]	82	1	3	—	8	—	8	22	42	—	—	3	—
W. London (Special) ...	39 [39]	39	—	—	—	—	—	—	34	5	—	—	—	—
N.W. London	61 [13]	57	2	—	2	—	6	4	34	15	—	—	—	—
N. London	82 [19]	80	—	2	—	8	3	2	14	48	—	5	—	—
N.E. London	16	16	—	—	—	—	—	2	2	12	—	—	—	—
E. London	77 [4]	73	—	3 [1]	1	12	3	11	28	20	—	—	—	—
Kent	52	48	2	2 [2]	—	5	3	9	—	33	—	—	2	—
†Reading	1	—	—	—	1	—	—	—	—	—	—	—	—	—
Northampton	20	20	—	—	—	5	—	—	—	15	—	—	—	—
Norwich	15	14	—	—	1	—	1	6	—	7	—	—	—	—
Ipswich	17 [5]	15	—	1 [1]	1	2	1	5	2	6	—	—	—	—
Bristol	31	28	—	—	3	7	1	5	2	13	—	—	—	—
Gloucester	7	6	—	1	—	—	—	1	—	5	—	—	—	—
Yeovil	3	3	—	—	—	2	—	1	—	—	—	—	—	—
Southampton	53	51	—	1	1	15	—	3	11	20	2	—	—	—
Plymouth	20	18	2	—	—	2	—	1	9	8	—	—	—	—
Swansea	8	8	—	—	—	3	—	—	—	5	—	—	—	—
Cardiff	72	72	—	—	—	43	—	7	—	14	6	—	—	2
Dublin	50 [2]	48	—	—	2	—	—	2	32	13	—	—	1	—
Cork	19 [3]	19	—	—	—	6	—	4	5	1	—	—	3	—
Birmingham	77 [13]	75	—	2 [2]	—	21	5	6	1	39	—	—	—	5
Coventry	12 [2]	12	—	—	—	5	—	2	2	3	—	—	—	—
Worcester	8 [3]	7	—	1 [1]	—	1	2	2	—	—	—	3	—	—
Wolverhampton ...	21	16	1	4 [2]	—	4	5	2	2	5	1	—	—	—
Walsall	4	4	—	—	—	—	—	2	—	—	2	—	—	—
Stoke	63 [11]	61	—	1 [1]	1	12	15	7	10	16	—	—	—	2
Leicester	27 [8]	26	—	1	—	2	9	3	12	—	—	—	—	—
Nottingham	39 [3]	34	—	1	4	2	1	1	14	16	—	—	—	—
Derby	100	85	—	10 [9]	5	21	7	10	5	45	3	3	—	—
Lincoln	53 [38]	40	—	13 [1]	—	4	1	9	9	7	—	4	—	7
Wrexham	10	10	—	—	—	2	1	—	1	6	—	—	—	—
Leeds	20 [8]	18	—	1	1	2	—	3	5	8	—	—	—	—
Leeds (Special)... ...	21 [21]	21	—	—	—	8	1	—	4	8	—	—	—	—
Hull	24 [4]	24	—	—	—	2	—	4	2	16	—	—	—	—
Sheffield	38 [4]	36	—	—	2	7	1	2	1	24	1	—	—	—
Huddersfield	23	22	1	—	—	1	1	3	8	10	—	—	—	—
Halifax	14	14	—	—	—	—	2	2	9	1	—	—	—	—
Bradford	40	38	—	1	1	2	2	5	11	16	2	—	—	—
Keighley	30	30	—	—	—	—	1	—	19	7	3	—	—	—
Newcastle	35	29	—	4 [2]	2	1	—	8	9	13	—	—	—	—
Stockton...	15	14	—	—	1	3	—	—	3	8	—	—	—	—
Manchester	91 [8]	85	4	2 [2]	—	3	3	14	25	42	4	—	—	—
Stockport	26 [4]	22	—	1	3	1	1	5	6	8	1	—	—	—
Oldham	354	354	—	—	—	—	—	9	230	113	2	—	—	—
Bolton	161 [1]	128	1	—	32	1	1	8	56	53	3	7	—	—
Rochdale	326	325	—	1 [1]	—	1	1	6	205	111	2	—	—	—
Wigan	21 [1]	20	—	1	—	1	1	4	11	3	—	—	—	—
Warrington	26	24	—	2 [2]	—	2	2	—	1	21	—	—	—	—
Liverpool	36 [1]	36	—	—	—	2	1	—	27	6	—	—	—	—
Blackburn	24	24	—	—	—	—	—	3	11	3	2	5	—	—
Burnley	33 [5]	32	—	—	1	3	3	1	3	15	1	6	—	—
Preston	22	22	—	—	—	3	—	2	7	9	1	—	—	—
Glasgow...	39 [5]	36	—	—	3	3	—	3	16	14	—	—	—	—
Lanarkshire	4	4	—	—	—	1	—	1	—	1	—	—	1	—
Kilmarnock	14	7	—	1 [1]	6	3	2	—	—	3	—	—	—	—
Edinburgh	69	69	—	—	—	16	—	2	25	26	—	—	—	—
Stirling	3	2	—	—	1	—	1	1	—	—	—	—	—	—
Dundee	20	19	1	—	—	4	—	—	5	7	—	4	—	—
Aberdeen	3	3	—	—	—	—	—	—	—	1	—	2	—	—
Inverness	13 [13]	7	—	—	6	—	—	—	7	—	—	—	—	—
Belfast	16 [5]	16	—	—	—	—	1	4	4	5	—	—	2	—
Londonderry	16 [1]	13	—	—	3	3	2	3	—	2	1	—	—	2
‡England	2,496 [213]	2,347	20	64 [32]	65	191	89	191	913	933	30	33	5	14
‡Wales	90	90	—	—	—	48	1	7	1	25	6	—	—	2
Scotland...	165 [18]	147	1	1 [1]	16	27	3	7	53	52	—	6	1	—
Ireland	101 [11]	96	—	—	5	9	3	13	41	21	1	—	6	2
United Kingdom ...	2,852 [242]	2,680	21	65 [33]	86	275	96	218	1,008	1,031	37	39	12	18
§*Lady Inspectors* ...	*242*	*219*	—	*9* [1]	*14*	*13*	*16*	*8*	*99*	*52*	—	*16*	*4*	*12*
§*Textile Particulars* ...	*18*	*18*	—	—	—	—	—	—	—	—	—	*18*	—	—

* Area altered during 1914.
† New district formed in 1914.
‡ Monmouthshire is included in Wales.
§ Also included in District summaries above.

TABLE 12.—Works or Departments under Regulations or Special Rules, 1914.

Code. (1)	Division. South Eastern. (2)	South Western. (3)	Midland. (4)	North Eastern. (5)	North Western. (6)	Northern. (7)	Total. (8)
Regulations :—							
Felt hats	2	—	2	—	32	—	36
File-cutting by hand	6	4	72	274	50	10	416
Electric accumulators	22	—	5	1	4	—	32
Docks, &c. (*a*) separate premises	1,316	1,069	336	307	530	610	4,168
Docks, &c. (*b*) parts of F. or W.	915	340	285	440	282	40	2,302
Self-acting mules	6	91	40	630	1,034	140	1,941
Wool sorting, combing, &c.	—	—	2	65	1	1	69
Flax	1	18	—	19	5	291	334
Locomotives	318	557	612	833	532	743	3,595
Paints and colours	45	24	51	34	40	33	227
Heading of yarn	—	—	—	—	14	7	21
Hemp and jute	16	15	3	17	14	127	192
Horsehair	130	36	47	67	54	48	382
Casting of brass under exemption 1	277	197	395	238	239	199	1,545
Casting of brass not under exemption 1	111	74	382	154	133	68	922
Vitreous enamelling	11	—	24	4	10	13	62
East Indian wool	5	1	10	65	14	18	113
Electricity	12,426	5,547	7,969	3,381	8,170	5,158	47,651
Nitro-benzol, &c.	4	2	—	3	5	2	16
Tinning of metals	16	4	91	7	11	8	137
Grinding of metals	60	27	181	1,709	54	25	2,056*
Lead smelting, &c.	10	13	8	11	13	2	57
Bronzing	366	84	273	122	228	135	1,208
Cotton cloth factories	—	2	—	230	1,464	47	1,743
Pottery manufacture and decoration	30	52	455	43	20	48	648
Bichromate	—	—	—	—	—	3	3
Shipbuilding	16	65	5	61	15	56	218
Special Rules :—							
Chemical works	121	202	141	191	211	107	973
Vulcanising indiarubber	13	—	2	—	19	3	37
Aerated water	667	618	432	444	375	360	2,896
White lead	6	1	2	7	4	1	21
Hides and skins	44	7	6	7	32	3	99
	16,960	9,050	11,831	14,364	13,609	8,306	74,120

* Including tenements of tenement factories.

TABLE 13.—Administration of the Factory Acts, 1904–1914.

Subject.	1914.	1909.	1904.
(1)	(2)	(3)	(4)
Staff (Inspectors and Assistants)	222	200	152
Expenditure* (excluding Central Office Clerks and Pensions)	£103,594	£91,322	£72,965
Registered Factories and Workshops. — Factories	123,058	112,479	104,472
Registered Factories and Workshops. — Workshops	153,797	151,270	145,278
Registered Factories and Workshops. — Total†	276,855	263,719	249,750
Works under Regulations (other than those for docks, &c.) and Special Rules.	67,650	26,165	8,574
Docks, &c. (Registered Occupiers)	4168	3,921	2,840
Warehouses	4,672	4,724	4,540
Humid textile factories under s. 96	315	272	?
Works under Particulars Section. — Textile — Factories	8,204	7,586	7,110
Works under Particulars Section. — Textile — Workshops	2,059	1,796	1,577
Works under Particulars Section. — Non-textile	28,678	20,788	11,531
Effective visits to — Factories	187,840	158,956	?
Effective visits to — Workshops	238,594	215,162	?
Effective visits to — Other places under the Act	15,676	24,598	?
Effective visits to — Places not under the Act	28,632	25,721	?
Effective visits before or after legal hours	42,629	46,370	?
Factories and Workshops visited — Once	182,155	?	?
Factories and Workshops visited — More than once	71,545	?	?
Prosecutions (Cases)	2,852	3,723	3,009
Certifying Surgeons	2,364	2,233	1,980
Accidents reported to — Certifying Surgeons — Fatal	1,287	946	1,018
Accidents reported to — Certifying Surgeons — Non-fatal	51,276	39,020	28,943
Accidents reported to — Inspectors only...	107,309	77,534	63,007
Dangerous Occurrences (s 5, 1906)	2,595	940	—
Poisoning reported by — Occupiers	433	442	445
Poisoning reported by — Certifying Surgeons	511	625	656
Poisoning reported by — Practitioners	312	409	537
Notices received, other than Overtime Reports	290,044	267,437	166,943
Notices to District Councils. — Representations (ss. 5, 145)	9,889	8,198	6,287
Notices to District Councils. — Occupation of Workshops	13,261	21,863	8,315
Contravention Notices (to occupiers)	192,001	162,418	?

* The expenditure is that of the financial year commencing April 1st.

† Docks, wharves, quays, warehouses (s. 104); "buildings" (s. 105); railway lines and sidings (s. 106); men's workshops, homework premises, and factories and workshops under the charge of H.M. Inspectors of Mines, are not included.

§ Including examinations made by Appointed Surgeons and voluntary examinations.