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FACTORIES AND WORKSHOPS.

Annual Report of the Chief Inspector of Factories and Workshops For the Year 1929.

Presented by the Secretary of State for the Home Department to Parliament by Command of His Majesty, July, 1930.

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ANNUAL REPORT

OF

H.M. CHIEF INSPECTOR OF FACTORIES AND WORKSHOPS FOR THE YEAR 1929.

HOME OFFICE,
May, 1930.

To The Right Honourable J. R. Clynes, M.P., His Majesty's Principal Secretary of State for the Home Department.

Sir,

I have the honour to submit the following Report on the work of the Factory Department during the year 1929.

In view of the considerable developments that have taken place in the establishment of Safety Methods on an organised basis, particularly in those industries in which the incidence of accidents is high, I have again dealt with this subject at considerable length, and have attempted to give a picture of what has been accomplished in the several industries coming within the draft Safety in Factories Order. The reports from all areas show that substantial progress has been made. Results vary, of course, from factory to factory, and cases are reported where the Safety Committees rarely meet, or accomplish little when they do meet. It is noticeable that this condition often arises when the management are only half-hearted in their support. Clearly the mere appointment of a Committee will accomplish nothing, nor can it be expected that the operatives on their side will take any interest in the question if they feel that their employers are not also in earnest about it.

The constitution of the Committees gives some little cause for disquietude. In a great many cases they consist only of the management and the foreman, without direct representation of the workers themselves. It is not suggested that such Committees cannot do good work, but it has been demonstrated year by year how many accidents are due to human failures, and can be eliminated only by educating the worker to perform his duties with due regard to safety. Such education will hardly be provided unless the workers themselves are given a due share of responsibility in the works safety organisation.

I desire to direct attention, too, to the account that is given of the work of the Joint Standing Committees which have been set up in both the spinning and weaving sections of the cotton trade to review the accident problem from time to time. Committees of

this kind afford a helpful link between the Department and an industry, and it is much to be hoped that it may be found possible to extend this principle to other trades.

I have again included a chapter on the Industrial Museum. It has been possible to give a more detailed account of the uses made of the Museum, and of the help it has been proved to afford to a wide variety of interests.

At the invitation of the German Government, a meeting of Directors of Industrial Museums was held in Berlin in September. Miss Martindale and Mr. Stevenson Taylor attended as representatives of the Home Office Museum. The meeting was a great success. It afforded opportunity for discussing the best form of organisation for these Museums, and methods of extending their utility. It also enabled our representatives to make a thorough inspection of the exhibits shown in the re-organised Museum at Charlottenburg, which was one of the first exhibitions of this kind to be established.

Mr. W. Williams and I were present as Advisers at the International Labour Conference at Geneva in May, when two subjects of special interest to the Department—Accident Prevention and Safety in Docks—were under discussion.

Dr. Bridge and Dr. Henry were present at the fourth meeting in April of the International Committee on Occupational Diseases at Lyons.

At the end of the year there were 152,453 factories and 108,323 workshops on the register of the Department, being an increase of 2,921 factories and a decrease of 3,726 workshops as compared with the previous year. A decrease in the number of workshops is likely to be caused either by the progress or by the decline of an industry. If a workshop increases its business, mechanical power is commonly installed—thus converting the premises into a factory—and this tendency has been accelerated, as has been pointed out in previous years, by the availability of cheap and convenient forms of power such as electricity and engines driven by petrol or gas. On the other hand, if an industry declines, workshops in that industry either close altogether, or the employer dismisses his assistants and works alone, thus removing the premises from the operation of the Acts. Since the war, a large number of workshops, especially in country districts, have been denuded of workers owing to the fact that, in view of reduced work or higher wages, many employers consider that assistants are unprofitable. This change has been marked in workshops engaged in engineering repairs, the making up of wearing apparel, watch and clock repairing, coachbuilding, or the manufacture of harness and saddlery. The new law concerning the derating of industrial premises caused additions to the registers as some employers who had previously escaped registration applied to be placed on the Inspectors' lists.

Employment in industry generally, although less bad than the previous year, was far from satisfactory. Many of the leading trades of the country experienced very difficult conditions, and

worked far below their normal capacity. Fortunately, however, other trades flourished and tended to restore the balance of employment, particularly in the South of England. Among the busier industries may be mentioned those connected with motor cars, building operations, wireless apparatus, gramophones, electrical engineering, some branches of chemical work, furniture, artificial silk, paper manufacture and sugar refining.

The demand for the productions of many of the miscellaneous trades carried on in the South of England, particularly in and round London, was so brisk as to cause in some works a shortage of suitable workers and to necessitate considerable extensions in factory buildings. In the choice of sites for new works, the trend of the times is shown. Cheap means of transport have always influenced this choice; consequently, in former years, proximity to a canal or railway was frequently a determining factor—the canal having the additional advantage of supplying water for steam plant. Now, owing to the popularity of road motor transport and to the frequent adoption of other forms of power than steam engines, preference is often given to good road communications with the consequence that many of the new arterial roads have already attracted factories.

In other parts of the country, the severe depression in the textile and other trades led to the closure of many factories, and to reduced production in a still larger number. In many areas, therefore, there was much unemployment and the industrial classes in those areas suffered in a marked degree from the buffetings which fate inflicts upon them from time to time. Not only did they feel the unavoidable effect of the reduced demand for their productions, but the tendency of the present day, under schemes of rationalisation, is to concentrate production into fewer units, and to close down old and less economic works, a procedure which must throw numbers of persons out of work, at least temporarily.

Fortunately, there is some degree of adaptability in workers as well as in manufacturing plant, and many illustrations of this were noted. For instance, some employers made arrangements for changing over from cotton to artificial silk; beet sugar factories, which formerly worked for a short season only during the winter, utilised their plant during the summer in refining imported sugar; agricultural implement makers widened their scope of production by making motor car parts, etc., and general joinery works turned over to furniture. As regards buildings, many of the works which were built during the war for the manufacture of munitions have been converted into factories producing a great variety of objects, while a number of the buildings erected for the exhibition at Wembley are now humming with productive machinery.

Ingenuity and enterprise are constantly at work in improving methods and materials. In the jute trade, which has been seriously affected by foreign competition, one small experimental mill has been running for over a year with automatic machinery

and adult male labour only, working 24 hours a day. Apparently the results have been successful, as the plant is being extended. Better methods have been introduced in the manufacture of bricks; there has been an extended use of machinery in glass works; modern coke ovens supplying gas for public consumption have been erected, and there is an increased manufacture of steel sleepers for railways and of machinery for pulverising coal. In view of the great increase in the application of cellulose paints or varnishes (generally by means of an air spray), it is satisfactory to note the effort of manufacturers to reduce the danger to workers by raising the flash point of the solvents and by restricting the use of benzol.

The search for better methods of working is not confined to points of economy, but extends to matters directly affecting the well-being of the operatives. For example, in some large works skilled investigators from the National Institute of Industrial Psychology have been employed in studying working methods with the object of eliminating waste and inefficiency, and also of improving the welfare and comfort of the workers.

In a highly organised industrial nation, the effect of any considerable change in practice, or even in fashion, may produce serious results on particular classes of workers whose means of livelihood are frequently affected to an extent which is not generally recognised. For example, the modern preference for glass bottles or jars for distributing milk and preserves has badly hit the makers of milk cans and stoneware jars; the extensive adoption of electric motors and oil or petrol engines has led to the closure of some factories making steam engines and boilers; jute bag manufacturers complain of the competition of paper containers; rubber soles for boots have caused a depression in the heavy leather trade, and the charms of gramophones and wireless have caused despair to the makers of pianos.

Important changes have taken place in the organisation of the Department following the Report of the Factory Staff Committee. The recommendations of that Committee were accepted generally, and the following changes were approved:—

(i) The general inspection staff attached to the inspection divisions and districts will be raised in number (over a 5-year period) from 180 to 243; the number of the superintending inspectors' divisions from 10 to 11 and the number of inspection districts from 83 to 96. The additional division will be formed in the South-east of England where there has been in recent years a great development of industry. At the end of the five years the full staff (apart from the technical and special branches) will consist of 1 Chief Inspector, 3 Deputy Chief Inspectors, 11 Superintending Inspectors, 46 Class IA Inspectors, 96 Class IB Inspectors, and 90 Class II Inspectors. Class II will continue to be regarded as a cadet or training grade as heretofore.

(ii) As a result of the amalgamation of the men's and women's staffs, the men and women inspectors will be recruited by the same examination, will be treated as one establishment with a single seniority list, and will, generally speaking, perform the same duties. No fixed rule will be laid down as to the proportions in which men and women will be recruited for the Inspectorate, but the Committee recommended that an establishment consisting of 70 per cent. men and 30 per cent. women, with an adequate distribution of both men and women inspectors in the different grades should be aimed at as corresponding to the needs of the Department, and this proposal has been accepted in principle.

(iii) The Technical Branches will be substantially increased, the Medical Staff from 5 to 8, the Electrical Staff from 5 to 12, and the Engineering Staff from 6 to 10.

During the year 1930–31, it is proposed to appoint 15 additional inspectors to the divisional and district staff, making, with 7 vacancies in the existing inspectorate, a total of 22 new inspectors to be appointed this year.

In the technical branches, 2 medical, 2 engineering and 4 electrical inspectors will be added this year.

Ten vacancies occurred in the staff through the death of Mr. J. T. Ashton, Assistant Inspector of Textile Particulars, and the retirement of Messrs. R. G. Broadhead, W. F. Ireland, R. R. W. Millward, C. E. Whitelaw, D. T. C. Eva, G. A. Taylor, B. J. Cook, W. Brown and Miss M. E. Roxburgh.

The following new appointments were made :—Messrs. P. E. Knowles, January 1st; F. O. Townsend, January 30th; W. M. Samson, January 31st; E. A. Clothier, February 2nd; F. J. Tanner, February 27th; F. J. Fedden, May 6th; Miss J. N. R. Currie, August 2nd; Miss M. M. Wilkins, September 21st; Miss M. M. Smith, September 25th; Mr. A. Mennell (Assistant Inspector of Textile Particulars), December 6th.

At the end of the year the authorised staff numbered 206, and there were five vacancies for Class II Inspectors.

New Acts affecting the work of the Factory Department, were the Factory and Workshop (Cotton Cloth Factories) Act, 1929, which gave power to the Secretary of State to give effect to the recommendations contained in the Report of the Departmental Committee in regard to cotton cloth factories, and the Expiring Laws Continuance Act, 1929, which provided for a continuation of the two-shift system sanctioned by Section 2 of the Employment of Women, Young Persons and Children Act, 1920.

A new code of Regulations was made for Cotton Cloth Factories, and a new Welfare Order for Oil Cake Mills.

One hundred and thirteen Orders (as against 116 last year) were made under Section 2 of the Women, Young Persons and Children Act, 1920, allowing the employment of women and young persons over 16 years of age in two separate shifts during the day.

A new Particulars Order was made applying Section 116 of the Factory and Workshop Act, 1901, with modifications, to the Manufacture of Lamp Shades, and a Home Work Order, made under Sections 107 and 108 of the same Act was also made, applying the provisions of these sections to the same industry.

An application for an Order under Section 49 of the Act of 1901 to allow Overtime Employment of Women in the manufacture of Almond Products was refused.

As regards Institution Factories and Workshops under Section 5, 1907, three Orders were made (affecting three Institutions) modifying the application of the Acts, and one Order was made revoking an earlier Order.

Returns of employment were received from 135 Institutions to which Orders allowing variations of the ordinary provisions of the law had been granted. These showed that 454 young persons under 16 years of age were employed at these Institutions, 1,123 between 16 and 18 years of age and 3,051 adults, making a total of 4,628 of whom only 17 were males. There were 516 persons employed in the supervision of the work or machinery.

The following pamphlets and publications were issued :—

Memorandum on Chains and other Lifting Appliances, Form 418, revised.

Home Office Industrial Museum :
Illustrated Leaflet for Occupiers, Form 737.
Descriptive Account and Catalogue, 2nd edition.

Cotton Spinning Mills : Report by Mr. E. F. May on Conferences between Employers, Operatives and Inspectors concerning Fencing of Machinery, Prevention of Accidents, First Aid and Temperature.

Cotton Weaving Factories : Report by Mr. E. F. May on Conferences between Employers, Operatives and Inspectors concerning Fencing of Machinery, First Aid and other Safeguards in Cotton Weaving Factories.

Cellulose Solutions :
Memorandum on Manufacture, Use and Storage, Form 826, 1st and 2nd editions.
Leaflet on Precautions in the Manufacture, Use and Storage, Form 275, 1st and 2nd editions.

Cotton Cloth Factories Regulations, 1929 : Explanatory Memorandum, Form 975.

Refrigerating Plant and Cold Storage Premises : Memorandum, Form 716, 3rd edition.

Welfare Pamphlet :—

No. 4.—First Aid and Ambulance (2nd edition).

Safety Pamphlet :—

No. 1.—Transmission Machinery : Safety Precautions, Part I, Fencing and other safeguards (3rd edition).

Industrial Health Research Board's Reports :—

Board's Ninth Annual Report (1928).

No. 52.—The Comparative Effects of Variety and Uniformity of Work.

No. 53.—The Use of Performance Tests of Intelligence in Vocational Guidance.

No. 54.—An Investigation into the Sickness Experience of Printers.

No. 55.—A Study of the Personal Qualities in Accident Proneness and Proficiency.

No. 56.—The Effects of Monotony in Work.

No. 57.—Further Experiments on the Use of Spectacles in very Fine Processes.

Bye-laws under Section 15 of the Factory and Workshop Act, 1901, with regard to the means of escape from fire in works in which not more than 40 persons are employed, were made by three Local Authorities, bringing the number of districts in which such bye-laws are now in force up to 93 in Great Britain. The additional Local Authorities are Bootle, Newcastle-under-Lyme and Walsall.

A new table—Table 11A—has been included in the Appendix, supplying particulars of the number of persons employed in factories in 1928, with details as to age and sex.

These figures were obtained from returns furnished by employers in accordance with an Order under Section 130 of the Factory and Workshop Act, 1901. In order that employers might be put to a minimum of trouble the return was combined with that required under the Workmen's Compensation Act, but the new table gives much fuller information in regard to employment than the Workmen's Compensation Statistics. It not only contains separate figures for adults and young persons, but also classifies them according to a far more detailed classification of industries. The same classification is adopted this year in Table 11, which gives the number and other particulars of all reported accidents, so that a basis is afforded for arriving at an accident rate in the different industries.

In conclusion, I desire to acknowledge the assistance I have received from various members of the staff in the preparation of this report.

I have the honour to be, Sir,

Your obedient Servant,

GERALD BELLHOUSE,

H.M. Chief Inspector of Factories.

CHAPTER I.

GENERAL REPORT.

SAFETY.

Accidents.—The number of accidents reported has increased from 154,319 to 161,269, and fatalities have also risen from 953 to 982.

The greatest number of fatalities in any one industry (133) occurred in the building trade, and the other industries most concerned were the metal industry (smelting, conversion, rolling, founding, etc.), 138, shipbuilding 95 and docks 90.

The returns present no new features. As in previous years only about 20 per cent. of the accidents were due to moving machinery, the remaining 80 per cent. being due to causes which, for the most part, cannot be prevented by physical safeguards. By far the largest proportion are attributable to causes such as falls, struck by falling body, handling goods, and use of hand tools.

It is again very striking how many accidents have been due to sepsis, 17,586, of which 51 had fatal results, were attributed to this cause. This represents rather more than 10 per cent. of the whole of the reported cases, a proportion which corresponds almost exactly with that of the previous year. Such figures can only suggest that there is still great neglect to make adequate use of the first aid appliances which are now compulsory in every factory.

Safety Organisation.—It was decided last year, after discussion with representatives of the various Employers' Associations, not to proceed further for the time being with the Draft Safety in Factories Order in the case of those industries where assurances were given by the Associations concerned that they would themselves take up the matter of safety organisation energetically with their members, and in my report last year I gave a list of the Associations from which such assurances had been received. It was not possible at that time to do more than record the fact that effect had been given to those assurances, by the issue of circulars, embodying in many cases model schemes which had been issued by the Associations to their members. It is now possible to review the results. The following table shows the

number of works which would be affected by the Order, and the number in which safety organisations have or have not been established :—

Industry.	Works affected.	With Safety Committees or other forms of Safety Organisation.	Without Safety Committees or other forms of Safety Organisation.
Blast furnaces..	58	52	6
Iron and steel mills	307	237	70
Heavy engineering	293	233	60
Iron founding	305	191	114
Shipbuilding	166	136	30
Total	1,129	849	280

It will be observed that in the great majority of cases Safety Committees or other organisations have been appointed, and there can be no doubt that there has been a big step forward in the Safety First movement. At the same time the reports of the inspectors show that there is great variation as regards the efficiency of these organisations, and there are far too many instances quoted where lack of interest, lethargy, and laxity have been observed. Thus it is reported, in reference to an iron-mill in the Eastern Division, that a Committee was appointed consisting of the manager, three foremen, one man representing the workshop side, and another man representing the furnace side and the Trade Union, that one meeting was held, when the members were invited to suggest any steps that could be taken to ensure safe working conditions, but that no other formal meeting has been held, and only informal discussions have taken place on various points raised. Mr. Warren (Derby) refers to a case where the Committee had not met for twelve months; Mr. Beard (Bristol) to a shipbuilding and repairing firm where, though a Committee had been appointed, " no meetings appeared to have been held, but the members are supposed to check dangerous practices which come under their notice " ; Miss Pease (Gloucester) to a large firm of engineers employing 900 men and boys where she found on making enquiries " that only one meeting of the Committee had been held during the year, and little safety work had been done " ; and Mr. Rogers to about a dozen tinplate and sheet factories where meetings had not been held for two or three months, or had not kept proper minutes. Again Miss Sanderson referring to an Engineering Works in Essex, says " The Safety First Committees are as yet very lethargic, and have not accomplished much," and Miss Slocock (Eastern Division) reports in reference to the work of the Committee in two iron foundries that " the zeal with which the Safety Committee started off had not been maintained," and she attributed this to " apathy on the part of the management rather than the men." And finally

Mr. Brown (Scotland), in dealing with this subject writes, " In many works the Committees are keen and take great interest in their work, but this is not always the case," and Mr. Lauder (Glasgow) adds " Although some attention is paid to the more serious accidents by the Committees, I do not think that in some shipbuilding yards sufficient attention is being paid to accidents in general, as one finds when enquiries are being made regarding accidents that there is still difficulty in obtaining full details of all the circumstances and conditions existing when the accident occurred."

It should be obvious that the mere appointment of a Committee will accomplish nothing ; they can never succeed unless they have full encouragement from the management, and there must be some one person whose duty it is to organise and keep alive the work of the Committee.

While, however, these reports provide examples of failure in different parts of the country, far more examples are given where definite success has been attained, and examples may be quoted of what has been accomplished in the different industries concerned.

Blast Furnaces and Iron and Steel Works.—Probably some of the best safety work has been accomplished in the iron and steel industry and the following summary, received through the Welsh Plate and Steel Manufacturers' Association, is of special interest.

Mr. Rogers (Western Division).—I have just received the combined Accident Rates for 1929 for 74 tinplate and steel sheet factories in the Welsh Plate and Sheet Manufacturers' Association. About 27,000 persons are employed in these factories, and 3,636 lost-time accidents occurred in them during 1929. Most of these were slight injuries through contact with sharp edges of plates and sheets.

Under the Safety First scheme described on pp. 18 and 19 of the 1927 Annual Report, the member firms send their accident records periodically to the office of the Association where they are tabulated. The results for the past three years are as follows :—

	1927.	1928.	1929.
Frequency rate	85·6	76·5	67·7
Severity rate	2·2	2·0	·1·7

These gradually declining rates are very satisfactory and show the value of the safety work which has been done in this trade during the past three or four years. As the Divisional Annual Report showed, these results are now producing reduced compensation costs. A further instance of this has been noted recently by Mr. Fotheringham (Newport) who reports that the tinplate firm in his district with the lowest accident rates have just had their compensation insurance premium reduced for 1930 to 9*s.* 0*d.* per £100 wages from the previous rate of 17*s.* 6*d.*

That safety work has been directly beneficial to this industry is shown by the following quotations from the inspectors' reports :—

Mr. Rogers (Western Division).—The firm of steel and sheet manufacturers mentioned in the last Annual Report (No. 1, p. 21) actually paid in compensation £1,212 less in 1929 than in 1928. The frequency rates in this group of factories were 96·9 in 1927, 92·9 in 1928 and 78·5 in 1929.

Mr. Younger (Swansea).—A very large group of steel, tinplate and sheet works in this District with several efficient Committees have had their insurance premium reduced for 1930 by 1*s.* 6*d.* per £100 of wages, which will mean a saving of over £500 a year to them. The frequency rates for tinplate

factories in the group were 99·2 in 1927 (when improved safety work commenced), 72·7 in 1928 and 54·6 in 1929. In another smaller group of similar trades employing 1,700 workers the rates for *all* the works combined were 49·1 in 1927, 45·5 in 1928 and 34·5 in 1929. The inclusion of steel works, which have a much lower incidence of slight accidents than tinplate works, mainly accounts for the lower figures in the second case.

Mr. Jenkins (Carmarthen) also cites a steel works, with a very good Committee, whose insurance premium was reduced by 3*s.* 3*d.* per £100 wages owing to the reduction in their accident rate.

Mr. Paterson thus summarises the position in Lincolnshire :—

The work of accident prevention Committees has expanded and has been most useful in the iron and steel industries of Scunthorpe. All the works in that district have such a Committee, but the efficiency of their working has varied with different firms. Representatives of the men have been on the Committees, but they have been nominated and are not elected by ballot.

In my opinion, the first and most important work of the organisations is that each accident is tabulated and by means of graphs it can be seen what type of accident is occurring and what steps can be taken to prevent recurrence. The work of a typical accident prevention Committee in a steel works in Lincolnshire is of interest. There is a joint works board with the General Manager as president. The managerial side is represented by heads of departments and engineers and the workmen's side consists of elected representatives. This joint board has control of the Workmen's Club, Athletic Association, Coal Committee and Band Committee, and controls everything connected with welfare at the works. It has dealt with all matters appertaining to the conditions under which the men work from the standpoint of efficiency, comfort, and accident prevention. As a result of the Draft Safety in Factories Order, and my visits, it was decided that this was not sufficient, and an Accident Prevention Committee was established in April, 1928. It has the advantage over the Joint Works Board, in that the whole of its time is taken up with Accident Prevention. It is constituted by a managerial representative for each department on the works, coke ovens, blast furnace, steel works, rolling mill, transport and engineers, and by workmen nominated by the management, specially chosen because of their suitability and enthusiasm for the work undertaken. The Committee have examined into every accident occurring on the works and have dealt with recommendations received from the workmen. If anything can be suggested to prevent accidents it is passed on to the department in question to have the work carried out. Any recommendation sent out from the Committee is put on the minutes and the department in question has to say that the work has been done or to give a reasonable excuse.

With the smaller firms it is more difficult to see results—some firms only have two blast furnaces in operation and at present have to avoid spending any money. At these works there have been improvements in ambulance boxes, first aid appliances, breathing apparatus, oxygen apparatus, testing of chains, and in one case automatic gates at the foot of blast furnace hoists. As a result of these Committees, a much greater attention is paid to the safe design of furnaces, buildings and new machinery. Gangways and steel ladders are provided at furnaces, to enable men to go up to make adjustments to the valves where formerly a wooden ladder was used ; steel ladders are put up at each end of the crane tracks at places where drivers used to walk along the crane rail before getting down ; two-rail fencing is provided at edges of galleries, and gangways are provided in the roofs to enable workmen to change electric light bulbs and repair the roof in safety. Flashing signs have been adopted at one works—similar to modern traffic control—such as " Beware of Slag Bogie," at a place where the bogie, containing a hot ingot, crosses one of the works roadways. During the year there has also been a substantial improvement in lighting of steel works.

The reports from the Midlands are not quite so satisfactory. In the Wolverhampton District out of 26 blast furnaces, rolling mills and tube works, 12 have a Committee or Safety Supervisor. In others some form of safety organisation is in force or has been promised, but in five nothing has been done.

Mr. Heath (Walsall).—*Blast Furnaces.*—Very little work is being done in the only two works in the district and an accident is rare. The standard of upkeep is fairly high, but the firms have no special organisation. The management carry on the safety work.

Iron and Steel Rolling Mills.—Advance has been made in these. In two large rolling mills and one small one (only about 120 workers) Safety Councils have been organised and are running satisfactorily. The safety spirit, it was stated, was percolating down to and through the foremen and doing good. In another mill, where 300 are employed, one of the partners personally supervises safety measures, and he had safety leaflets placed in the men's wages envelopes for several weeks; also safety posters affixed. At another works, although a separate Safety Committee is not in action, the factory has a works council, and safety is one of its functions. At still another iron-mill, where about 300 are employed, the works managers do the safety work.

Mr. Garrett (Stoke-on-Trent).—The terms of the Draft Order apply to only three blast furnaces in this district. At the most important works, the Safety Committee of managers and foremen meet monthly, and discuss all accidents, and in several cases really useful suggestions for preventing similar occurrences have been put forward, for instance, ducts for carrying off the steam in the melting shop to above roof level after interference with vision had caused a slight traffic accident; also monthly inspection of the balance weights of hopper doors to the blast furnace feed hoppers after the collapse of a nut and bolt had caused a slight accident. The weakness of the system is the lack of a Safety Supervisor who will carry out the immediate investigation of all accidents. In the departments where the managers and foremen are keen this is done, but in some instances, undue delays occur.

Mr. Heath (Walsall).—*Tube Works.*—At my largest tube works, a Safety Committee has been in existence for several years, but for some time past it has not been very alive. I think this is partly due to the high standard of safety there is in the works, and the fact that the managing director, who was the life and soul of it, has not now so much time to give to this Committee. The company has, however, promised to try and infuse new life into it; also they will try and arrange a visit to the Museum during 1930. At another large tube works (650 employed), which has grown of late years, the son of the managing director takes charge of the safety measures. Safety posters have been affixed and he investigates all accidents, but there is no Safety Committee. He has, however, promised to have something of this nature brought into being. At another tube works, where about 250 are employed, the manager personally investigates every accident. He also has special safety posters affixed, and although the work is of a fairly dangerous nature, the accident rate in 1928 was only 2 per cent. and in 1929 about the same (none being caused by machinery). There are several other tube works, but with one exception they are comparatively small and accidents are not frequent. The occupiers themselves usually give personal safety supervision. The exception is a large new tube works at which safety work has not yet got into its stride.

In the Barrow and Workington area, Mr. Dymock reports that the past year has been one of great encouragement, and that Safety Committees are functioning admirably in all the industries concerned. Monthly meetings are held when all reportable accidents are discussed and suggestions for their avoidance considered. At one works, workmen are encouraged to make safety suggestions through their Trade Union representative, who is admitted to the Committee when he has points for discussion.

In Scotland, Safety Committees have been established at all blast furnaces and all iron and steel rolling mills and tube works. The Committees usually meet once a month, and as in other cases their duties are to discuss the nature and cause of all accidents and the remedies to be applied, and to consider suggestions as to dangerous practices and conditions, or as to improved methods of working. Mr. Brown (Superintending Inspector) also supplies figures as to the results obtained in some of the works. For the

most part they show a reduction in the frequency rate, but as these records have only been kept for a very limited period, it is hardly possible to draw definite conclusions.

Engineering and Foundries.—It is more difficult to give a true picture of precisely what has been accomplished in this branch of industry, first because it is so widespread, and secondly, because the conditions differ so much on account of the great variety of articles produced. It is in this branch though that the greatest number of defaulters is found. At the same time the following extracts from the reports indicate that a great advance has been made in all parts of the country, and some examples are given of the results obtained :—

Mr. Shaxby (Woolwich).—In this district, there are 15 works under the Draft Order, and in every one of them the attitude to the question of safety is distinctly one of sympathy. Firms and their managers have been induced to translate this sympathy into action by the propaganda of the Employers' Federation, and by encouragement from the staff. At the present time, five of the 15 works have a Works Committee and four have Safety Supervisors. Two of these Committees, one with a Supervisor, were formed during the past year. Where a Committee or Supervisor has not been appointed, the managers, superintendents, etc., have undertaken the duty of looking after the safety of their workers because they consider they can perform the work better.

Mr. Stevenson Taylor (Southern Division).—The Draft Order has resulted in the appointment of either a Safety Committee or Safety Engineer in all the factories in the West London district which would come within its scope. Unfortunately, only in one works have any workers been appointed on the Safety Committee, in this case, five of the men are chosen periodically by the management on the basis of experience and reliability.

In five works the committees are composed of the works manager, heads of departments, and foremen. The workers are not apparently represented, although the workers are generally invited to submit suggestions for the consideration of the Committee. At one works, a Safety Engineer has been appointed in addition to the Committee, and in two works, Safety Engineers only have been appointed.

The Safety Committees established in the Government and other engineering works in the Southampton area have continued to function well, but the report from North London is not satisfactory.

Miss Dunch.—Not more than four firms would be under this Order. At every visit the management has been interviewed and urged to form a safety organisation, but so far without much result. Safety Committees are not established at any of the four factories, but investigations of all accidents, with written reports thereon, are made at a Government factory, and the general supervision is good at two other works.

The activities of the local branch of the Engineering Employers' Federation have brought about great changes in Coventry, now a very important engineering centre, and the developments recorded below are of special interest :—

Mr. Turner (Coventry).—At the end of 1928 the local Engineering Employers' Federation, representing the bulk of the important engineering firms in the district, outlined a scheme for their members to enable them to comply with the requirements of the Draft Order. Under the scheme, which began to function fully in the spring of 1929, 21 firms are represented and 22 Safety Officers have been appointed to carry out the scheme in 41 factories. In two instances these are whole-time officers, and carry out the safety work in five factories ; in the others the Safety Officer is usually either the plant engineer or a member of his staff. As is to be expected, the manner in which

the scheme is carried out varies with the factory, but on the whole, it seems to work satisfactorily, though probably its full benefit will not be noticed for a year or so. It has established safety work in these factories on a clearly organised basis. Posters are displayed in all the works with the Safety Officers' name thereon; and suggestions, complaints and information concerning safety in the works are asked for and welcomed. All accidents are investigated by the Safety Officer, and these are tabulated in the form required by the Association, and the frequency and severity rates calculated. In some cases additional tabulation is made by the officers according to departments and machines. One firm, in its monthly magazine, gives a list of all accidents causing absence during the previous month, with notes as to their cause and future prevention.

An interesting feature of the Coventry scheme is that arrangements are made for quarterly meetings of the Safety Officers, when the quarter's accident returns are produced and discussed, and ideas and information are exchanged.

The following may be taken as fairly typical of the position in Birmingham :—

Miss Taylor.—The Draft Safety in Factories Order would apply to about 18 or 20 places in the Birmingham East District. Of these, 3 are so small and have so few accidents that it has not been thought worth while to create any special organisation for safety. In 11 factories Safety Supervisors are now employed and are settling well into the work. In some cases there are Safety Committees in addition to the Supervisors. In most of the cases the Safety Supervisors are on the staff of the Works Engineer and work under him. I have found that this method works very well as, in the circumstances, the Safety Supervisor and his work have the sympathy and help of the Works Engineer, whereas if the Safety Supervisor works independently of him, he may meet with opposition from the engineering department, who have to carry out the details of his instructions. In one factory there is a Safety Committee, but no Safety Engineer, and in three, no special alteration has been made in the method of dealing with safety. In all three cases the shop foremen are responsible for safety in the same way as they are responsible for other matters in their shops. Safety is not, by any means, neglected in these factories, and the accident rate is reasonably low, but the organisation does not include either a Safety Supervisor or a Safety Committee.

Undoubtedly the appointment of the Safety Supervisors and the creation of the Safety Committees has had a good effect on the accident rate and on the general feeling in the factories with regard to safety, but it is impossible to give definite examples of this result as before the start of the safety organisation no figures were kept or they were kept so badly as to be useless for purposes of comparison.

In Birmingham South, 17 firms have appointed Safety Supervisors.

Following a conference at Walsall in 1928, the Malleable Ironfounders' Association formulated a code of recommendations for all its members. The precautions advocated are said to have been on the whole fairly well observed, but as the works are mostly small, occupiers and managers have generally acted as their own Safety Officers. At one large foundry, not in the Association, informal safety meetings have been held and somewhat different rules drawn up for that factory; these also are said to have been fairly well observed.

In the Eastern Division there are 56 works coming within the draft Order and 52 have established Safety Committees. Two engineering works and two foundries have not as yet done anything.

Safety Committees are functioning well in the large Lincolnshire works, and the Lincoln and Gainsborough Branch of the

Engineering Employers' Federation have been using their influence to get Safety Committees going in that area.

In Leicester and Northampton, Committees have been formed in all the works concerned, but in Luton there are still one or two works where little has been done.

In Rotherham, efficient Safety Committees are now operating in the eight works coming within the draft Order, in Derby nearly all such firms have now started similar organisations, while in Huddersfield, of four firms coming within the Order, Safety Committees have been established in three. In the fourth, the manager, newly appointed, received instructions from the Directors to form a Safety First Committee, but was anxious to get a grasp of his new duties, and be more conversant with the conditions and personnel of the works before deciding upon the best method of giving effect to those instructions. Miss Dennistoun proceeds :—

> It now appears that after full consideration he has formed the opinion that such a Committee would be contrary to the spirit of the works where Committees are very much suspect and an almost "Fordian" idea of informality reigns. He compares the conditions prevailing in these works very favourably with others of which he has intimate knowledge where such Committees function. The grounds on which he criticises them are (in his own words) as follows :—
>
> (1) They have a bad psychological effect in making people's minds run on accidents and tend to induce nervousness.
>
> (2) Valuable time is lost attending them.
>
> (3) Many of the suggestions put forward are futile.
>
> He claims that the existing organisation of the works which makes each foreman responsible for his own department in all such matters and the keen interest of the management are more effective in securing the best conditions of safety or welfare than a Committee would be.

These views are interesting but are not borne out by the general experience of the working of such Committees.

In Manchester, engineering firms have taken the matter up, and the results are said to be satisfactory. There was a proposal to form a Regional Safety First Committee in Manchester, but this was dropped in favour of a Committee under the National Safety First Association. A meeting was held at the offices of the Manchester Chamber of Commerce, presided over by Mr. Mather (of Messrs. Mather and Platt), and addressed, among others, by Colonel Pickard, and a Committee was formed.

It would appear though that by no means all the firms interested in Safety First, and who have Safety Committees have joined the Association, as they seem to prefer working on their own lines. These vary from those where the "Committee" consists of manager and foreman to those where managers, foremen and operatives are well represented.

Information is given with regard to one or two works, which indicates satisfactory results. Mr. Hird (Manchester East) mentions a firm with 1,000 workmen who tell him that the lost time accidents have been cut down by 70 per cent. for the period in which the Committee has been in operation, and that they had one spell of seven weeks without a single accident, an experience unknown before in their history.

In another instance, lost time accidents fell from 225 in 1928 to 120 in 1929. Mr. Taylor (Manchester West) mentions a factory where the scheme has provided a marked effect on the condition of the fencing, while at another, employing 400 to 500 workmen, the number of hours lost through accident, both reportable and non-reportable, represented a percentage of only 0·17 of the total hours worked.

Similar progress is reported from the Liverpool area.

In Scotland, there are 103 works coming within the Draft Order and in 94, Safety Committees have been established. There are nine foundries in which there are no such Committees, but in two, Committees are in process of formation. As regards the remaining seven, steps are being taken to get them to fall into line with the rest of the industry.

In the Railway Engineering Works no *ad hoc* Safety Committees have been established though in all there is, in pursuance of agreements with the Trade Union, a system of Works and Shop Committees, within whose competence it is to consider safety questions. For the most part accident prevention work is entrusted to an assistant works manager or other appointed officer, to whom all accidents are reported on a special form, and who investigates those in which he considers enquiry to be necessary. Records of accidents are kept either at the works, or at the head office of the Company. In addition, a booklet entitled " Safety Precautions for Railway Shopmen " is issued to every person employed.

It is understood that the question of safety organisation in these works has been dealt with by a Sub-Committee of the Railway Companies' Association, and that further matters in this connexion are still under consideration.

Shipbuilding.—The position in this industry is very similar to that in other industries covered by the draft Order. In the great majority of yards Safety Committees have been established. The following quotation from the report of Mr. H. R. Rogers may be regarded as summarising the position of the North East Coast :—

> The Shipbuilding Employers' Federation issued circular letters, containing recommendations, to its constituent Associations. These Associations called meetings of their members and drew up schemes which should be adopted throughout their areas and should secure uniformity of practice on the lines indicated by the National Federation. It is now possible to report that at every shipyard on the River Tyne which is in use, and at every one of the shipyards on the River Wear which is connected with the local Associations, there is now a Safety First Committee. Some of these Committees have been in existence since October, 1928, and two since 1918.
>
> The constitution of these Committees varies slightly, but consists generally of the manager, departmental managers, departmental foremen and secretary.
>
> The departmental foremen represent all sections, including the metal-working shops, the wood-working shops, the shipyard men and the outside men.
>
> In some cases it is customary to include in the membership of the Safety Committee representatives of the technical departments, *e.g.*, the electrical engineer, and, in a few instances, the workmen's representatives have seats on the Committee but this is not usual.

These Committees meet, as a rule, on a definite day in each month, but it is quite common to find that provision is made for calling special meetings in the event of anything arising which makes such a meeting desirable, *e.g.*, a serious accident.

A few of the Committees meet less frequently than once a month, but provision for calling special meetings exists in all these cases.

The lines on which these Committees work are mainly as follows :—

(*a*) Tabulation of all accidents as in Section 5 of Draft Order.
(*b*) Discussion and investigation of every reportable accident.
(*c*) Issue of instructions for prevention of similar accidents.
(*d*) Discussion of reports of departmental managers and foremen.
(*e*) Discussions of safety suggestions from workmen.
(*f*) Consideration of guards required for new machinery.
(*g*) Approval of safety first notices and instructions for affixing in the works.

Works Safety Committees, constituted and working on the lines indicated above, exist also in the works and yards of all the ship-repairers in the area, except in those very small yards in which few men are employed.

At three of the ship-building and repairing works, there are Safety Officers in addition to the " competent persons " appointed under Regulation 10 of the Shipbuilding Regulations.

In addition to the supervision and instruction given to apprentices by the departmental foremen who are members of the Works Safety Committees, such young persons are also put in charge of an apprentice-master at some of the yards, and are provided with simple codes of instructions at other yards.

As regards Scotland, Committees have been established in all the 41 yards on the Clyde, but the following remarks by Mr. Lauder (Glasgow) certainly suggest that their work is not very thorough in some cases :—

Although some attention is paid to the more serious accidents by the Committees, I do not think that in some of the shipbuilding yards sufficient attention is being paid to accidents in general, as one finds when inquiries are being made regarding accidents that there is still difficulty in obtaining full details of all the circumstances and conditions existing when the accident occurred. In an industry where so many accidents occur every year, I feel sure that an intensive campaign by all Safety Committees, if directed to all accidents occurring in the shipyard, and especially to those occurring at or on ships in construction or repair, would be of enormous benefit in reducing the number of preventable accidents occurring, and particularly those due to falls of persons and materials.

Committees are in operation at the yards in Barrow and on the Mersey, and appear to be working well. Similar reports have been received from South Wales, and Mr. Edwards (Cardiff) sends particulars of improvements effected by the Committees, which include such items as the following :—Provision of rope nets for stages on rudder work ; improvements of lighting arrangements on shore and on board ships ; provision of extra guards on machinery ; annealing and testing of lifting gear ; removal of obstructions in yards and workshops ; posting up of ' Safety First ' notices ; renewal of a main dock ladder and of staging and wire ropes ; protection of holes in platforms and tank tops ; provision of rope guards for truck staging ; earthing system of electric light altered to prevent shock ; systematic tours of works by Safety Committee and encouragement of workmen to offer suggestions.

The constitution of the various Safety Organisations in these several industries varies considerably, but the most common form seems still to be a Committee representative only of the

management and foremen, without any direct representation of the workers, and in some cases the whole duty rests upon a Safety Engineer who may or may not be a whole time officer. Unfortunately the fear still seems to exist, despite the many examples that can be quoted to the contrary, that the inclusion of representatives of the workers on these Committees may result in their interference with management.

Docks.—Progress in Safety First organisation in docks has varied a good deal in different ports. In some, very good work has been accomplished. In London, the only organisation comprises the three Committees of the Port of London Authority, but other Associations are understood to have the question under consideration. The port in which perhaps the best work has been accomplished is Liverpool, and the following account of their activities has been furnished by Mr. Peacock (Liverpool South) :—

> The Port of Liverpool Employers' Association, in conjunction with the Dockers' Union, organised a scheme of Safety First Committees over a year ago, which is now working satisfactorily. There is a Central Committee, consisting of four representatives of the employers and four Trades Union officials. The Port is divided into six areas, each of which has a separate Committee, comprising two representatives from the employers and two dock labourers, the latter are elected by the dockers and their wages are paid whilst attending meetings. Each Area Committee is served by a clerk from the offices of the Employers' Association, who is furnished with a list of accidents which have occurred, and these are discussed at the monthly meetings of the Committees, and any other matter relating to safety may be introduced by the individual members. All recommendations made by the Area Committees are referred to the Central Committee, and if approved, a circular letter is sent out to the various shipowners, master stevedores, master porters, and to the Mersey Docks and Harbour Board.
>
> The Area Committees meet in the various Clearing Houses for dock labour.
>
> The Committee have joined the National Safety First Association, and many useful illustrated placards specially designed for docks are now affixed on the walls of the sheds throughout the whole of the docks in the port, in addition to large posters warning workers against the dangers of anthrax, and stressing the necessity for the immediate examination and treatment of any pimple, boil or similar affection.

The reports from Manchester are also very favourable. An active Committee has been set up and meets regularly once a month, or at more frequent intervals if urgent questions arise; they enquire into the accidents that have occurred and make recommendations as to the steps to be taken to avoid similar accidents in future.

Good work is also reported from the South Wales ports :—

> Mr. J. L. Edwards.—The Committees at Cardiff and Barry have taken active steps and meet regularly. Over 140 accidents were enquired into by these Committees, and additional safety measures were taken in many cases as a result. Mr. Edwards mentions the following among other recommendations of the Committees which have been carried out :—
>
> Luffing and driving controls on cranes reversed.
>
> Windows on some cranes enlarged to provide a better look-out for the crane drivers.
>
> Wooden ladders provided for men bunkering steam cranes.
>
> Suggestions for improved lighting carried out, and the importance of adequate lighting in ships' holds emphasised. Lighting of the timber yards improved.

Investigation of method of forming slings for pit props.

First aid importance emphasised.

The representatives of the workers addressed a meeting of the transport men at the docks and explained the work and scope of the Committee, giving details of the points raised at the meetings. It was also impressed upon the men that accidents can be materially reduced by the men taking all precautions possible.

At Newport it was found necessary to have two Committees, one for general cargo and docks plant work and the other for coal shipping. Both Committees are now working and enquiring into accidents as well as taking steps to improve plant and methods of working to secure greater safety.

Progress has been slow in the Swansea District in spite of frequent reminders and explanations by the Superintending and the District Inspectors. This was due to a certain lack of interest, and to differences of opinion between the employers' and workers' representatives as to procedure. These differences have now been composed except that the Coal Trimmers' section of the Union refuses to join the Committee.

Mr. Younger reports.—A meeting was held in October at which it was decided to circularise the employers of labour concerned, asking for their co-operation, especially by supplying particulars of accidents occurring to their men. This was done, and notices as to the Committee, showing its composition and functions and asking for the co-operation of all concerned, were affixed about the docks. The Secretary informs me that he is arranging for the first routine meeting to be held almost immediately.

At Port Talbot there has been a recent change in the management of the docks. The new manager informs me that he has now had the Committee constituted, including all sections except the Coal Trimmers, who, as at Swansea, cannot be prevailed upon to come in. He has arranged for the first meeting to be held this month. The number of accidents in Port Talbot Docks being few, quarterly meetings are proposed.

In Scotland the most efficient Committees are those established at Dundee and Ardrossan.

Mr. Young (Dundee).—A Safety First Committee was formed in connection with the Dundee Harbour in July, 1928. The Committee meets in the Board Room of the Harbour Offices on the first Tuesday of each month. A shipbroker, is chairman, and in the Committee there is a representative of the Harbour Trustees, one from the Dundee, Perth and London Shipping Co., Ltd., one from the Coast Lines, Ltd., the Secretary of the Dock Workers' Union, two dock labourers, two stevedores and a clerk in the Harbour Office is the secretary. The Harbour Trustees subscribe to the National Safety First Association, and suitable Safety First placards are exhibited over the docks, and renewed every month. All accidents which happen at the docks are reported to the Secretary of the Dock Workers' Union, and are discussed at the monthly meetings. Dangerous practices and methods of working which have been noted by members of the Committee or are reported to the Secretary of the Union or any of their representatives are brought forward and discussed, and if a resolution regarding them is carried the Secretary of the Committee notifies the party concerned, and asks that steps be taken to remove the danger. First aid dressing stations are distributed over the docks, and I am informed that owing to persistent propaganda, there is a marked increase of first aid treatment. The representative of the Coast Lines, Ltd., reports that there has been no case of sepsis among the men working with them since the inauguration of the Safety Committee.

In some of the smaller ports, while no *ad hoc* Committees have been set up, safety work is undertaken by Joint Port Working Committees or other local Joint Committees.

On the other hand there are still a number of important ports, e.g., Bristol, Southampton, Glasgow, Leith, where little or nothing has as yet been done. This is due in the majority of cases to differences between the two sides as to procedure, or to temporarily interrupted joint relations. The inspectors are doing what they can to straighten out these difficulties and it may be anticipated that these ports will in the near future come into line.

Little is said in the reports as to results upon the accident rates, but in an industry like this, results are difficult to measure and it may be some years before anything very definite will show itself.

There is less to be reported this year regarding developments in industries outside the scope of the draft Safety in Factories Order, but the reports from all the Divisions show that progress has been made. In particular several inspectors refer to the fact that a number of engineering firms, which would fall outside the draft Order because less than 500 persons are employed, have nevertheless set up safety organisations in their works. They have no doubt been influenced by the recommendations made by the Engineering Employers' Federation to the larger firms, and have adopted a similar form of organisation.

An attempt has been made to collect complete information as to the total number of Committees now functioning in works outside the Draft Order and the following figures have been forwarded from the different Divisions :—

Division.	Number of Firms outside the scope of the Draft Safety in Factories Order with Safety Committees or other Safety Organisations.
South Eastern	16
Southern	25
Western	54
Midland	33
Eastern	9
North Midland	8
North Eastern	34
East Lancashire	18
North Western	25
Scotland	23
Total	245

They have been established in a great variety of industries, and the following report by Mr. Cook may be quoted as showing the gradual growth of safety work in a large explosives works in Scotland :—

> During the past year a large explosives works which employs 2,000 workers, has experimented with what is known as a Works Council, composed of 28 members, half of which is selected by the management and the other

half elected by the workers, such election to be an annual one. In addition, a Labour Officer has been appointed, who acts as Secretary to the Council, and is also responsible for welfare matters. He also supervises the accident lists, and brings to the notice of the management any such which he considers requires special attention or explanation. The Council, although appointed for the purpose of dealing with all subjects of interest in connection with the works—the one exception being wages—was not primarily intended to be a Safety First Committee, but after being in existence for almost a year, it has found itself really carrying out the duties of such. All accidents are reported on a special accident notice by the foreman of the department in which it has occurred, and one is sent to the assistant works manager, and a copy to the Labour Officer. It contains a special paragraph which asks "what steps have been taken to prevent recurrence of the accident." These accident notices are then laid before the Council at their monthly meeting, and, where necessary, the matters are fully discussed and recommendations made. The Works Manager presides at all these meetings, and he recently expressed his intention in the near future of relieving this Works Council—which is rather unwieldy and overworked—of the duties connected with the carrying out of safety first principles, by creating a small sub-committee to deal with them in the first instance, and to report results to the parent body. Steps are to be taken at an early date to carry this into effect, and I have no doubt when once in operation it will be carried out with the same enthusiasm as has characterised the past efforts of the Works Council.

Mr. Mitchell (Aberdeen) refers to the steps taken by a firm of boxmakers to interest their workers in the avoidance of accidents :—

Each week on which no accident occurs a sum of money is placed by the firm to the credit of a fund for the benefit of persons employed, and a notice to this effect is posted weekly at the factories entrance. Should an accident occur, no contribution is made to the above fund that week and the name of the person who has sustained the accident is posted up at the entrance to the factory. This has had an amazing effect, particularly in reducing minor accidents, and has made employees more careful in the maintenance of guards at circular saws. The fund is used as a holiday and benevolent fund, help being extended therefrom to workers in straitened circumstances, such as assistance in cases of illness in the homes, or the provision of coal in severe weather to the widowed mother of a young person employed. Dowries are also apportioned from the fund to girls getting married.

Out of a number of instances of the successful working of these Committees mention may be made of one referred to by Mr. Bennett (Leeds). The firm have had a Committee in operation since 1916. In that year the frequency accident rate was 19·0 and the severity rate 4·7 ; during the past year they were respectively 4·3 and ·48, and for the past five years the accident rate has averaged only 25 per cent. of that in 1916.

Very little has been done as yet in the way of safety work in the textile trades. This is no doubt due to the fact that the accident rate in this branch of industry is low and the call for special organisation consequently less pressing. The following remarks by Miss Ahrons gives some account of the position in Yorkshire :—

There is nothing fresh to report with regard to the development of Safety First Organisations in textile factories. Although one of the best of these organisations that I know exists in a worsted spinning mill in the Rotherham district, and still maintains its full activity, it is a "rara avis" indeed, and there are only one or two other textile factories in which anything approaching organised measures of "Safety First" are taken. The trade depression is so great that it is difficult to interest the occupiers, and, through them, the managers and overlookers in anything which will not produce direct financial benefit. A number of textile firms have affixed posters in the factories which are changed at regular intervals, but this by itself is lamentably inadequate,

if the management is not really interested. The best Safety First Organisations I have found are in the dye works. One large company has an excellent system throughout all its branches, the efficacy of which differs in the respective factories in accordance with the amount of interest taken by the management. Headquarters issue annually posters to be affixed in the different branches giving an analysis of the accidents for the year. The one for the 12 months ending 30th June, 1929, tabulates a total of 298 accidents, consisting of 126 bruises and cuts, 51 sprains, 38 burns and scalds, 21 septic conditions, 17 chrome cases, 1 skin affection, 1 rupture, 33 fingers trapped and 10 from other causes. Only 37 (12·4 per cent.) of these accidents are said to be due to machinery, and the average period of absence from work is stated as 4·65 weeks as compared with 4·90 in the previous year.

Lectures on Safety.—A new development in the work of the Inspectors of Factories, in connection with safety, has been the giving of lectures illustrated by lantern slides on methods of safeguarding machinery. This development dates from a Conference held at the Museum, with the officials of the Association of Technical Institutions, of which Dr. H. Schofield, Principal of Loughborough Technical College, was the Hon. Secretary. It was felt at this Conference that it was most desirable that in particular the larger Technical Colleges, which are responsible for training young persons about to enter all forms of industry, should themselves introduce into some part of their curriculum a certain amount of education on the above subjects. Accordingly, it was arranged that the Superintending Inspectors should put themselves into touch with the Principals of Technical Colleges and similar Institutions all over the country, and for lectures to be given at these schools. In addition, the Senior Engineering Inspector has also given lectures on the same subjects at Technical Colleges, Engineering Societies, Insurance Institutes and the British Medical Association. Over 100 lectures have been given and the attention of approximately 16,000 persons drawn to the important subject of "Safety in Industry."

In addition to the Students at the Colleges, invitations were often sent to prominent men, employers and workers, in the industries in the locality. The lectures provoked a great deal of discussion, and letters of warm appreciation have been received, and requests made that the lecture should be repeated.

Sets of slides, covering a general survey of the exhibits at the Museum, and Health and Welfare, have been prepared and have been used for the lectures. Other sets, dealing with Lighting, Mechanical Ventilation, Non-Machinery Accidents, Building and Woodworking Machinery, are in course of preparation.

In addition to these, a number of lectures have been given, by invitation, at different individual works. Thus, Mr. Stevenson Taylor gave two lectures to heads of departments, foremen and workers at Messrs. Kodak's factory at Wealdstone. One progressive firm in Birmingham holds a country week-end for its staff and workers every summer, when, in addition to social events, lectures and discussions are arranged. This year Mr. Lotinga addressed the gathering on Safety First. Mr. Dymock (Barrow), on the invitation of the United Steel Co., Workington, delivered

an address to their Works Committee. Mr. Lauder (Glasgow) was invited by the Managers' Association of the Calico Printers' Association to address them on the subject of Industrial Safety and Welfare. Mr. Hird (Manchester) read a paper to a meeting of the North Western Section of the Junior Association of Engineers.

The demand for lectures of this kind and the interest they have aroused are certainly hopeful signs of an increased general interest in the subject of accident prevention.

Industrial Safety Congress.—Another Safety Congress took place this year at Sheffield. This Congress differed from those previously held in that it was organised entirely by representatives of industry in that area without any assistance from official sources. It was a conspicuous success, and was well attended by delegates from works in all parts of the country. The delegates were welcomed by the Lord Mayor of Sheffield, and the proceedings were opened by an address from Mr. Alfred Short, M.P., the Parliamentary Under-Secretary of State at the Home Office. The Chief Inspector, at the invitation of the National Safety First Association, presided, and papers were read on—

(*a*) " Trades Unions and Accident Prevention."
Mr. J. L. Smythe,
Social Insurance Secretary of the Trades Union Congress.

(*b*) " Safety Work in Factories. Co-operation the Keynote of Success."
Mr. L. C. Sellars,
Messrs. Tangye's Ltd., Birmingham.

(*c*) " Organisation and Value of a Local Area Committee."
Mr. F. Woodifield,
Parkgate Iron and Steel Co., Ltd.,
Rotherham.

Trade Conferences : Cotton Spinning and Weaving.—Attention was directed last year to the provision in the Agreements reached with this industry for the setting up of Joint Standing Committees, to review the Agreements in the light of experience from time to time. These Committees have been duly functioning, and the following account is given by Mr. May (Superintending Inspector) of their work :—

Spinning Section.—Three meetings of the Committee were held on April 18th, October 16th and October 31st, respectively.

At the April meeting a number of stang locks and mule driving strap guards, submitted for the Committee's consideration, were approved. The Committee also approved a minimum specification for mule strap guards of the board or trough type, and a minimum specification for guards of the " bar " type for straps 7 ft. 6 in. or more above the floor. The specification for straps below 7 ft. 6 in. from the floor was left over for further consideration, and the employers, at the meeting on October 31st, agreed to experiment in a mill fitted with such drives, which the Committee, or some of them, could visit and report to a special meeting of the Committee. So far, this matter has not been finally disposed of.

At the meeting on October 16th, it was found that the accident statistics for the first half of the year showed no material variation from previous returns, and it was, therefore, agreed that no discussion of the figures in detail was necessary.

Considerable discussion followed on the failure of a large number of firms to conform to the First Aid Rules, and the employers agreed that the question should be taken up afresh with their members.

I took the opportunity of referring to the mule carriage and roller beam accidents which strict enforcement of the signalling system would have prevented, and both employers and operatives promised to draw the special attention of their members to the matter.

At the special meeting on the 31st October, the proposed instructions referring to First Aid were discussed, and a safety device designed to prevent accidents between the carriage and roller beam of self-acting mules was considered. The Committee resolved not to recommend its adoption.

It was agreed that the approval of stang locks should be entrusted to a sub-committee, but that the general body should continue to deal with the consideration of guards for mule driving straps.

Weaving Section.—Two meetings of this Committee were held, one on April 11th, and the other on October 14th.

The general and First Aid notices of instruction to persons employed were approved. The form of report on the examination of tape sizing cylinders has also been approved.

A prolonged discussion on shuttle kissing took place at the first meeting. It was found impossible to reach agreement on this question.

The rules with regard to First Aid were considered, and the employers consented to circularise their members on the necessity for compliance.

A sub-committee was entrusted with the duty of considering and approving guards for the card bars of plaiting machines, several of which have been accepted.

Progress in carrying out the terms of the Agreements has been disappointingly slow, but regard must be had to the deplorable conditions of trade in this industry, which have rendered any considerable expenditure largely impossible.

Building Construction: Cranes.—The Conferences reported last year have been continued, and a large measure of agreement has been reached. It is proposed that these agreements shall be embodied in a new code of Regulations applicable to the building industry.

Paper Mills.—In 1928 an analysis was made of the 1,595 accidents reported during the previous year from paper mills. The results of this analysis were considered at a Conference held at the Home Office in April, 1929, of representative employers and workers concerned in paper manufacture. Both sides considered that the subject demanded attention, and it was agreed that the Joint Industrial Council for the Trade should be called together with a view to the appointment of a Committee to deal with the whole question of safety. Subsequently, the Council appointed a Joint Committee which is now carefully discussing the problem.

Flour Milling.—The Joint Sub-Committee appointed to review from time to time the accidents reported in this industry has not met as yet. An analysis of the year's accidents has, however, been made, and arrangements are in hand for a meeting of the Committee to review them.

Safety Rules for Chemical Works.—The Department has also been in close touch on the question of safety with the Association of British Chemical Manufacturers. This Association are doing admirable work in this connection. They have issued to their members, Model Safety Rules for use in chemical works, as well as leaflets and memoranda on safe working of particular processes and plant. These are proving most valuable and as an example, at a chemical works in the Midlands, one of the directors stated that he thought the Safety Circulars were so valuable that he now obtains six copies of each, for circulation to the different heads of departments and the technical staff. In regard to one relating to carbon bisulphide, he said that it explained a cause of danger (the presence of pyrophoric iron sulphide) which had been a mystery to the firm. They immediately took steps to remove the danger and felt that a disaster had been averted.

Cotton Machinery Accidents.—The table below gives the total accidents on carding engines, speed frames, mules and looms for 1927, 1928 and 1929, and gives the number of accidents arising from parts with which the fencing agreements might be concerned :—

Machine.	1929.		1928.		1927.	
	Total.	Number which might be affected by Agreement.	Total.	Number which might be affected by Agreement.	Total.	Number which might be affected by Agreement.
Carding engines and speed frames	517	187	464	177	545	209
Mules..	510	236	602	302	640	322
Looms	586	233	564	219	666	293
Totals	1,613	656	1,630	698	1,851	824

While each successive year has shown a reduction in numbers, it should be emphasised that a total of 656 accidents (1929) on cards, speeds, mules and looms throughout the cotton trade is small having regard to the number of machines at work. To draw any inference from so small a figure, particularly without any accurate knowledge of the variation in state of trade from year to year, is out of the question. Strict observance of the Agreement, however, should certainly reduce, if not almost eliminate certain specific accidents, notably those between carriage and roller beam on mules to little piecers engaged in " drying down."

The total number of machinery accidents compares with those for previous years as follows :—

1910	1912	1913	1914	1924
3330	3907	4592	3452	2641
1925	1926	1927	1928	1929
2696	2287	2578	2420	2322

and the number which occurred on certain machines compares with the number in 1913 as follows :—

	1913.	1929.	*Percentage of* 1913.
Openers	150	66	43·0
Cards	492	215	43·7
Draw frames ..	119	47	39·3
Speeds	613	302	49·2
Mules	1,236	510	41·2
Ring frames ..	235	119	50·6
Looms	1,180	586	49·6

Scutcher lap rollers caused 7 accidents. No guards were provided on 6 of these machines and in all of the 6 accidents the weights were down. It is fairly clear that a good guard would have prevented the mishaps. In the seventh accident the injured person in attempting to doff a lap, work of which she had no knowledge, got the slip roller out of place and was pinched between its weight and a calender roller.

The total number of accidents on beaters and cylinders on opening machinery (bale breakers, scutchers, waste breakers) was 19 of which 5 were severe. Only 4 of these occurred on scutchers through access being obtained at a spot which is required by Agreement to be protected by interlocking mechanism. Small though this number is, this type of accident is one of those which strict observance of the Agreement would eliminate. In three of the cases the interlocking mechanism was defective or missing, and in the fourth, which resulted in serious injury to a hand, the injured person himself had removed a screw and so rendered the mechanism inoperative.

No fewer than 10 of the remaining 14 accidents happened because the injured person thought that the beater or cylinder had stopped when it was still in motion under its own momentum. In the majority of cases the man was attempting to clear a " choke " in the machine by reaching through a cage door or similar opening in the machine casing.

There were 18 accidents to persons who were crushed between carriage and roller beam on self-acting mules, of which 1 was fatal and 6 others severe.

Transmission Machinery.—Despite the great attention paid to the question of safeguarding this type of machinery, no decrease can be shown in the number of reported accidents. There were 211 accidents due to shafting as compared with 207 in the previous year, but fatalities have fallen from 35 to 24. Accidents caused by belts, ropes, pulleys and gearing amounted to 1,233, as compared with 1,111 in 1928, and in this class fatalities have increased from 12 to 23. Many of these cases have been attributable to the usual causes—shipping and unshipping belts, approach to overhead shafting for lubricating and even for cleaning purposes, allowing men to carry out such jobs as lime-washing in proximity to revolving shafting, allowing belts to ride loose upon revolving shafting, and so on. A large number of prosecutions have been necessary. It seems impossible to persuade the average person, be he employer or worker, that revolving shafting, even though it be smooth and round, is a source of danger. And yet, despite these adverse figures, it cannot be said that no progress has been made in securing safer conditions. A number of instances are quoted where great improvements have been carried out by individual firms.

Mr. Margetts (Divisional Inspector).—I have recently visited the most important roller flour mills in the London area of the Division, and have given special attention to the precautions recommended by the Factories Committee appointed by the National Joint Industrial Council for the Flour Milling Industry.

The intentions of the Committee have been best realised in the efforts which have been made to safeguard overhead transmission machinery. It is the avowed intention of most mills to protect all overhead mill gearing, wherever it may be, and I think it can be safely predicted that this will be done by discing the pulleys and enclosing the shafting in loose "sleeve" guards. Some owners have already adopted this method for considerable sections of their mills.

Mr. Hardwick (Cambridge).—One large firm of sauce manufacturers in Peterborough has taken steps to obviate any chance of millgearing accidents by completely encasing the overhead shafting in strong split papier maché sleeving. Anyone climbing up to the shafting, say to oil a bearing, could do so with impunity, since the loose rolls would effectively prevent any chance of loose clothing becoming entangled round the revolving shafting. Many hundreds of yards of shafting are so enclosed.

A large firm of flour millers in Cambridge has adopted a stirrup form of belt perch placed near the rim of certain large overhead pulleys as a result of reading the Home Office Safety Pamphlet No. 12 on "Belt Mounting." The result has been that the overhead belts so supported can be quickly coaxed back on to the running pulley by a simple wooden pole, and there is now no necessity for anyone to climb aloft near to the shafting to put on belts by hand. The use of such appliances is being extended.

Mr. Sutherland (Nottingham).—It was found that a number of firms, where shafting had previously been approached in motion, have taken steps to comply with the law in this respect. In some cases firms had found that shafting could be stopped when necessary without seriously interfering with production. Other firms have provided a simple form of belt pole for the shipping of small belts, and are stopping the shafting for any belt which is too fast or too large to be replaced by a pole. A firm of cotton doublers have made substantial progress with sectionalising their plant as mentioned in the last Annual Report. Formerly stopping the shafting brought the major part of the factory to a standstill. This would ruin the work, particularly in the gassing department. They have installed a very large

number of electric motors, many of the machines have now individual drives. In other cases short lengths of shafting are driven by a motor. More than half the factory has now been dealt with in this way.

Mr. John Law (North Midland Division).—It is only exceptionally that overhead shafting is securely fenced, by enclosure in metal, wood or paper tubes, but there are several concerns where all overhead shafting is so encased. Mr. Barnett (Rotherham) instances in particular a worsted spinning mill where all the overhead shafting, 15 to 20 feet above floor-level, is now in tubular fencing. Generally, however, there is a stricter supervision in factories, belts are mounted much more frequently by a pole or other shipper device, or when the shafting is at rest or is slowed down.

Mr. T. Brown (Scotland).—The more general use of electricity has led to the sectionalising of lengths of shafting, so that a particular part can be stopped for the mounting of belts without interfering with operations generally. For example, a firm of linoleum manufacturers who were prosecuted for failing to fence a shaft which could not be stopped without stopping the whole factory, and upon which a man was killed while mounting a belt, have now installed a number of motors.

In a number of works distant oiling points have been arranged so as to do away with the necessity for approaching shafting. In other cases, trap doors giving access to transmission machinery below the floors have been provided with locks, the keys for which are in the charge of a responsible person.

Cardboard tubing is being largely used in fencing the more accessible portions of overhead shafting. One of the largest breweries and an engineering works in Edinburgh has been treated throughout in this manner.

Mr. Stevenson Taylor (Southern Division).—A few firms in the Finsbury district have encased nearly all the overhead shafting in their factories, and other firms have encased all such shafting which is likely to be approached for any purpose whilst in motion.

Mr. Rogers (Western Division).—There has been little, if any, progress as regards belt mounters, but many additional belt perches have been provided, and there has been much tubing of shafting done.

Crane Failures.—Ninety cases of crane and derrick failures were reported, an increase of 15 per cent. on last year's figures. These caused 19 fatal and 61 non-fatal accidents. The number of fatal accidents is the same as in 1928. In 23 instances no personal injuries resulted. A tabular statement is attached showing the classes of cranes and the parts on which failure occurred.

Insufficient examination of cranes is still indicated by the number of cases in which failure has resulted from serious structural defects. In 11 of the cases the cranes had been inspected by an Insurance Company, and six of the cranes were used under the Docks Regulations and were reported to have been examined as required by that Code. But in 32 cases the inspection was made by the crane driver, fitter or engineer, and it is quite possible that in a number of these cases the inspection was not sufficient. In about 40 instances there does not appear to have been any effective examination or inspection at all. One building crane (which had been newly erected) collapsed, owing to the failure of an anchorage which was fastened in old brickwork.

Definite cases of substantial overloading appear in the list; they occurred, however, in circumstances in which no legal action could be taken against the parties responsible.

A new " Load Indicator " has recently come to notice which automatically indicates the weight of the load to be lifted, and warns the craneman when the margin of safety has been reached. The general adoption of such an appliance would do much to reduce the risk of accidents due to overloading.

ANALYSIS OF CRANE FAILURES.

Showing the Class of Crane and the Parts where Failure occurred.

Jibbing Cranes—

Masts—

(*a*) Shoe	1
(*b*) Heel pins	2
(*c*) Head pins	1
(*d*) Joints	1

Jibs—

(*a*) Ties and accessories	1
(*b*) Gearing	1
(*c*) Decayed wood	2
(*d*) Handles	1
(*e*) Head pulleys	1
(*f*) Cleats	1

Overhead Travellers—

(*a*) Overwinding	9
(*b*) Rope anchorages	1
(*c*) Gearing	4
(*d*) Rails and wheel flanges	3
(*e*) Electrical equipment	2
(*f*) Underhung jibs—	
King post or taper pin	1

Dockside Cranes—

(*a*) Balance weight	1
(*b*) Chains	1
(*c*) Overturning	1
(*d*) Brakes	1

Foundry Cranes—

(*a*) Overwinding	1
(*b*) Masts	1

Grabbing Cranes—

(*a*) Overwinding	1

Guys—

(*a*) Bolts	6
(*b*) Glandirons	1
(*c*) Decayed wood	4
(*d*) Insecure anchorage	3

Jibbing Gear—

(*a*) Pawls—lock absent or inefficient	7

Bed Plates—

(*a*) Weak	1

Complete Collapse 3

Steam Loco. Cranes—

(*a*) Jib tie and accessories	2
(*b*) Slewing gear	1
(*c*) Overturning	9
(*d*) Bed plates	1

Portable Cranes—

(*a*) Overturning	2

Pedestal Wharf Cranes—

(*a*) Brakes	2

Ships Jib Cranes—

(*a*) Brakes	1

Ships' Derricks—

(*a*) Shackles	3
(*b*) Overwinding	1
(*c*) Splices	1

Teagles—

(*a*) Overwinding	1

Home Made Cranes—

(*a*) Handles	1
(*b*) Complete collapse	1

Building Trade Accidents.—All reported accidents have again been analysed and the results are shown in the following table :—

CLASSIFICATION OF THE CAUSES OF ACCIDENTS AT BUILDINGS IN COURSE OF CONSTRUCTION OR REPAIR, 1929.

Cause of Accident.	Breakage or Defect of Plant.	Other.	Total.
1. *Falls of Persons :—*			
(*a*) From scaffolding during erection or dismantling	7^{2}	22^{1}	29^{3}
(*b*) From working platforms	103^{17}	132^{17}	235^{34}
(*c*) From gangways or runs	12^{3}	35	47^{3}
(*d*) From ladders	55^{5}	101^{7}	156^{12}
(*e*) From structural steelwork or joists :			
(i) Girders	1	23^{5}	24^{5}
(ii) Joists	1^{1}	18^{2}	19^{3}
(*f*) Down wells :			
(i) Hoist	2^{1}	7	9^{1}
(ii) Stair	1	9^{4}	10^{4}
(iii) Other	3	44	47
(*g*) Through roofing material :			
(i) Asbestos	3	—	3
(ii) Other	5	—	5
(*h*) Other falls from heights	28^{2}	154^{14}	182^{16}
(*j*) Falls on the flat	2	227^{1}	229^{1}
2. *Falls of Articles or Plant :—*			
(*a*) From working platforms	2	48^{2}	50^{2}
(*b*) From suspended slings, buckets, baskets, etc.	5	15	20
(*c*) Other :			
(i) From heights	20^{1}	356^{3}	376^{4}
(ii) On the flat (rolling, canting over, etc.)	1	90^{1}	91^{1}
3. *Cranes and other Lifting Appliances :—*			
(*a*) Power	22^{4}	53^{4}	75^{8}
(*b*) Hand..	20^{2}	3^{0}	52^{2}
4. *Other Machinery :—*			
(*a*) Power	2	35^{1}	37^{1}
(*b*) Hand..	—	2	2
5. *Electricity, Burns, Scalds, Explosions* ..	3	31	34
6. *Stepping or Striking against Objects* ..	1	324^{1}	325^{1}
7. *Handling Articles without Machinery :—*			
(*a*) Carrying or wheeling articles ..	1	55	56
(*b*) Moving or lifting articles	5	518	523
8. *Use of Hand Tools*	9	264^{1}	273^{1}
9. *Transport*	—	23	23
10. *Miscellaneous*	3	135	138
Totals	317^{38}	$2,753^{64}$	$3,070^{102}$

The total number has increased from 2,863 to 3,070, but no special significance is to be attached to this. There can be little doubt that the increased inspection of buildings in course of construction has resulted in better reporting. On the other hand the proportion of accidents due to breakage or defect in plant, though still high, is distinctly lower than last year. Accidents due to falls from scaffolds and working platforms are also again lower, but those due to falls from ladders have increased from 130 to 156, and no less than one-third are attributed to breakage or defect of plant. Among the other causes of accidents the highest number are attributable to falls of articles or material, stepping or striking against objects, and moving or lifting articles. This is an industry in which safety depends largely upon the human element. Many of the accidents would not occur with a little more thought, a little less carelessness, a little less callousness to danger. The reports indicate many cases attributable to these causes which need never have happened, but surely the acme of thoughtlessness and fool-hardiness was reached in a case reported from Liverpool. "The fatality," the inspector says, "occurred to a foreman steel erector who was walking on an 18-inch steel girder at a height of 75 feet above the ground. He was reading a plan, and, not watching his steps, walked off the end of the girder."

Steam Boilers.—A serious explosion, involving two deaths, occurred at a shipbuilding yard at Birkenhead, and was found to be due to the weakening by corrosion of the end of one of the mud drums of the boiler. The external surface of the end was concealed by brick work. At the formal inquiry held by the Board of Trade it was revealed that it had not been thought necessary by the Insurance Company who made the statutory periodical examination of the boiler to have the brick work removed for a period of 25 years, and the Commissioners reflected very seriously on their action in this respect.

As a result inquiries were made as to the practice of other large Insurance Companies, particularly with regard to the periods which may be allowed to elapse between exposures of important parts concealed by brick work. It was found that no Company has any fixed rule in this respect; they have been guided rather by the needs of each particular case. It is their experience that where a boiler is not exposed to the weather or to damp from other sources, there is little danger of corrosion or deterioration of plates covered by brick work, but on the other hand where there is exposure to damp, removal of the brick work at fairly frequent intervals is essential.

In order to arrive at some fixed standard in this matter, a conference has been held, since the end of the year, with representatives of all the Boiler Insurance Companies. Having regard to the varying conditions under which boilers are used, it was recognised that some discretion must be given to the person

making the examination ; at the same time it was agreed that it is reasonable, whatever the conditions, to require brick work to be removed within certain fixed periods. After some discussion the following standard was proposed :—" Brickwork must be removed for the purpose of thorough examination when required by the person making the examination, and in any event not less frequently than once in every six years in the case of a steam boiler situated in the open or when exposed to the weather or to damp, and not less frequently than once in every ten years in the case of a steam boiler which is properly housed and is not exposed to damp."

The great majority of steam boilers used in factories are now insured with one or other of the Insurance Companies, and little trouble, therefore, arises as regards their examination, but occupiers are sometimes neglectful in attaching their reports to the Factory Register, and producing them to the Inspector. Several prosecutions have been necessary in this connection.

Mr. Stevenson Taylor (Southern Division) refers too to several cases where the safety valves have been found to be overloaded by means of additional weights, and the boiler worked at pressures exceeding the maximum permissible working pressure. At a night visit to a West London bakehouse, situated in a basement of shop premises with sleeping accommodation for women shop assistants, the safety valve of the boiler was found jammed by means of a baking tin. Proceedings were taken against the occupier, and a penalty of £5 was imposed.

Explosions.—The danger of explosions from dust is again demonstrated by accidents which occurred during the year, the circumstances of which have been investigated by Mr. McNair (Engineering Inspector). One explosion which occurred in a cotton-seed grinding plant was probably caused by a piece of iron which was afterwards found in the disintegrator. This disintegrator had a relief vent leading to a stive room and the explosion travelled to the stive room which was blown open, the flame injuring a man who was standing close to the door of the room. Stive rooms should not be used for dust collection since the dust deposited in them is always readily blown up into a cloud by any explosion wave which may enter the room.

In a new plant the firm has now provided a choke conveyor worm between the disintegrator and the elevator, and the stive room has been replaced by a bag-filter suitably placed. This is enclosed in sheet metal and will be fitted with a suitable explosion vent. The feed chute to the disintegrator is also fitted with electro-magnets for trapping pieces of iron or steel. All the electrical fittings are being suitably enclosed.

In two other factories explosions occurred during the grinding of linseed meal and cotton-seed cake. Here again, there were no intercepting choke tubes between the disintegrators and the rest of the plants, and no vent tubes were provided.

Another similar explosion occurred in a cork mill. The explosion in the mill spread through the worm conveyor to an elevator, and thence to a cyclone dust collector, one man being seriously burnt by the flame.

Mr. McNair also enquired into explosions connected with the use of acetylene generators and one case may be quoted as showing the danger of allowing a naked light to be used even when apparently every precaution has been taken to prevent the presence of gas.

The generator had been thoroughly cleaned on the day previous to the accident, and all waste carbide removed. It was filled with clean water and the charge-drawer filled with fresh carbide, but no attempt had been made to generate gas. The next morning it was found that the water had frozen and the charge-drawer containing the carbide was removed, while steps were taken to thaw the water by the application of hot irons. Later on one of the workmen, unfortunately, applied a rag soaked in petrol to the drip pipe of the generator and set fire to it; at the same moment another man moved the bell of the generator up and down, evidently with the intention of seeing whether it was free. An explosion immediately occurred which blew the bell upwards and injured this man fatally. The iron cross guide bar was broken at either end and the bell forced partly through the roof of the factory. It was quite clear that the gas which caused the explosion must have been evolved from the carbide over-night by some accidental addition of water, or possibly water vapour which may have passed from the inside of the bell to the carbide chamber. The violence of this explosion illustrates the danger from the explosion of even small quantities of acetylene. It is estimated that in this case only $\frac{1}{5}$ oz. of carbide mixed with water formed sufficient acetylene gas to give an explosive mixture in the bell.

A serious explosion of a somewhat different kind occurred in sheet metal condensers connected with plant used for the sublimation of salicylic acid. In a previous case, which occurred some time ago, it was supposed that the cloud of condensed material in the condenser was ignited either by a spark or by spontaneous ignition of material such as waste blown into the system by the hot air. To meet these risks the occupiers were recommended to cover the intake of each hot air blower by fine wire gauze and to provide suitable relief panels to minimise damage due to any explosion, and also to provide properly enclosed dust-proof electrical fittings.

In this case the explosion took place in the condenser furthest from the inlet, and although the condenser had a large panel of copper gauze, 18 inches square, the explosion was so rapid that although the gauze was undamaged the condenser was wrecked. The firm are inclined to the view that some catalytic action of the copper gauze has been responsible for igniting

phenol, evolved through the sublimation having been carried too far at too high a temperature, and they have removed the gauze. They are also taking steps to ensure that no person shall be allowed in the condenser house whilst the process is going on.

DANGEROUS TRADES.

Celluloid.—This Code is in force in a very large and increasing number of works in a wide variety of trades. In view of the serious fire risks involved, special attention has been paid by the staff to securing the provision and maintenance of the necessary safeguards. Close supervision is particularly required in these trades as changes in processes, causing increased risk, and the opening of new works or departments are frequently taking place. Whilst the firms accustomed to working in celluloid are well aware of its dangers and, as a rule, take adequate precautions, those who are new to this work display a surprising ignorance of the danger and carry on the work in quite unsuitable premises and without adopting safeguards. The Inspectors' reports give many instances of this, and also mention several cases where employers have wilfully run grave risks. Mr. Owner (West London) reports on two small works making celluloid name-plates in which dangerous conditions were found. In one of them he says :—

> Large stocks of celluloid articles lay in boxes on the ground floor, and on the first floor young girls were found manipulating celluloid in close proximity to open gas jets which were in use for heating foot operated presses. The management had been very fully instructed as to the Regulations before the workshop was occupied, and, as they did not give any assurance of compliance but purchased and installed several more dangerous presses, proceedings were taken against them and they were heavily fined.

Very dangerous conditions have been found in some of the numerous works engaged in developing and printing amateurs' photographic films.

> Mr. Crutchlow (Woolwich).—In a factory recently discovered, 50 girls were employed on the four floors of an old building which had only one staircase. All the doors opened inwards. At the first visit paid, there were some 200 films on a bench near the doorway on the first floor, and the only fire appliances available were lengths of garden hose which had to be fitted to a tap. It is not hard to imagine what would have occured if this batch of films had become ignited ; probably few of the workers, who were mostly employed on the upper floors, would have escaped. Pressure was put upon the firm, and they moved to a single storey building.

In another works in this trade eleven women and girls were found employed on the third floor of an old building with only one staircase. Additional exits were provided at once. The main difficulty experienced in administering the Regulations has arisen through so many celluloid-using works being housed in old and unsuitable buildings and it is often very hard to decide when the margin of reasonable safety has been passed. This often depends upon the amount of celluloid used. In several cases pressure has been necessary to enforce removal from

dangerous premises which could not be made safe without rebuilding. This difficulty is specially acute in the Sheffield cutlery trade, much of which is carried on in old and congested buildings. The Inspectors have secured alternative exits in all cases, but many of the buildings are not well suited for work on inflammable material like celluloid. They have also recommended the adoption of periodical Fire Drills which are systematically carried out in some works, but little progress can be reported on this point.

Cinematograph Film Manufacture.—Mr. Macklin (Engineering Inspector) who has closely watched the operation of this Code, reports :—

> The film industry has been somewhat interrupted during the year as the demand for "talking" films has necessitated re-organisation of plant and buildings, more or less extensive, in all works. Consequently much time has been occupied in discussing plans and proposals in this connection. In practically all cases alterations have not been commenced until the plans had been submitted, with a view to obtaining assurance that the ultimate arrangements would comply with the Regulations. The increase of film production in this country has not, as was expected, resulted in any considerable addition to the number of works under the Code, but most existing works have been extended or rebuilt, whilst others, hitherto partly idle, have been employed to greater capacity.
>
> All works under the Code have been visited at least twice during the year, and the Regulations have, on the whole, been well observed. Some difficulty has been experienced in securing that all films not in actual course of manipulation shall be kept in proper receptacles. Workers are mainly to blame, and it is almost impossible to impress upon experienced workers, who handle many thousands of feet of film daily, the necessity for care in this respect.
>
> The installation of automatic water sprinkling systems as means for preventing or extinguishing fire has increased. Such systems are compulsory in all film store-rooms constructed after 1st March, 1928, and this has led occupiers to extend the system to the remainder of the works.
>
> Only one fire occurred in premises to which the Regulations apply, although another occurred in a studio outside the scope of the code. In the former case there were low windows in the cutting room close to a public footpath. The cutter stated that she had left a few small rolls of film, uncovered, upon the bench, and it was possible that a lighted match or cigarette-end had been thrown through the window—no other cause could be traced. The room was burned out, but nobody was injured except that one girl had her hair singed.

Cinematograph Film Stripping.—Satisfactory compliance with the Regulations has now been secured and plans of the premises concerned have been approved. Mr. Macklin observes :—

> There have been only two additional works—and these not of considerable importance—started during the year. During 1928, all the works were very carefully examined and structural alterations were required in order to secure compliance with the code. Consequently, during the past year it has only been necessary to see that the standard thus secured has been maintained. No outstanding incidents have occurred.

Cotton Cloth Factories.—The new Regulations came into force on the 15th May. Under them the dry sheds are brought within substantially the same rules as the humidified sheds. Many of the former have commenced humidifying during the year. In the Keighley district Mr. Scott reports that twelve firms have recently introduced humidifying plants, and similar alterations are also reported from the Burnley district where the new plants mostly consist of fans delivering a mixture of air and steam

through perforated trunks above the looms. Mr. May (East Lancashire Division) reports that satisfactory steps have been taken by the trade to secure compliance, and that the Manufacturers' Association have co-operated in every way and urged their members to make the necessary alterations. The serious condition of trade has, however, tended to delay compliance with requirements involving substantial expenditure.

The important amendment of the old code which reduces the upper limit at which humidification must cease has been generally well observed, very few excesses being noted. The alteration of existing hygrometers and the provision of new instruments is proceeding satisfactorily. Owing to the shortage of supply and the inevitable delay in having instruments tested some latitude has had to be allowed. The new records are reported to be coming in fairly well in most districts. These have shown a few cases of temperature below 50° in the first half-hour of the working day and improved methods of warming are being required in some sheds. In many cases the position of roof air inlets has had to be altered to comply with the new rule which requires them to be 3 feet above the ridges; many of them were in the roof valleys. In some cases, in order to save expense, employers have reversed the fans to make them into exhaust ventilators. The rule as to keeping ventilators in operation during mealtimes, in certain cases, is well observed, but difficulty has been experienced in maintaining ventilation in these cases for the required time after work has ceased for the day. Difficulties have also been experienced in securing cloakrooms in sheds which have recently installed humidifying plant.

Docks.—Though there is little cause for complaint in regard to the majority of British ships or foreign ships which are regular traders to our ports, serious irregularities have been found mostly on ships which are infrequent visitors to British ports, and many prosecutions have been taken. One of the most frequent irregularities is the absence of the certificates of test of gear or records of its periodical examination. The importance of this rule is shown by two fatal accidents in the Woolwich district through the falling of derricks due to the failure of defective shackles. In neither case was there any evidence of test. Both the shipmasters and the stevedores were prosecuted in these cases. Defective means of access to holds has also been very frequently noted, usually through rungs of ladders and cleats being broken, or not being of the required width or depth, and several prosecutions were taken for this offence when the conditions were very dangerous.

Although much greater care is now taken than formerly to protect unused hatches, several accidents occurred through neglect on this point. Three occurred in the Western Division and legal proceedings were taken in all. In one case the accident was partly due to defective lighting of the deck and the foreign shipmaster was also prosecuted for this. Several prosecutions have

been necessary, too, for leaving hatch-beams unsecured, one of which followed an accident due to the unsecured beam falling into the hold.

An important development in regard to safety in dock work has resulted from the adoption at the International Labour Conference held in Geneva in June of a draft Convention setting out measures which should be taken to reduce the risks of those engaged in loading and unloading ships. This Draft Convention follows very closely the Code of Regulations at present in force in this Country, and it is interesting to note how well the British Code stood the test of international criticism. Most of the points of difference between the two codes are of quite minor importance and can readily be met by a slight amendment of the British Regulations, but there remain two or three points which present greater difficulty as seeming to necessitate changes of practice which have long been established in this Country. These are now under consideration by a joint Conference representative of the Employers' and Workers' Organisations and of the Home Office.

A further subject of great international importance discussed at the Conference was the possibility of securing among the various maritime countries the principle of reciprocity in the mutual recognition of the measures taken to secure safety in dock work. Such reciprocity would obviously be a great convenience to shipowners, but before it can be granted there must be practical uniformity in the legal requirements of the Countries concerned. The ratification of this Draft Convention would do much to make reciprocity practicable.

Electric Accumulators.—Difficulties in maintaining a good standard of compliance with this Code have arisen in many works through the processes being carried on in old and unsuitable premises, and through the work being subject to seasonal fluctuations. The following case noted by Miss Johnson (South London) is the worst of several instances of serious irregularity mentioned in the Inspectors' reports :—

> One works resumed full work after a period of slackness when floors got broken, overalls, etc., got lost, cloakrooms were used for storage, and so on. The firm took on a larger staff than ever before and were discovered to be contravening almost every Regulation—and this at a time when one of their men was in hospital with lead poisoning, undoubtedly contracted at his work. Proceedings under Regulations were taken and heavy penalties inflicted.

The conditions in the larger factories are now generally satisfactory. In some cases precautions against poisoning beyond those required by the Regulations are adopted. In one factory, certain classes of workers exposed to lead are periodically transferred to outside work. In another, the medical examination is weekly instead of monthly as required by the Code. In reporting on the latter case Mr. Lotinga (South Birmingham) says :—

> On the slightest symptoms of lead poisoning the worker is transferred to a non-lead, but not generally so highly paid job till the appointed surgeon permits him to return. I think that the knowledge of this helps the workers to remember to take that little extra care that prevents ill-effects.

Grinding of Cutlery and Edge Tools.—The main part of this Code came into operation in 1925, but the operation of five Regulations applicable to grinding on wet grindstones was deferred until January, 1929. In the majority of works the substitution of abrasive wheels for grindstones has obviated the necessity for making the extensive alterations which would have been required by these deferred Regulations. The extent of this substitution is shown in the Inspectors' reports. In Sheffield where there were at least 1,540 grindstones working in 1926, in the latter part of 1929 there were only 654. In Birmingham, only about 30 grindstones are now in use, and in the Walsall district, where 150 stones were used a few years since, only 7 remain. The introduction of a new form of hood for grindstones which has also helped to remove difficulties, is thus described by Mr. Law (Superintending Inspector) :—

> Its principal advantages over the old squatting or squirting board, used to catch the spray from the grindstone, are (1) that by being curved and enclosed at the sides with wings, the spray is deflected downwards into the trough instead of messing the floor and surrounds, and (2) that being provided at its apex with a duct leading to an exhaust fan it removes the dust locally which a cross-ventilation system (Regulation 3) does by a general movement of the air forward from the grinder. It is a good device, deserving of wider adoption. There are some 54 such hoods in position in Sheffield, many, curiously enough, on abrasive wheels.

Grinding of Metals (*Miscellaneous Industries*).—The replacement of grindstones by abrasive wheels is even more marked in this industry, and now extremely few grindstones are used. A good deal of time has been spent by the Inspectors in securing improved systems of ventilation. Old and doubtfully efficient exhaust plants have been replaced by modern installations. In most cases these old plants had been erected by local firms of tinsmiths and others without any specialist knowledge. There is, fortunately, an increasing tendency to consult the Inspector and obtain his advice before installing or altering ventilation plant.

Mr. Macklin (Engineering Inspector) mentions a simple device for improving the exhaust at machines for grinding castings :—

> The dust is not always removed promptly although the exhaust draught appears adequate. This is often due to the fact that the rest upon which the work is held obstructs the draught; a great increase of efficiency results if a few holes are drilled through the rest so as to allow the exhaust draught to operate from below.

Potteries.—The number of reported cases of lead poisoning is again very low, amounting only to 14, with 11 deaths, as compared with 23 and 14 for the two previous years. The number of deaths is abnormal and it is explained by the Senior Medical Inspector in his report (*see* page 76) that the deaths were due to poisoning of long standing, and are not attributable to exposure to lead of recent date. When it is recalled that in 1900, 210 cases of poisoning were reported to the Department it will be realised how successful the Special Rules and Regulations applied to this industry have been in stamping out lead

poisoning. Indeed, in the Potteries to-day the silicosis problem is more urgent than that of lead, and it is noticeable, as pointed out by the Senior Medical Inspector later in the report (*see* page 89), in what a large number of processes in the industry cases of silicosis have occurred. The Regulations, of course, contain provisions to meet the dangers from both sources, but regulations can never have their maximum effect unless there is adequate supervision and full co-operation on the part of the workers in ensuring that they are at all times adequately observed. This point has been stressed on many previous occasions by both Mr. Werner and Mr. Garrett, and it is satisfactory to find that the practice established some time ago by Mr. Garrett, with the co-operation of the National Council for the Pottery Trade, of arranging periodical conferences with the persons appointed in the different works under Regulation 27 to see that the requirements of the Code are duly observed, has been continued. He reports :—

> As in the previous year, the Research Committee of the National Council of the Pottery Industry has arranged two meetings of works inspectors as part of its winter's programme. The first was held at Longton Town Hall on March 20th, when 34 representatives of firms were present. The second meeting was held at Hanley Town Hall on December 9th, and was attended by about 50 representatives of firms. The meetings were presided over by the Chairman of the Research Committee, and several members of this Committee were present. Short informal talks were given by Mr. Werner and myself, and all questions submitted by the works inspectors were answered. At the Longton meeting useful discussions developed on the powers of the works inspectors to deal with workers found to be endangering their health, and on the steps that could be taken by these inspectors to induce workpeople to use the messrooms. At the Hanley meeting the difficulties of the works inspectors situated, as they are, between the employer and the workers, were discussed. At the request of one representative I dealt with the simple (but repeated) mistakes still being found in exhaust draught installations, and gave a few simple rules by which the inspectors could check the efficiency of their plants.
>
> As in former years, the Research Committee has considered a variety of matters which are the close concern of the Department, and in many cases has issued recommendations to the industry on broader lines than our Department could do.

The number of leadless glaze factories is now 118 and the number of low solubility glaze factories is 169. In addition, certificates allowing leadless glaze exemptions have been granted, under the powers conferred by the Regulations, to 19 low solubility glaze factories in which leadless glaze is used for a substantial part of the output.

Samples of glaze are taken systematically from all works to which these exemption certificates have been granted. Last year 259 samples, taken from different works, were submitted to the Government Chemist for analysis. Of these 17 were found to exceed the prescribed limits. In some of the cases the excess was found to be quite trivial and in others due to accident. One case resulted in an important prosecution against a firm holding a leadless glaze certificate. There had been great laxity on the part of the firm, irregularities having been discovered in previous years on two separate occasions. A conviction was obtained and

the magistrates, in recording their decision, added that "the firm should so test the glaze on receipt that they would be able to take civil action against the suppliers of the glaze if necessary." In five other cases (2 leadless and 3 low solubility) the exemption certificates were cancelled on account of the excess of lead discovered. In addition, 9 leadless and 5 low solubility certificates lapsed owing to closure of works and for other similar reasons. New certificates were issued to 4 leadless and 7 low solubility glaze factories.

Lead Paint Act, 1926, and Regulations.—Progress in securing compliance with these new rules has been greatly helped by the action taken by the Employers' and Workmen's Associations to bring their requirements to the notice of their members and by conferences which have taken place between the Inspectors and representatives of the Employers' and Operatives' Associations. Although it has been impossible for the Inspectors to visit many buildings actually being painted, a sufficient number of visits has been paid to give some indication, by sample, of the general degree of compliance. The dangerous process of dry rubbing-down is now dying away, though two or three prosecutions were taken for this offence. Successful proceedings were also taken for neglect to provide washing conveniences and failure to distribute the cautionary leaflet to painters. The periodical distribution of this leaflet has a valuable effect in urging greater care by the workers. Very few complaints have been received. The operation of the Regulations has undoubtedly caused a considerable increase in the use of leadless paints.

SANITATION.

Ventilation. (1) *Chromium Plating.*—This process is extending, not only in the motor car industry, but in other trades, and severe cases of chrome ulceration have occurred. The makers of the plant now usually supply means of exhaust ventilation designed to carry off the spray or fumes before they reach the breathing level, but several cases have been noted where this was not done before the Inspector's visit. Mr. McCullough (North-West London) reports on the elaborate precautions taken in a large factory in his district. These include: (1) exhaust ventilation drawing the fumes away from the surface of the vat; (2) good washing conveniences; (3) overalls, gauntlet-gloves, rubber boots and aprons, goggles and respirators; (4) regular examination of hands and arms of workers on the vats; Alternative work is arranged for those suffering from cuts or sores; (5) a greasy preparation is rubbed into the hands and forearms to prevent contact with chromic acid. Since the end of the year draft Regulations have been prepared to make requirements of this nature generally compulsory.

(2) *Manufacture and Packing of Cleaning Powders.*—Many of these powders contain dangerously high proportions of silica. All the works known to carry on the process have been carefully inspected in order to secure the provision of the enclosed apparatus and exhaust ventilation necessary to prevent the inhalation of dust, which otherwise escapes into the air of the workroom. In most cases the installations are reported complete. In some the work is still in progress. In several works a substitute for silica flour has been adopted, and other manufacturers have ceased carrying on the process rather than adopt the expensive exhaust apparatus which is necessary to render the work safe. In the Woolwich district the two principal firms have arranged that one shall do the packing for both, in order to save the expense of installing duplicate apparatus. There are a few works carrying on the process only to a very small extent intermittently, and the provision of respirators has been accepted in these places.

(3) *Manufacture and Use of Cellulose Solutions.*—These processes have been considerably extended and are now carried on in hundreds of factories and workshops in a wide range of trades. The dangers and appropriate precautions have been fully explained in previous reports and in the Memorandum published by the Department for the guidance of employers. Among the defects noted at the Inspectors' visits have been—unprotected electrical conductors, switches, lamps, etc., inadequate fire escape, open fires and gas lights, defective storage of inflammable material and absence of mechanical ventilation. All these defects have been, or are being, dealt with on the lines set forth in the Departmental Memorandum which has been of the greatest service in showing clearly what precautions should be taken.

Though a number of fires came to the knowledge of the Inspectors, only one caused personal injury, and this was slight. One fire completely destroyed a large cabinet-making works. Mr. Macklin mentions an interesting point in one of these cases :—

> A fire which illustrated the efficacy of locked iron cupboards for temporary storage of the ready-for-use supplies of lacquers necessarily present in spraying rooms, occurred at an important motor-car repair works. The fire spread from an adjoining property and involved the whole of the works, the cellulose spraying rooms being burnt out. Some enclosed cans of lacquer were in a locked iron cupboard but, although the latter became red hot and the heat inside was sufficient to melt some of the solder on the cans, the temperature was not high enough to ignite the lacquer which was quite intact.

Mr. Macklin also refers to a new form of spraying which is increasing :—

> There has been an introduction of portable spraying apparatus into the cellulose spraying industry. These portable outfits are of two classes : (*a*) those in which the necessary air pressure is obtained by hand or foot power, and (*b*) those in which a small electric motor obtaining its current through flexible leads is made up in one unit with the spray pistol. In the use of the former type there is, of course, no inherent ignition risk, but in the case of the electrical sprayers the motors are not flame proof and are obviously dangerous. The importers of the apparatus were accordingly interviewed, and after the danger had been pointed out, the design was altered so that the motor was separated from the pistol, and could thus be placed in another

room, or, at least, far enough away from the spraying zone to be safe. The toxic risk is, however, present with both types. It is, however, not intended that these light portable plants of small capacity should be used for extensive work, but merely for repainting small parts of motor-car wings or panels damaged by accidents. Under these circumstances it would appear that no special ventilating appliances are necessary during the short time such spraying is done, provided, of course, that there are no sources of ignition in the vicinity.

Artificial Silk.—With a view to finding means for overcoming the temporary eye trouble experienced in this industry, two conferences were held with representatives of the different firms concerned. The question was discussed from various aspects, such as causation of the trouble, design of machines, ventilation and humidity of the atmosphere. After the first conference certain tests as to the condition of the atmosphere were carried out, but with only negative results. Nevertheless, the unanimous opinion was formed that a remedy is to be found in efficient ventilation. Consequently much time has been spent in securing improvements in this direction. It was also agreed that a monthly return should be submitted by each firm, giving the number of cases occurring in their works and the total time lost by each worker. During the three months ending January 31st, 1930, 230 cases of conjunctivitis (not necessarily separate individuals) were recorded, involving a loss of 1,555 working hours, or an average of 6·7 hours per case. It was estimated that the total possible number of working hours was 2,355,872, and the total loss of time was therefore one hour in every 1,500 worked.

These returns have served a very useful purpose in confirming the general opinion that efficient ventilation provides a complete remedy for the complaint. They have been useful, too, to the employer by providing an immediate indication of any inefficiency in his ventilating plant.

Complaint has also been made of gastritis, but the returns which have been obtained do not bring to light any evidence that this illness is specially prevalent in the industry.

Dust in Cardrooms.—Means for removing dust from cotton in the earlier stages of manufacture are still under consideration by the Departmental Committee appointed in 1927. Pending the issue of its Report, the work of Inspectors in this connection has been mainly confined to the investigation of complaints.

Nothing calling for special comment has taken place in the methods of ventilating the cardroom itself, but an interesting device is being tried to secure more complete dust removal in the earlier processes. This is an appliance known as the " Shirley cage," which has been designed by a firm of cotton spinners in collaboration with the British Cotton Industries Research Association. It consists of a high-speed cage which can be inserted in opening machines, e.g. bale openers, openers with porcupine cylinders, Buckley openers, etc., after the cotton has been subjected to the action of the beater. Owing to the high speed at which the cage revolves, the cotton is maintained in a

thin and open condition and it is thereby possible to extract through the exposed perforations in the cage a much higher percentage of dust and short fibre than is possible with the ordinary condenser cage. Immediately after the cotton has passed over the " Shirley cage " a fresh supply of clean air is admitted from the atmosphere tangentially to the circumference of the cage. This strips the cotton from the cage surface and conveys it to the next machine. This appliance has been brought to the notice of the Departmental Committee.

Lighting.—The Department have continued to take special light readings in particular industries, as recommended by the Departmental Committee. Interest in this question increases year by year, and a high standard of both natural and artificial light is now the general rule in all new factories. In many of these the greater part of the wall surface is glass, and the artificial lighting is usually of good design, so as to give proper illumination without glare. The importance of preventing glare can hardly be exaggerated, and Miss Keely quotes a typical case. The workroom was adequately provided with powerful lamps, but these were covered with only small reflectors, which left most of the incandescent filament exposed at about eye level. She says " the occupier, who was persuaded to provide much deeper reflectors, was very pleased with the results ; the workers were happier and ceased to suffer from headaches and ' bad temper,' and the output during the winter was reported to have increased by 15 to 20 per cent."

Cases are reported, too, where bad systems of lighting have been the direct cause of accident. One report mentions a factory in which the lighting has been completely remodelled after an accident at a lathe, which was attributed to the workman being affected by glare from an unshaded electric light placed just above his machine. Again, a fatality in the Cardiff district occurred through a man falling down an open hatch on the badly lighted deck of a ship. There was a clear breach of the Docks Regulations and the master of the ship was prosecuted. Two other cases also occurred in the Western Division. In one, a serious accident happened at a badly lighted machine when the operator was taking a handful of material to test the grade. He could not see the nip of the grinding rolls into which his fingers slipped. The other occurred through an unshaded light glaring in the operator's eyes and throwing a deep shadow on the back of a leather cutting machine, thus preventing the worker from seeing a passing boy who put his fingers in the machine.

A complaint was received that persons employed in works where artificial silk is used in the manufacture of lace and hosiery suffered from eye-strain. Full enquiry as to this was made by Mr. Murray (Engineering Inspector), who came to the conclusion that the principal cause of the trouble was the poor system of

lighting which exposed the workers to glare from unshaded lamps. The firms concerned were advised as to the steps which should be taken to remedy this, and after certain experiments had been made, suitably designed reflectors were provided with satisfactory results.

The Department has also collaborated with other bodies concerned with different aspects of lighting, namely, the Illumination Research Committee of the Department of Scientific and Industrial Research, the National Illumination Committee of Great Britain, and the Illuminating Engineering Society.

At the request of the Home Office the first of these Committees has investigated several problems in industrial lighting, including the conditions in grinding hulls and silversmiths' shops, and the methods of securing good illumination for different processes in docks.

Some investigation has also been initiated by a special Sub-Committee of the National Illumination Committee, particularly as to the prevalence of glare in workrooms. A method of estimating glare is being devised, and when this has been completed, arrangements will be made for the actual observations (combined with measurements of illumination) to be taken by some of the Inspectors.

Finally, reference may be made to the results of an investigation recently completed by Mr. H. C. Weston and Mr. S. Adams, Investigators to the Industrial Health Research Board.* These confirm previous work in showing that in very fine processes, benefit can often be secured by the use of special spectacles, designed to relieve the eye-strain due to the necessity of close vision.

A curious result, not unconnected with this subject, was obtained at a large jam factory where the windows of the storage warehouses had been glazed with yellow glass to prevent discolouration of the jam by the action of daylight through ordinary window glass. The warehouses were connected by corridors glazed with ordinary glass, and it was noticed that whereas there were always plenty of flies in the corridors, they never went into the warehouses. The corridors were then glazed with yellow glass and the flies disappeared from there also.

A record of this experience was contributed by Messrs. Pilkington Brothers, Limited, the makers of the glass to "Nature" from which the following extract is quoted :—

> We have heard of other instances where coloured glasses have been used as a deterrent for flies, and we understand that some abattoirs have been glazed with blue glass.
>
> As we were continually being asked for advice on this subject, we decided to carry out some experiments in an endeavour to ascertain whether the house-fly was susceptible to coloured light, and if so, which colour was the best deterrent. We carried out a series of experiments last summer under advice from Prof. R. Newstead, and found that, everything else being equal,

* Further Experiments on the Use of Special Spectacles in very fine Processes, by H. C. Weston, M.Inst.E. and S. Adams, M.Sc. (I.H.R.B. Report No. 57).

the house-fly prefers white light to coloured light, and that red and yellow are the best deterrents. Blue and green are not nearly so effective. The loss in illumination with red glass being too great for general use, it appears that yellow is the best.

Although it cannot be claimed that the use of yellow glass is an absolute preventive, it is a very effective deterrent, and valuable for use in connection with the storage of food.

We do not suggest the use of yellow glass for any building in which people are continually employed, because it has been found that yellow light is bad for the eyes and general health.

We cannot find a record of any work on this subject, and intend to continue our experiments during the coming summer. In the meantime, we wonder whether any readers of " Nature " have noticed this peculiar attitude of the house-fly towards coloured light, and can offer any explanation.

Use of Vita glass in Factories.—This new type of glass has been introduced into a few factories and enquiries have been made by the Inspectors as to the results that have followed, but unfortunately, in most of these works the introduction of the new glass was accompanied by structural improvements, increased lighting area, better ventilation and the like, and the conditions before and after the change were not strictly comparable. No definite conclusions can therefore be drawn.

Noise in Industry.—The information available on effect of noise is very indefinite; and very prolonged, and detailed scientific investigation would probably be necessary to establish any definite results as to its effect o individuals.

Nevertheless, instances have come to the notice of the Staff where noise has been found to have a deleterious effect, and the means adopted for minimising those effects are referred to in the following notes.

Miss Lorrain-Smith (Leicester) who studied this question before joining the Department, has given the matter some attention, and she summarises the result as follows :—

I have, as far as possible during routine visits, paid particular attention to the question of noise in industry. The noisiest processes in the district, are the making of elastic web and braid, lace on circular machines, silk braid and shoe nails. In general, there are no complaints from the workers. They tell me that they never notice the noise after the first week in the factory and they do not find that they are deaf to outside noises.

Members of the staff of certain factories who have definite mental work to do, such as organising, and planning new schemes, writing reports, etc., find that they are unable to think clearly; on the other hand, where noise is not excessive, merely continuous, and even rhythmical, this same class of person find that they cannot think well if the noise suddenly ceases.

As far as I have enquired, I have not found in this district any factories where efforts have been made to minimise the volume of noise. The managers, and others receiving no complaints rarely consider the question.

Among the instances of attempts to minimise noise the following are recorded :—

Certain rooms for a welfare department were erected in the middle of a large works in order to be in a central position. To secure quiet in these rooms some of which are used for ambulance

and rest rooms, the walls have been lined with a special preparation of sea weed, and the result is excellent. A specimen of this method of deadening may be seen, and tested in the Home Office Industrial Museum.

In a large printing works in Buckinghamshire, the walls of the monotype room have been lined with " Celotex," a strawboard type of material said to be made from sugar cane. This was done in order to prevent noise from other parts of the works reaching the monotype operators, but it has also had the effect of preventing echoes, or the reflection of sounds produced in the rooms.

An interesting case of success in dealing with unwanted noise came to light in a bell foundry.

> Mr. Hunt (East London).—The tuning of a bell is exceedingly delicate, and in this particular case, the noise of a fan in an adjacent part of the works, caused a " beat " note with the note of the bell that rendered the operation of tuning even more difficult. The firm, therefore, enclosed the blower in " Cabot Quilting," a sort of mattress made with a Canadian seaweed, which absorbs noise, and arranged the same quilting round the part where the tuning machine was placed. The manager stated that this had eliminated their trouble.

Mr. Plumbe (Central London) also found a case of sound deadening by means of " Acousticos " material :—

> A shop, 114 ft. by 48 ft. by 11 ft. high, was treated with material consisting of an outer layer of American cloth, perforated by circular holes, 3/32 in. diameter, and $\frac{1}{4}$ in. apart, backed up by $\frac{3}{4}$ in. of fibrous packing made up of 60 per cent. Canadian cattle-hair, 40 per cent. asbestos fibre. The shop was used for linotype machines, hand type-setting and matrix making at a large newspaper works, and the noise from 24 linotype machines, and all the subsidiary plant was reduced to a mere pleasant murmur.

EMPLOYMENT.

General.—The standard 47 or 48 hours week still prevails as the basic period in most industries, but overtime may be worked in some for long periods. Thus, in the cycle trade in the Midlands, overtime is common for 2 hours a day on four or even five days a week from February until August. In many other seasonal trades, overtime is still common, though not always extended to the full legal limits.

Miss Forrest again reviews the position in the Fish Curing industry at Yarmouth and Lowestoft :—

> In signing contracts for the autumn fishing, most of the curers agreed that the 12-hour day should not be exceeded, 6 a.m. to 6 p.m. during October, and 7 a.m. to 7 p.m. in November. In some yards this was adhered to throughout the season, and the women declined to do any overtime. In the majority of cases, however, the slack period during October caused some anxiety, and when plenty of fish became available, overtime was worked on the old system of 6 a.m. to 9 p.m. on three nights a week; in some cases overtime was worked on Saturday, which is very exceptional, as the women workers generally stipulate to have that evening free for their shopping. The feeling of the women was most emphatically in favour of doing no overtime if it could possibly be avoided, and their opinions were expressed much more freely, and emphatically, even than last year.
>
> A rather greater number of young persons seemed to be employed this season than last, in several cases I found that the employer, and even the foreman cooper, were genuinely unaware that the girls were under 18. In certain yards the young persons do not turn out until breakfast time in the morning, when overtime has been worked the previous night, thus ensuring the break of 11 hours required by the Employment of Women and Young Persons Act, 1920. In one yard two complete crews of young persons were employed at the beginning of the season, but when an overtime visit was paid later on, it was found that the young persons had been sent home to Scotland, as the conditions had proved too hard for them.

Complaints relating to illegal employment reached the high total of 1,161, but some related to premises entirely outside the scope of the Acts, and others to employment of men. Of those relating to the employment of protected persons, several which involved no irregularity, evidently arose from the complainant's belief that the 8-hour day is now compulsory, or that overtime under the Factory Act is identical with overtime under the Trade Board Act. A very large number of complaints related to illegal employment of young persons, especially in bakehouses, or in factories dealing with articles of food. In routine visits to bakehouses, serious irregularities were also found. Proceedings were taken in a large number of cases, and some substantial penalties inflicted.

These cases afford evidence of the necessity for a continuance of statutory limitation of the hours of women and young persons, if exploitation of this class of labour is to be avoided.

One of the worst cases occurred in a textile factory in Lancashire. It was aggravated by the continuance of the illegal employment after investigation had been made and following interviews with a director, and the secretary of the firm. The hours worked were 5 a.m. to 2 p.m. and 2 p.m. to 11 p.m. on Shifts, including Saturdays. The change over took place in

mid-week, so that women and girls working up to 11 p.m. one night, had to start at 5 a.m. the next morning. One hundred and ninety-one Informations were laid against the firm, and penalties amounting to £461 (including costs) with £105 special costs in addition were imposed.

A complaint relating to employment of a woman at a milk sterilising factory revealed serious illegal employment: one of the women concerned had worked 79 hours during the 7 days preceding the Inspector's visit.

Five-Day Week.—A few additional firms have adopted this system of working as a normal practice, and it continues in those factories where it has once been seriously adopted. It is more often found in cases where workers have to travel long distances to their work, than where they live around the factory. Sometimes it is necessary to revert temporarily to Saturday work owing to pressure of orders.

Mr. Stevenson Taylor quotes some of the reasons given for adopting the five-day week, and the views of employers and workers are of interest :—

> At a large engineering works in the Finsbury district, an attempt was made to introduce the system some time ago, but the men objected on the ground that it would entail domestic labour at home, so the proposal was dropped. It was re-introduced, and adopted compulsorily during a period of slackness, and now the workers prefer it.
>
> A managing director of a large firm of constructional engineers in an outlying suburb of North London, stated recently that the five-day week had been worked in their factory at the men's request since the general strike. He said, that in consequence, the output had gone up 22–26 per cent., and the overhead charges were decreased by 6 to 7 per cent. On no account would they return to the old arrangement.
>
> At a large tin box works, which had been removed from South London to the Reading district, the system was started mainly because many of the original workers continued to reside in London, and so much time was taken in travelling.

Miss Sanderson (North East London) mentions that the largest engineering firm in the N.E. London district, which reduced their working week a few years ago from 6 days or 47 hours to 5 days or 43 hours, are very emphatic in their approval of the shorter week. They found that after a few weeks production definitely went up, improvement being shown, not only in the output per hour, but also in the total output per week. It has been necessary occasionally to keep their men a few hours overtime or to bring them in on Saturdays, in order to deal with an exceptional rush of work, but the carefully-kept figures of production show that employment beyond 43 hours a week is not economical.

Mr. Sumner (Wolverhampton) reports on an interesting experience in a tube works, and on the success of the system in a motor works :—

> A large tube works employing 3,000, of which about 150 are young persons, experimented with this method of working for the last two months of 1928. At the end of the time they held a secret ballot at which practically every worker voted, and to the surprise of the officials there was a large majority

for reverting to the six-day week. The firm had been expecting, and hoping, for the opposite result. They carefully considered the matter, and came to the conclusion that the winter was the wrong time of the year to take for the experiment. The very short amount of daylight, and the depressing and dismal weather, unsuitable for outdoor pursuits, usually experienced here in November and December, was not attractive enough to the men to compensate for the three-quarter of an hour extra working time on the other five days. The firm went back to the six-day week on January 1st, according to their agreement, and then made another trial of the five-day week, starting on June 1st. It has proved a complete success and is still in force, and now the darkest month is past without complaint, it looks as if it will become a permanent all-the-year-round method of working.

The large motor-car works employing 1,000 (including about 100 young persons) referred to in last year's Annual Report, is finding after over two years' continuous experience, that the five-day week is an unqualified success from both the firm's and the workers' points of view. Establishment expenses have been reduced, and it is found that the men, if overtime has to be worked, prefer to come in on Saturday morning, rather than work in the week-day evenings, especially when summer time is in force.

Two-Shift System.—One hundred and thirteen Two-Shift Orders were made for different classes of factories, including those carrying on the manufacture of hosiery, silk and cotton, rubber goods, toys, cake and confectionery, paper making, brick making and electrical apparatus.

The reasons advanced in the applications for the Orders were similar to those quoted in previous reports, such as shortage of plant, need to increase output in order to fulfil or obtain new contracts, experiments with new processes, or foreign competition.

The arrangement of hours made possible by this system has also been of assistance in dealing with processes of a continuous nature and in training new workers.

By means of a Two-Shift Order one large firm which had sold part of their premises to another firm were able to avoid dismissing any of their workers, while in other cases where work in certain departments was slack and workers were already on half-time, the granting of an Order enabled the employers to transfer workers to departments where work was plentiful. Again, in another case, a Two-Shift Order rendered it unnecessary to dismiss workers employed in a factory in which a large part of the machinery and stock had been destroyed by fire.

All applications for permission to work on this system have been, as in the past, very carefully scrutinised and in some cases refused because it was not proved that the workers were really willing parties to the application, or because the welfare conditions were unsatisfactory. In factories where the system resulted in men being replaced by women in certain processes it was made a condition in granting the Order that the men should be absorbed in other Departments, while in other works in which some of the workers lived near the factory and others a good distance away a condition was attached to the Order that the latter should not be put on shifts. In the case of a printing works in which there was no space for a mess-room or cloakroom, it was arranged that a room should be procured for the use of employees, and for provision of meals in a café close to the works.

The question of transport facilities has arisen in connection with several applications, and in some cases operatives made their consent conditional on a clause being inserted requiring adequate arrangements to be made. It is interesting to note that very few irregularities as regards employment have been found, and there is no reason to think that shift employment leads to evasion of the law or that it makes it more difficult to detect irregularities in regard to hours of employment. Cases of infringements of observance of the conditions of the Order have been confined on the whole to minor matters which have been remedied on instruction.

The circumstances of one application are of interest. A firm applied for and obtained an Order entitling them to employ women and young persons on shifts. For some reason they decided not to use the Order but instead, for 8 months last year, the women and young persons concerned were employed for the full legal period from 8 a.m. to 8 p.m. on every week-day except Saturday.

As it had been noted that only about one-third of the Orders granted continued to be used in factories, it was thought desirable to get exact information on the extent to which such Orders have been used. Accordingly precise information was collected from all the Divisions. From 1921 and up to the end of June, 1929, 852 Orders have been granted to 653 firms in respect of 750 works. Of these, 168 had become permanently inoperative either through the works having been closed down or the Orders having been superseded by later ones ; 351 although still operative, were not considered likely to be used again ; 191 were used only from time to time but were considered likely to be used in future ; 142 were used more or less continuously.

WELFARE.

General.—In spite of trade depression and other adverse circumstances, a great deal of progress is reported in provision of welfare amenities. This progress is most marked in the case of new firms or firms moving from congested town areas into the country, or from the City of London into the suburbs. There is indeed evidence that welfare arrangements are becoming increasingly necessary if the services of the best type of worker are to be obtained. Some works run on the most modern lines are said to draw their workers from a considerable distance because of the welfare facilities provided. The workers are willing to face the discomforts of long daily journeys if they know that they can get their meals in comfort.

Reports from all the Divisions mention new canteens, and messrooms. These are now, almost invariably of the café type and fitted with small tables, and comfortable chairs. They are much appreciated by the workers.

Progress in provision of washing accommodation with hot water laid on, soap, and towels provided, and under the charge of a responsible person is also reported. Baths have been provided in some new works in which the nature of the work is dirty, as for example, for boiler stokers employed in an engineering works.

Mr. Turner (Coventry).—One artificial silk manufacturing firm have, at one of their works, installed an exceedingly fine set of bathrooms. The work in the factory is the winding, reeling, etc., of artificial silk yarn, and it is about as clean a job as can be found in any factory. Nearly the whole of the employees are females, and most of them come from mining districts, where bathing facilities at home are crude. It was consequently decided that baths should be provided at the works for any worker who would wish to use them. Bathing takes place in the firm's time, and no deduction is made from the wages for the time taken. Bathing lists are made out, and the girls go in batches. No charge is made for the use of the bath, the only conditions being that the users shall provide their own soap, and wash the bath out after use, and only take the allowed time in the bath. Great use is made of these baths, and they appear to be much appreciated.

Oil Cake Welfare Order, 1929.—This Order was extended to apply to extracted meal or compound cake, and came into force August 1st. Mr. Chasteney (Liverpool North), in whose district most of the works in that area are situated, describes the conditions :—

The Order, extending the scope of the 1919 Order to cover the manufacture of extracted meal and compound cake, affects nine additional mills in this district. The previous Order applied only to three mills, where oil cake is made. In one of these—by far the largest in the district—both oil-cake and compound cake are made. This firm have always been pioneers in welfare work, and had made no distinction between the two classes of workers in carrying out the provisions of the old Order. The result was that when the new Order came into force they already had excellent welfare provision for the compound cake workers, and their example has been useful in securing a good standard of compliance in other mills, particularly as they kindly consented to show their mess-rooms, dressing-rooms, and washing facilities to interested parties, and to give the benefit of their experience.

Several firms have provided one-piece overalls of the boiler suit type. Having no jackets to lose buttons, and hang loose, they are naturally much safer wear for men employed about machinery, but they suffer from the disadvantage that they are apt to feel " stuffy " if the mill is at all hot. The objection has been met in one case by providing the kettle men exceptionally with jacket and trouser overalls. In some mills two sets of overalls are issued to each man to allow of one set being washed while the other is in use, and this is, of course, the most satisfactory way of dealing with the matter.

Apart from incidental sack repairing, comparatively few women are employed in this trade. In one mill, however, female labour is employed to a substantial extent in drawing off, weighing and trucking, and here permanent seats fixed to the walls have been provided.

The standard of cloakroom accommodation varies considerably. At the largest mill there are dressing rooms having the lower half of the walls of glazed tiles. Ventilated metal lockers, one for each man, are arranged in rows across the rooms with forms, and standing boards in front. Heating is by steam or warmed air, and a rack is provided on which wet clothes may be hung, and hoisted up to the ceiling for drying. A safe, under the charge of the cloakroom attendant, is available, and is well used on pay-day. There is no doubt that the security and privacy afforded by lockers is appreciated, and cloakroom accommodation is better used where they are provided. At one of the smaller mills an effort has been made to satisfy these conditions in an inexpensive way by fitting small lockers, 12 in. square, at about head level. Clothes pegs are fixed beneath the lockers, and steam pipes are arranged along the floor below, and are screened to prevent contact with the clothing.

Most of the mills had messrooms before the Order came into force. On the whole they are clean and well kept. At one mill the messrooms are of the café type, with small tables and chairs, and there is a canteen serving hot meals and refreshments.

The supply of warm water at the wash basins has, in several cases, been somewhat difficult to arrange, and two firms have found it advisable to move their washing facilities nearer to the steam supply. An economical method of obtaining warm water is to utilise the exhaust steam from the kettles. Roller towels are the general rule, but one large firm provide individual towels, 800 being issued weekly. Liquid soap is commonly provided, and is probably the most suitable for use in these circumstances. The extravagant wastage which is inevitable where cake soap is used is avoided, and the first cost of the containers is soon recouped. Where washing facilities are an innovation, complaints are sometimes made that they are not much used. Experience has shown, however, that where the accommodation is good, and well looked after, it is, in time, greatly appreciated.

Good shower baths are provided in two of the oilcake mills. Up to the present no application appears to have been made for their provision elsewhere, but they have been voluntarily provided at one large compound cake mill.

There is only one mill where an ambulance room is required under the terms of the Order, and here excellent arrangements have been made.

Fish Curing Welfare Orders.—The season in Yarmouth and Lowestoft was a good one, and the numbers of Scotch workers engaged was well up to the average. Visits were paid to all the First Aid dressing stations, and welfare centres, during the first week of the season, and all were found fully staffed by voluntary workers. Most of these workers accompany the girls each year from Scotland, and with the assistance of a few local voluntary workers, they give all possible care and attention, and look after the girls in case of illness, in addition to rendering first aid, and attention to salt sores.

The conditions for the migratory Scotch girls have improved so much of recent years that there is now little cause for complaint.

Miss Forrest, who was stationed in Yarmouth during the fishing season, reports :—

The migration of the curing plots in Yarmouth described in last year's report was consolidated this season. Open plots on Bloomfield's land, and particularly round the Nelson Monument, were well taken up, and the old sites between the promenade and the sea, belonging to the Corporation, were left mainly unoccupied. The same provisions for first aid, and rest room were again available, and the arrangements for rest room and refreshments in Messrs. Gundry's net works proved highly popular. The site is convenient, and men and women alike, took great advantage of the tea provided, especially after the weather became more severe, and work was more continuous. All the other dressing stations in Yarmouth were opened as before, and the returns show that the workers suffered very greatly from bad hands and salt sores.

An additional voluntary dressing station, and evening recreation room was run this year by the Norfolk Branch of the British Red Cross Society; a vacant shop was secured in the middle of the town on what proved to be a most advantageous site; the lorries on which the women are conveyed back to their work at meal-times made this corner the rendezvous, and while the women were waiting many of them took the opportunity to have their hands attended to. In the evening the premises were brightly lit and cheerful looking, and attracted many of the workers who wanted to have their hands dressed before going to bed. The number of dressings done (11,561 during the two months) is a proof of the convenience of the situation.

The dressing stations in Lowestoft and Gorleston were the same as last year, but all show an increased number of dressings. All the voluntary workers are unanimous that the women take much greater care of their

hands than they formerly did, and show much greater readiness to have attention for any sores or cuts they may get, so that serious cases of sepsis have not been numerous. The total number of dressings, and attention in case of illness taken from the records kept, in all but three of the stations, reaches the high total of 28,534.

The standard of compliance with the Order in the yards is satisfactory as regards first aid, but little has been done to improve washing accommodation. The workers all go to their lodgings for meals, and the conditions in this respect have entirely changed since the Order was made.

Miss Meiklejohn, who again visited all the curing stations in Scotland, reports :—

There was an abnormally heavy fishing in Shetland at the opening of the season, and before the curers were ready to cope with it. There was a shortage of stock, of salt, and of workers, and every process became more or less of an emergency. The fishing was so heavy that the fleet had to lie up for a day or two at intervals, and even so the workers were taxed to the utmost. Salt sores always occur most when the fishing is heavy at the beginning of the season, and before the women's hands are hardened to it. This year in Shetland, the incidence of "sore hands" was very great owing to the quantity of roused herring which had to be dealt with. As has been the case during the last few years the proportion of young inexperienced girls to older women in the Shetland crews was high.

There is nothing new to report as regards the dressing stations under the Order, except that in Fraserburgh, the Free Church and United Free Church workers combined, and operated from the one centre where the facilities for first aid treatment, and hand dressing were more satisfactory than was the case at the Bassesgate Street Hall used as a dressing station last season.

Provision of first aid boxes in the yards is fairly good, though there is still irregularity as regards the box being in charge of a person trained in first aid. This irregularity occurs both in the case of a yard where the curer has neglected to take the necessary steps to have one of his workers so trained, and also where the curer has a number of first aid men, but has, owing to the necessity of his business, drafted several of these men to one centre, and so left one of his yards without any.

In Orkney and Shetland, considerable advance has been made in the provision of washhouses under the local byelaws, and these meet the requirements of the Section of the Welfare Order, as to provision of facilities for rinsing hands and clothing. Warm water is not always provided in the washhouse except on Mondays, but where it is available on all working days the provision is greatly appreciated by the women.

The greatest need in the islands is a good water supply, and following that, suitable sanitary accommodation. Two curers in Stronsay have now erected sanitary accommodation with water carriage, but the provision of sanitary accommodation in Stronsay as a whole is very bad, and consists of small wooden erections on the beach alongside the public road. In Stornoway, the beach stations are very greatly improved this season as the Harbour Trust, whose property they are, has laid concrete below, and in front of the farlins, the concrete having a fall to a drain. The women in former years were standing sometimes ankle deep in slush and brine, and the yards, being slightly lower in level than the roadway, did not drain properly. Unfortunately this, the first season since improvements were effected, was a very poor one, rather a common coincidence in the herring industry.

Gutting and kippering of herrings is carried on at Milford Haven, and packing of pilchards in Cornwall. These processes do not come under the Welfare Order, but Miss Pease, who visited during the season, was able to secure voluntary welfare arrangements for the women and girls concerned :—

The work does not come within the scope of the Welfare Order, but a very good welfare hut, provided and staffed by the Royal Mission to Deep Sea Fishermen, has done good work in previous years and first aid, food and resting facilities, were provided. Unfortunately in July, between the drifter

and trawl seasons, the hut had to be closed on account of expense, and the difficulty of finding a welfare worker. Realising how disastrous this closure was going to be to the herring workers, I conferred with the Superintendent of the Royal Mission, consulted the fish curers, and asked the Welsh Branch of the Y.W.C.A., whether they could give any assistance. The Royal Mission kindly promised the use of the hut, the curers subscribed generously, and the Y.W.C.A. found a girls' club leader who came, and took charge of the welfare work to the end of the season. The work accomplished has been most successful, a club spirit was developed among the girls, the canteen has done excellent work. Dr. Overton, H.M. Medical Inspector of Factories, came and inspected the first aid work, and instructed the helper in the treatment of the knife cuts, and salt sores, which occur in the course of the work. At the annual yearly meeting of the Y.W.C.A. held at Cardiff in December, the Secretary announced that the Association had been requested to carry on the welfare work at Milford Haven next year, and had promised to do so.

There has been a great improvement in the sanitary conditions on the docks. All the notices served last year have been enforced, the sanitary accommodation is much improved, the refuse dumps have been removed, and the Port Authority have provided trucks for carrying away the refuse, so that this year there was no plague of flies. A water supply, and a sewage disposal scheme are being authorized by the Ministry of Health, and carried out by the Local Authority.

The Cornish pilchard trade had a record year, and the fishing villages of Newlyn, Mousehole and Porthleven have never been so busy. The season started early—it usually begins in mid-August—but as the weather in Italy, where pilchards are sent, was still hot, and the Italians were not ready for salt fish, the catches had to be retained for longer than usual in the salt pickling tanks in Mounts Bay, and every old fish house, and every old tank that had not been used for years, was pressed into service. I went to Mounts Bay in September, and visited 35 fish curers' premises, and obtained the assistance of the Sanitary Inspector of the Local Authority. The sanitary accommodation left much to be desired, and the limewashing of the previously disused premises was very necessary. Full compliance was promised by all the occupiers concerned, and the Chairman of the District Council undertook to see that the notices were enforced.

The process is simple: the catch is brought to the curing house, the damaged fish are discarded, and the good ones are placed in a deep brick concreted tank with salt, and are left there for at least three weeks. When taken out they are pressed, and packed in small wide barrels. The pilchards are very oily fish, and when they are packed they look silvery, but if they are not soon eaten, the oil exudes, and spoils their colour. The workers attribute the good condition of their hands—which are very different from those of the herring curers—to this oil, and cases of septic hands seldom or never occur in this trade. The numbers employed in the villages were 86 men, 1 boy and 123 women. The men did the salting and pressing, and carried the fish up to the women, who did the packing. The men nailed up the casks ready for despatch.

There were no properly organised welfare arrangements, but the workers all live quite close to their work. There is no imported labour as in the herring industry. The provision of washing accommodation might be advisable, but the only thing which the workers themselves told me, they really needed was protective clothing. The men are given thigh boots, and oilskins, but the women have to provide their own high aprons, and boots or clogs. Some women wore their ordinary boots or shoes, but a few had bought felt-lined clogs at a cost of 5*s.* 9*d.* a pair, which were excellent for their purpose, but the expense was too much for most of the women.

Bakehouses Welfare Order.—The provisions of this Order are now well known to the trade, and occupiers of remote country bakehouses, who may not have been visited for a considerable time, are found to have taken some steps to comply with the requirements.

In the large factory bakehouses a good standard of compliance is generally reported, but in the small bakehouses especially those of a semi-domestic nature attached to dwelling houses,

considerable difficulty is experienced in getting satisfactory washing and cloakroom accommodation. Proceedings have been taken in a few cases in the London area, and the Magistrates held that (1) a sink, without hot water laid on, situated in a living-room upstairs, did not comply, and (2) a sink in a yard upstairs, without hot water, did not comply—obviously the men would not be likely to carry hot water from the oven, upstairs, and across a yard. Surprise was expressed by one Magistrate that a special Order had been necessary. In the interests of the consumer he said cleanliness was necessary.

PARTICULARS AND HOMEWORK.

The late Mr. Hermon Taylor, Senior Inspector of Textile Particulars, reports on the work of his branch :—

" Little of an outstanding nature has marked the work of this branch during the past year. No breach of the Act, serious enough to call for a prosecution, has taken place. A dispute in the cotton trade which ended in a reduction of wages made a complete revision of the price lists necessary. A large number of firms probably by oversight neglected to do this. For some time after the new rates came into force many departments were found where nothing whatever had been done to amend the notices. When attention was drawn to the fact that the rates posted in the room were legally binding under the Act, and the percentage agreed upon as a settlement of the dispute was in the downward direction, employers quickly corrected the lists, and the matter became regularised.

" Beyond this failure to revise price lists few irregularities have been found. As stated in a previous report, the practice of giving full written particulars of work and wages has long ago become a regular part of the mill routine, with the result that only very occasionally is any serious default met with.

" One such instance was in the Midlands where a member of my staff found that weavers' particulars were being entered into their books, but these books were kept in the office, and were never actually in the weavers' possession. It was pointed out that this method was clearly a breach of the Section which requires particulars of work and wages to be furnished to the weavers in writing along with the work. Instructions were therefore given for full and proper compliance to be made at once.

" Two cases of an unusual kind have been satisfactorily dealt with. A manufacturer is allowed to make the reed space of his looms a little wider by cutting down the back board, but once altered in this way, these looms must not be reduced again, with the result that a higher price must be paid permanently than for the original width. This is provided for by the placard which the Act requires to be posted in each weaving shed, stating that the Uniform List (with all future alterations and additions agreed upon between the Employers' and Weavers' Associations) is the basis on which wages are paid. A few years ago, an agreement as above was made between the two sides respecting such altered looms. As this agreement is covered by the posted placard, it thus becomes a breach of the Section to reduce the width of the loom when it has once been made wider. On this being pointed out to the employers referred to, both decided to allow the looms to remain at the altered width, and pay for them accordingly.

" A large business of pulling or tearing rags, old clothes, stockings, etc., as well as new cloth cuttings into what are known in the trade as mungo and shoddy, has its centre in the Heavy Woollen District of Yorkshire. The resulting fibrous material is worked up again, either alone, or mixed with new wool, cotton, or other textile material into a new cloth somewhat lower in quality than a cloth made from pure wool. The sorting of these rags finds employment for a large number of women and girls, a large percentage of whom are paid by the piece. Here again is a branch of the textile trades where only constant and regular inspection can secure compliance with the Section. Sometimes the workers do not seem to care whether they get written particulars of the weight of the rags they are given to sort, or the price to be paid for doing the work. A custom of giving oral instructions or roughly entering the figures, without any descriptive headings, in a note book or on a slip of paper, which has been in existence ever since the trade commenced is very difficult to eradicate ; but taken over a period of years, a great improvement can be seen in this respect, and properly headed books of particulars are much more in evidence.

" With the exception of the general reduction in the rates of wages in the cotton trade, those in a few sections of the woollen trade, and a reduction of 10 per cent. in the carpet trade, no alterations have come to our knowledge. The reduction in carpet workers' wages was in accordance with an agreement existing in the trade, and no trouble ensued.

" Forty-three complaints have been received as against twenty-nine last year, though a few were of a rather trivial nature. These latter in several instances came from anonymous sources. Nineteen were verified."

A new Order was made applying the Particulars Sections to the making of Lamp Shades. This industry is mainly carried on in London and Manchester. As the Order only came into force on

January 1st, it is too early to report on its observance, but the following shows the need for the Order and the attitude of the workers :—

Miss Cox (Manchester West).—In the majority of works to which this Order will apply, it has not been the practice to supply particulars of work and wages before the work is done. The few good employers who give particulars welcome the advent of the Order, as they feel it will help them to meet the competition of the less reputable firms. In the other works, the order will be very much appreciated by the workers who realise that they need the protection of the law to improve their conditions. At one workshop where I was enquiring about particulars, a worker said : " We are going to work under a new system soon ; then we shall always be given the price in writing before we start the work, and that will be much better for us." In another case, when a worker complained about her wages, and was told about the Particulars Order, she said : " Well, that is something. She won't be able to cut down the prices after we have done the work as she does now." Most of the workers in this trade have been doing work without being sure of the price, and this will be remedied by the Order. As only a small number of works are engaged in this trade, there should be little difficulty in enforcing it.

CHAPTER 2.

HOME OFFICE INDUSTRIAL MUSEUM.

Hilda Martindale, O.B.E., H.M. Deputy Chief Inspector of Factories.

From its inception it was realized that the exhibits in the Museum if they were to be of real service to Industry must be continually changing, new developments in them must be indicated and additions to them must be made. Progress in industrial inventions is rapid and it is essential therefore that this progress should be reflected in the exhibits.

A number of interesting new features have been installed which show that the desire that the Museum should be a "living" one is being fully carried out.

New Features in the Museum.

Ventilation.—A small building has been erected in the yard to demonstrate the effects of unfavourable atmospheric conditions in workrooms and methods by which the conditions can be remedied or their effects mitigated. Means are provided for ventilating the building by regulated air movements, heating by convection or radiation and humidifying the air to any required degree over a wide temperature range. Thus, widely differing conditions can be attained, such as those found in warm humid cotton-weaving sheds, steamy laundries and dye houses, at hot furnaces, in insufficiently warmed workrooms and so forth, and the effects of air movement, and different methods of heating, in improving the conditions practically demonstrated. It is hoped that the building will prove of interest and use, not only to those concerned with industrial conditions, but also to heating and ventilating engineers, architects and others concerned with the ventilation and heating of buildings generally, and this has already been found to be the case. Demonstrations of effects of atmospheric conditions have been carefully planned, and a syllabus indicating clearly the actual features to be demonstrated drawn up.

Silicosis.—One of the most valuable parts of the health section of the Museum is that which calls attention to the disastrous effects of certain kinds of stone dusts on the lungs of the workers, illustrates the processes in which the danger is greatest, and indicates the remedies. There has now been installed in two huts in the yard a pneumatically-operated stone dressing plant equipped with a new method of trapping the dust near the cutting tool point without impeding the

worker's view, and so preventing its reaching the worker. Demonstrations of great interest and importance can be given in these huts.

Noise.—The effects of noise on the health and efficiency of the worker have lately become a subject of study, and experiments are being made with various methods of reducing noise. One method, recently installed in some City buildings, is shown in a room in the Museum. The ceiling is lined with a special padding and the effect can be judged by comparison with an adjacent room of similar size in which the ceiling is not so treated.

Explosions.—An exhibit illustrating the danger of dust and other explosions in a variety of industries is being further developed. New features are an apparatus for demonstrating the explosive properties of dusts of common substances, such as flour and starch; a device for preventing explosions from sparks in the grinding of malt; specimens of defective valves and other plant, and diagrams showing safe types of valves, and storage arrangements for dangerous gases and liquids.

Safety.—In the machinery part of the "Safety" section, the new features are a large-size power press suitably guarded; a foot-treadle guillotine for cutting thin sheet metal showing the blade properly fenced; a "Victoria" platen machine for printing and embossing, with an instantaneous stop safeguard; a corner staying machine with a sweep-away finger guard and a wire stitching machine with a safety attachment; a meat-mincing machine so designed as to make it impossible for the fingers to be caught in the worm; and a modern double-dimension saw bench. Mention may also be made of some interlocking devices for lift gates; a mechanical-belt mounter fitted to the overhead driving pulley of the cake mixer; an apparatus for holding aerated water syphons when the heads are being polished, to prevent the worker being injured in the event of the bottle bursting; fresh types of milling cutter guards; new photographs in the Labour Saving Section, and photographs illustrating precautions in connection with shunting on railway lines and sidings.

These new features have been installed chiefly on the suggestions of the Inspectors. It is to be hoped, however, that the time is not far distant when the Museum will show more signs that it has the support of Industry itself, and that promoters of any new industrial enterprise of real value will not be satisfied until they in their turn have had a share in contributing to the exhibition.

Offshoots from the Museum.

It is not only by the developments in the Museum itself that its vitality can be estimated—already there is indication that it is becoming the parent of other exhibitions of a similar kind.

Two notable visitors from Northern Ireland paid an informal visit in order, as they said, " to look round for half-an-hour." They stayed nearly two hours, and were particularly interested in the Lighting exhibit—remarking that they would like to start a lighting campaign in Ireland, where this question was somewhat neglected. They wasted no time setting to work. An Inspector of Factories from that country was sent over to spend several days in the Museum and to study closely the exhibits, and in less than six months an Industrial Lighting exhibition was opened in Belfast.

Local Exhibitions.

The second offshoot of the Museum is likely to be of extraordinary interest and to have an important effect on an industry which has in the past called for much serious attention on the part of the Factory Department.

The Managing Director of an important works in Stoke-on-Trent visited the Museum and was so impressed by its effectiveness that he put himself into touch with Mr. Garrett, the District Inspector, with the object of ascertaining whether it could not be repeated in a modified form in the Potteries. The District Inspector, feeling more and more convinced that the education of the worker in the dangers of lead, could claim almost an equal share with the Regulations in the reduction of lead cases, particularly amongst the younger workers, welcomed the suggestion warmly, and as it had always been the intention of the Home Office to consider the question of arranging for small Museums in industrial centres, the proposal received immediate support.

The organisation and arrangement of this Exhibition is now being pressed forward, and it is hoped that in a few months' time the Potteries will have their own Industrial Museum containing exhibits bearing on the three branches of safety, health and welfare, specifically required in the local industry.

Work carried out by the Inspectors in the Museum.

As indicated in last year's report, it was soon realised that there would be a real advantage in having the exhibits explained by someone closely in touch with industrial processes. Accordingly 12 Inspectors were chosen to spend one month each in turn at the Museum. The Inspectors have found that their own practical experience has repeatedly been called upon to enlarge or expand on some problem, and the visitors themselves have time and again expressed their great satisfaction in finding that they could have as a guide the services of a person of actual factory experience. The reports furnished by the Inspectors have been so full of interest as showing the great use which has been made of their services, that they are quoted at length. Mr. Findlay, for example, reports :—" The visitors came from all classes and many countries. The varied nature of the enquiries is best shown by detailing some of them. Two partners in a printing business

came for information regarding general ventilation, and afterwards sent their Manager to see the various exhibits shown them. A maker of dental appliances wanted information as to where he could obtain glasses which would give large magnification and yet allow the object being held far enough away to allow of both eyes focussing on it properly. The Manager of a belt-making factory called after a fatal accident to see how the intakes of heavy rolls could be guarded. A gentleman from Melbourne University made enquiries regarding the fencing of textile machinery. A builder came for particulars as to how to construct a cellulose spraying chamber. The managing director of a laundry firm which had been prosecuted after a shafting accident came for information regarding the fencing of transmission machinery. A lady desired information about canteen equipment. A managing director whose firm were considering building lavatories and cloakrooms called to look at the equipment suitable for such places. A joiner who had just commenced business on his own called to inspect the woodworking machine guards. More than one person called for information regarding the fencing of power presses. An Insurance Inspector wanted information regarding the processes and dangers incidental to manufacture of artificial silk. Besides these there were quite a number of other enquiries. I think that with the exception of the gentleman who wanted advice regarding special glasses, all the visitors received the information they required."

Mr. Jenkins (Carmarthen) reports :—" that a Manager of a large printing works brought one of his foremen, who was also the Trade Union Representative, to obtain all information regarding dermatitis, as one of their employees had been affected since they had commenced using a new kind of ink. He told me he wanted to show his workers that he was prepared to do all he could to prevent them being troubled with dermatitis."

At Mr. Sedgwick's (Northampton) invitation " the works Manager, accompanied by eleven departmental foremen, from a large Carriage Works, spent the whole of one afternoon at the Museum. They were much impressed with what they saw, and took notes of devices and methods suitable for adoption in their own large works. Again, the visits paid by the principals and staff of a tailoring firm were of particular interest in that they were instigated by desire for information prior to fitting up a new works. Notes were taken of machinery, fencing methods, sanitary conveniences, washing conveniences, clothing accommodation, seating, protective clothing, canteens, lighting and other matters. Whole-hearted appreciation was expressed of the information available at the Museum. They had not anticipated finding so much of value to them. Other representatives were sent at a later date for the opportunity of seeing the exhibits, and obtaining further details."

Another visitor wanted to know how the problem of earthing static electricity was being met. There had been an explosion in one of his factories in America and he wanted to issue a code of instructions to all his mills where such explosions were likely to occur.

Mr. Eccles (Leeds) reports that several occupiers arrived with Contravention Notices to see in what manner they could best comply with the instructions of their District Inspectors, while a young member of the staff of a large firm of Biscuit Manufacturers was brought by one of his senior colleagues to be shown the most up-to-date methods of securing safety in factory work. The assistance of the same Inspector was sought by a Member of Parliament who had given notice of a question to be asked in the House, and who called at the Museum to get first-hand information on the subject in which he was interesting himself.

Thus, more and more the Museum is showing occupiers how statutory requirements can be carried out in a practical way.

Opinions expressed by Visitors to the Museum.

It would be surprising if, amongst the many persons visiting the Museum, some had not come for the express purpose of criticising all they were shown, holding strongly to the opinion that there was nothing there for them to learn. Fortunately, however, it is rare to meet a visitor like an old Scotch employer who, the Inspector reports, was reluctant to admit that the Museum held anything that was really good. Without proof and refusing to forward photographs or supply details, he said that all his guards were better than those in the Museum. Gradually, however, the Inspector felt that internally he was admitting the efficiency of the exhibits. His replies to requests for comments was a grunt or silence, and when shown the Ventilation section he had to admit it was good—" but " he added, " that's nothing —I invented that in 1880."

Such a visitor, however, is unusual, the critical visitor is usually like an engineer who informed the Inspector in charge before he was shown round that he intended to subject the Museum, especially the machinery section, to his severest criticism. Before he was half-way round he had ceased to criticise and was busy making notes of devices which he thought would be useful in his particular industry.

Genuine criticism is, of course, always helpful, and the Inspectors have reported many useful suggestions which have been made by visitors, and which have resulted in alterations in the exhibits. Miss Andrew relates how it was in escorting the Works Committees and parties of foremen from one large works that she felt the Museum to be serving its true purpose. It was, she says, these parties which were the most ready to criticise and whose criticism and suggestions were most fruitful. The same Inspector tells, too, of a party from a London factory who had

been given the morning off to see the Lord Mayor's show, but who came to the Museum instead. The leader of this party said that " any employer who started a new works or reconstructed an old one without first coming to the Museum was wasting his time."

Miss Coombes gives an interesting account of the opinions of some of the visitors she took round the Museum :—

" A small party of laundry proprietors came to see the air-conditioning demonstrations, and also made a general survey of the Museum. They represented different firms, and one evidently had adopted more modern machinery and methods than the others. The discussion which took place must have been of some educative value to those less advanced. Any suggestion that the various safeguards were not practicable was quickly disposed of."

" A manager from a wireless instrument firm came to see power press guards. He said he would like his foreman to see them, and on the following Saturday afternoon the young man arrived with his wife. After seeing the guards they stayed all the afternoon seeing all the exhibits and discussing various safety and welfare matters. The following week the manager returned and brought with him a maker of power press guards, and during the visit gave him instructions to fit Udal guards on to most of his presses, and automatic feeds on to others. He said, with some amusement, that his foreman had given him a long lecture on Safety and Welfare measures after his visit to the Museum. He asked to see a particular type of seat mentioned by the foreman as being suitable for their women workers."

" A student worker from a Coventry firm, who was in London to take an examination, paid a lengthy visit and remarked that he had seen a great deal to help him in his work. He spoke of his intention to get the Safety Officer from the Coventry Works to visit the Museum. I found him taking notes of the different types of goggles for eye protection, and he said, apologetically : ' I've never taken much notice of this sort of thing in the shops, but this place makes you think.' "

It is gratifying to find that the Museum is making the public realize the real aim and object of the work of the Factory Department. Miss Bradley, for example, mentions that a Managing Director and Works Manager stated : " we have often been told to come to the Museum but did not think it would be worth it. I have completely changed my mind and shall send some of my foremen. And after all—I think there *is* something in what the Factory Acts require. Up till now I have put on guards because the Factory Inspector has asked me. Now I see they really are out to secure the safety of the workpeople."

" Another expression of opinion which proves the humanizing influence as well as the technical aid the Museum can give was made by the leader of a Literary and Debating Society. He

proved to be a manager of a works. On taking leave he said: 'I think the Museum is a good thing. We generally regard you Inspectors as a nuisance—but I think this will do much to make a more human understanding between owners and officials'."

The Value of the Museum.

The value of the Museum to all those engaged in industry is becoming more and more apparent, and Inspectors in the ordinary course of their duties are finding evidence of this. It is particularly interesting to find that Magistrates, from whose findings respecting "facts" there is no appeal, are making use of the Museum.

Mr. Lowe (South Essex) reports that "a Stipendiary Magistrate in this District has never failed to mention the Home Office Industrial Museum when giving judgments in cases involving machinery accidents. He tells the defendant that if he has not visited the Museum, then he should do so without delay, that he has visited the Museum himself and that it was a revelation to him. After reciting all the good points of the Museum that he can think of, he then whimsically remarks that the law now requires machinery to be made safe for fools, and that the place to learn how is the Museum. In one case where a defendant argued that separate parts of a machine could only be guarded as a whole and not individually, he remarked that he knew that that was not so, because he had seen many machines in the Museum with guards fitted to individual parts."

Miss Dunch (North London) reports that both Magistrates and Coroners make frequent allusions to the Museum and refers to a "prosecution taken for failure to fence securely the dies of a power press. In his summing up of the case the Stipendiary remarked that the guard which should have been fitted could be seen at the Home Office Industrial Museum, a visit to which had impressed on him the wonderful ingenuity displayed by those whose business it was to render dangerous machinery safe. Such persons had done their part and it was up to the occupiers to provide the guards. He strongly urged defending Counsel to complete his education by paying a visit to the Museum."

The following are some of the cases noted by Inspectors:—

Mr. Patterson (Lincoln): "A firm of engineers had trouble with manilla rope slings and the question of safe working load of these slings arose. A visit was paid to the Museum by the plant engineer and particulars obtained as to the practice of a Railway Company. A notice was then drawn up and affixed in the factory for the attention of the slingers. A similar question was settled later in regard to shackle dimensions."

"A girls' messroom in a cardboard box making factory was very drab and cheerless. One of the Managers visited the Museum and afterwards provided table cloths, flowers, and had the walls brightened."

Mr. Smith (West Cheshire) : " The Manager of a large belting factory, whilst in London, decided to visit the Museum. He was particularly enthusiastic on his return and informed me that, discovering so much of useful interest during his visit, he found it necessary to spend two days in the building. He arrived back at his factory with many pages of notes and sketches, a large variety of pamphlets, and a determination to translate what he had seen into practice. His visit was also useful in another way. He saw in the Museum belting which his factory turns out regularly and in large quantities in actual use on machinery, the nature of which the firm had no certain knowledge, indeed no opportunity before of discovering. Advantage will be taken of this in an endeavour to increase sales. And so, in another sense, commerce is allied to safety."

Mr. Dymock (Barrow) : " Following a visit to the Museum, the works engineer of a large Steel Works, reported on his experience to the Works Council, of which individual members expressed the view to me that safety work would be much encouraged by the exhibits in the Museum.

" At another factory, I was able to obtain for the Museum an excellent example of safety action in the shape of goggles fractured under impact of a flying particle of metal. From the relative discussion arose the germ of the idea of a safety cabinet containing samples of fractured goggles. This cabinet is exhibited periodically in different parts of the works and acts as a silent safety adviser."

Mr. Pedlar (Southampton) : " The Museum has been of real practical service to an increasing number of employers in this area, who have in many cases expressed their appreciation of the splendid service the Museum is rendering to industrial life.

" Employees also have approached me and have spoken with satisfaction and pleasure of excursions taken, aided by their employers, to see the Museum. In one large factory one of them remarked (I will recount in his own words) ' Several of us went up, so many from each department, to see the Museum. We were surprised and were very much impressed at all the protection devices. Well, the upshot of it all has been that a committee made up of the managers and a few of the work-people, a committee from each shop in fact, has been going round the factory and into each shop to make notes of all matters needing improvement. I can tell you this, that they have found out something to go on with. The Museum has been a fine thing.' "

An enterprising Managing Director of 10 laundries who had been prosecuted for unfenced shafting and had visited the Museum was so impressed by his visit that he arranged for the managers and manageresses to spend a morning there and then invited an Inspector to meet them in the afternoon and open a discussion on Safety Devices. A practical result of these interviews was that the Director arranged for the sleeving of all the

shafting in the laundries, the instruction of the managers and manageresses to the effect that no one must approach the shafting while it is running, and the affixing of notices to this end. Further, he arranged for a copy of the Laundry Pamphlet to be sent to each laundry.

Mr. Stevenson Taylor similarly reports that in a laundry in his division the result of the Managing Directors' visit to the Museum was shown by his giving immediate instructions that all his hydros, of which there were a considerable number, should be fitted with interlocking covers.

It is, however, not only magistrates, coroners, employers and workers and Insurance officials who have visited the Museum and expressed their views on it. Parties of boys from Technical Institutes have found it of absorbing interest, and from the essays they were required to write after their visits, it is evident they have fully realised its purport. The following quotation from the essay of a boy of fourteen years illustrates this :— "No doubt the Industrial Exhibition is known in all the factories and the managers send their representatives up to view the safety devices and they, after seeing them, are almost sure to order them for the improvement of their factory. Thus in a few years the old dangerous machines in factories will be abolished and replaced by healthy, safe and efficient machinery."

International Aspect of the Museum.

Undoubtedly, Safety, Health and Welfare in Industry are international concerns, and nations must work together, and there must be an interchange of information between them, if real progress is to be made.

As previously reported, visitors from all over the world came to the Museum in 1928 to see what Great Britain was doing to further improvements in these matters. The year 1929 saw even more visitors from abroad making use of the Museum, and the Inspectors in charge cite many interesting conversations they have had with them.

In view of the importance of interchange of information, the German Government invited the Directors of Industrial Safety Museums to a Conference at the Deutschen Arbeitz Schutz-Museum, Charlottenburg. This meeting was held in connection with a Session of the Safety Sub-Committee attached to the International Labour Office, and the British, Danish, Dutch, Finnish, German, Italian and Hungarian Museums were represented, and representatives from the German Ministry of Labour also attended. The Conference was opened by the Minister of Labour, Dr. Wessell, who welcomed the delegates in the name of the German Government.

Herr Oberregierungsrat Bertheau was elected Chairman of the Conference and Mr. Gorter, Director of the Amsterdam Industrial Museum, and myself, Vice-Chairmen.

In the course of the Conference many interesting subjects were discussed dealing with the organisation of Museums generally and at the close of the discussion a resolution was passed that the next Conference should be held in 1931 at the invitation of Great Britain at the Home Office Industrial Museum. As Museums have, in addition to those represented in Berlin, been opened or are about to be instituted in several other countries, the Conference should be really international.

Meanwhile, in order that the directors of Museums should remain in permanent touch, it was proposed that each should regularly communicate to the International Labour Office a short report on their activities, and the Chief of the Safety Service declared that he would willingly publish short notices in the Industrial Safety Survey.

Publicity.

A difficulty which was admitted by all the Directors of Museums at the Conference in Berlin was the problem of propaganda. It is surprising that after a life of nearly two-and-a-half years and notwithstanding all the steps taken to bring the Museum to the knowledge of all concerned it should be possible for an Inspector to report as in regards the visit to the Museum of an important Association of Engineers—" During the tour of the Museum they manifested keen interest in all they saw and were obviously delighted with their visit. They expressed enthusiasm for the Museum and its instructional value. Concern was voiced that the Museum was not better known, several stating they were not aware of its existence until the visit was arranged."

Undoubtedly the readers of Trade Papers would welcome an article on the exhibits. Where these have appeared they have been much appreciated and have resulted in visits from manufacturers, followed often by their foremen or engineers.

The following extract, taken from an article in a Journal, stimulated considerable interest :—

> The question is often put to factory inspectors by factory occupiers and factory officials who are concerned with carrying out the requirements of the Factory Acts in regard to safety, ventilation, etc. ; " Can you show me how to carry out this or that requirement ? " or " What is the best and most efficient way of carrying it out ? " or " Where can I see the method or kind of appliance in actual use ? ". Inquiries of this kind, moreover, are not limited to the bare requirements of the Factory Acts, but extend to other means and methods of improving the conditions of work, such as lighting, and the various activities covered by the word " welfare ", which are now recognised as being important factors in efficiency of production.
>
> A visit to the Museum (where an official will be found ready to assist the visitor) will provide the solution of many of the difficulties with which occupiers, managers and officials may be confronted. And apart from any special difficulties, they will gain at the Museum new ideas.
>
> The Museum covers the whole ground of safety, health and welfare (so far as the *manufacturing* industries are concerned), though, of course, conditions of space and expense have not permitted every industry or every process to be included.
>
> The visitor will find nothing recommended in the Museum which is not in actual use in some industry and found by experience to be satisfactory.

Then followed a description of some of the safety devices to be found in the Museum and the health and welfare exhibits.

The President of one important industry, when issuing a circular to all his members concerning various points of safety, concluded as follows :—" The officials of the Home Office have installed an Industrial Museum of Safety Methods in Horseferry Road, Westminster, which is an exhibition of methods, arrangements and appliances for promoting safety, health and welfare of industrial workers. This Museum is well worth a visit from any employer who is interested in this side of industrial organisation, and the Secretary of the Association will be pleased on hearing from any member to give him an introduction to the officials of the Home Office, who will then make a special point of showing him round and pointing out the more interesting exhibits."

It is quite probable that a letter on the same lines would be appreciated and found of value by the members of many of the other great industries of this country.

CHAPTER III.

REPORT OF THE SENIOR MEDICAL INSPECTOR.

John C. Bridge, F.R.C.S.E., M.R.C.P.E., D.P.H.

This report deals annually and in detail primarily with the group of workers who come into daily contact with lead, phosphorus mercury, arsenic, etc., or are exposed to poisonous fumes, gases and dust. But there remains a second group, outnumbering by many thousands the first, who are not so exposed, in regard to whom the effects of industry on health are much less readily ascertained.

While the physical examination of the individual is necessary to form a real estimate of his health, much may be learnt from a study of the statistics of sickness among a group or groups of workers. This line of inquiry is receiving greater attention. The Industrial Health Research Board have issued reports by Dr. Bradford Hill on the sickness among workers in Humid Weaving Sheds and in the Printing Industry, and a further inquiry is proceeding among Card-room operatives. Evidence of undue sickness from any cause, established in this way, may lead to the recognition of a cause which is possible of remedy. The value of investigation on these lines is great and its usefulness will be increased as other industries are considered and comparisons possible.

The Report of the Silicosis (Medical Arrangements) Committee, of which I was Chairman, was issued in April. They came to the conclusion that the only really satisfactory arrangements would be the appointment of whole-time medical officers, and they recommended the establishment of Medical Boards on the lines of that for the Refractories and Sandstone Industries to make all examinations under any Compensation Scheme for Silicosis. They also recommended that further research should be undertaken, not only into the question of Silicosis, but into other forms of industrial pneumonoconiosis.

Dr. Middleton has been much engaged on questions arising from the operation of the Sandstone (Silicosis) Scheme and The Various Industries (Silicosis) Scheme. The number of cases of silicosis which have come to the knowledge of the Department since The Various Industries (Silicosis) Scheme was made prove beyond all reasonable doubt that in certain industries there is a high incidence of this disease. Simultaneously with the inquiry into the incidence of silicosis among granite workers by Drs. Sutherland, Bryson and Keating, in this country, an inquiry has been made in America. The report of the latter indicates the very high incidence of silicosis amongst granite workers in that country, and the different character of the disease as manifested by X-rays, compared with that shown where there is exposure to a dust with a much higher content of free silica.

The outcome of Dr. Merewether's inquiry in connection with asbestos works, which is summarised, briefly, later in this report, is to show conclusively the occurrence of fibrosis among workers exposed to the dust of asbestos. The views previously held as to the effects of free silica dust and silica in chemical combination must be modified in the light of recent work. Our present knowledge as to the effects of dust of all kinds on the lungs is far from complete, and all observations emphasise the need for inquiry and research. Every industrial country is alive to the question, and while there is still, on the part of some Continental Authorities, doubt as to the practicability of diagnosing silicosis as an industrial disease, it has been regarded sufficiently important to demand further study.

When the history of Industrial Medicine is written, the present period might not incorrectly be described as the " Dust age," in view of the attention that is now being given to the effect on the lungs of dust of all kinds.

The " Dust in Card Rooms Committee," of which Dr. Henry is Secretary, has continued its inquiry.

Lifting of heavy weights by women and young persons has received further attention by Dr. Overton, and for the first three months all accidents associated with lifting were particularly investigated and are dealt with separately.

The work of the Medical Inspectors has greatly increased. Evidence was submitted to the Factory Staff Committee, and I hope that the increase of staff which the Committee recommended will enable the Medical Inspectors not only to keep pace with the existing work, but to give attention to other problems which await consideration.

The following table gives particulars of the notification of industrial poisoning or disease under Section 73 of the Factory and Workshop Act, 1901, and under Section 3 of the Lead Paint (Protection against Poisoning) Act, 1926, and permits of comparison with previous years :—

Notification of Lead, Phosphorous, Mercurial, Arsenical, Carbon Bisulphide, Aniline and Chronic Benzene poisoning, Toxic Jaundice, Anthrax and Epitheliomatous and Chrome Ulceration.

Disease and Industries.	Reported Cases.						
	1929.	1928.	1927.	1926.	1920.	1910.	1900.
Lead poisoning	244[31]	326[43]	347[35]	332[46]	289[44]	505[38]	1058[28]
1. Smelting of metals	20	36[2]	21[1]	26[1]	45[3]	34[5]	34[1]
2. Plumbing and soldering	8[1]	11[1]	11[1]	7[2]	3[1]	25[1]	9
3. Shipbreaking	18	32	32	8	3	—	—
4. Printing	8[1]	3	10	8	9	33[4]	18[2]
5. Tinning of metals	3	1[1]	3	2	2	17	5
6. Other contact with molten lead	12[2]	9[1]	17	16[4]	13[2]	17[1]	30[1]
7. White and red lead works	8[1]	9[1]	21[1]	13[1]	28	44[1]	377[6]
8. Pottery	14[11]	23[10]	14[6]	41[14]	25[12]	78[11]	210[8]
9. Vitreous enamelling	9	23	12	8	2	17	11
10. Electric accumulator works	23[2]	33[1]	58	52	47[2]	31	33
11. Paint and colour works	8[1]	12[1]	6	10	9	17[1]	56[1]
12. Indiarubber works	1	1	2	2	7	3	1
13. Coach and car painting	9[2]	18[3]	14[3]	14[2]	13	70[6]	70[5]
14. Shipbuilding	3	7[2]	10[1]	8	9	21[2]	32[2]
15. Paint used in other industries	11	11	7	16[3]	10[1]	51[2]	50[5]
16. Other industries	14	10	11[1]	11	18[1]	47[3]	122[7]
17. Painting of buildings	75[10]	87[20]	98[21]	90[18]	46[21]	—	—
Phosphorous poisoning	—	—	—	—	—	—	3
Mercurial poisoning	—	4	3[2]	4[1]	5	10[1]	9
Arsenical poisoning	—	2[1]	3[1]	5[2]	3	7	22[2]
Carbon bisulphide poisoning	6	1	—	1	—	—	—
Aniline poisoning	26	41	38[1]	33[1]	—	—	—
Chronic benzene poisoning	1	—	—	1	—	—	—
Toxic jaundice	2[1]	6	3	2	6[3]	—	—
Anthrax	40[5]	45[6]	31[2]	38[3]	48[12]	51[9]	37[7]
1. Wool	16[2]	14[2]	18[1]	15[2]	25[7]	28[3]	10[2]
2. Horsehair	3	4[1]	3[1]	8[1]	5[1]	6[1]	12[3]
3. Hides and skins	20[3]	24[3]	9	12	17[3]	14[3]	9[1]
4. Other industries	1	3[2]	1	3	1	3[2]	6[1]
Epitheliomatous ulceration	165[52]	175[59]	174[49]	187[49]	45[1]	—	—
1. Pitch	53[3]	32	34[1]	49	32	—	—
2. Tar	34[12]	36[19]	24[8]	27[14]	10[1]	—	—
3. Paraffin	4	2[1]	6	2	3	—	—
4. Oil	74[35]	105[39]	110[40]	109[35]	—	—	—
Chrome ulceration	109	70	65	55	126	—	—
1. Manufacture of bichromate	13	3	12	2	77	—	—
2. Dyeing and finishing	24	28	25	33	43	—	—
3. Chrome tanning	1	4	7	2	4	—	—
4. Other industries	71	35	21	18	2	—	—

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

Lead Poisoning.—The number of cases of lead poisoning notified was 244, made up of 231 male adults, 10 female adults, and 3 male young persons under 18 years of age. Excluding those cases occurring among painters of buildings, for the purpose of comparison with previous years, the remaining number, 169, is the lowest recorded since notification under the Factory and Workshop Act came into force, with the exception

of the year 1918—an abnormal year as regards the use of lead in industry. There are no features of special importance or interest to record in many of the industries concerned.

Shipbreaking.—Further trials of a respirator effective against lead fume were made in a shipbreaking yard. · From these it appears quite clear that an effective type of respirator, which will be tolerated by a burner in this industry, has yet to be found. The incidence rate of lead poisoning in the shipbreaking industry seems to follow the potential risk closely ; thus the breaking up of a large, heavily leaded British warship usually coincides with an increase in the number of cases of lead poisoning notified.

Pottery.—The number of cases in this industry, 14, is the same as for 1927 ; eleven of them were fatal. Of these, 4 had been reported in previous years and the cause of death was in nearly every case chronic nephritis, associated in some cases with cerebral hæmorrhage and degeneration of the arteries. Such conditions are manifestation of an intoxication of long standing and not attributable to exposure to lead of recent date.

Electric Accumulators.—It has always been my contention that with whatever strictness regulations are drawn up, their full effect cannot be achieved unless there is close supervision to ensure that they are observed in detail, and in no manufacture is this more important than in pottery and electric accumulators. The action taken by one of the largest electric accumulator works in this country may be said to have confirmed this view. Following the appointment of a whole-time Medical Officer two years ago, no case of lead poisoning has been notified from these works, although numerous cases had occurred previously. The appointment of such an officer indicates at the outset an appreciation by the management of the importance of supervision, which in itself secures special attention to the full observance of the Regulations. Co-operation between the Medical Officer and the management, so essential to produce the best results, has naturally been assured from the commencement, with the gratifying results referred to. Throughout the whole industry there have been only 23 cases recorded. The two deaths occurred in men aged 64 and 59, the cause of death being chronic nephritis. Their employment history shows the extent of their exposure to lead to have been 22 years and 30 years respectively. Although lead is undoubtedly a cause of chronic nephritis it should be remembered that there are other well-established causes for this condition, and the kidneys present no distinguishing features, which makes it possible to state, without question, the exact cause of the nephritis. The precise employment of the cases was as follows :—Casting 1, pasting and mixing 8, lead burning 5, trimming, filing, sawing, wire brushing and cleaning 3, trucking and packing plates 1, assembling 1, melting scrap lead and old accumulator plates 2, other processes (formation, erecting, etc.) 2.

Coach Painting.—The use of leadless fillers and paint in this industry is increasing, but from time to time instances occur such as the following :—

Through information that two women formerly employed in a perambulator factory had symptoms suggestive of lead poisoning, Dr. Overton investigated and found that filling by hand and subsequent rubbing down was being performed by young women in an open room with no special precautions as the filler was said to be "leadless." Clinical symptoms of lead absorption alone or associated with typical changes in the blood, including punctate basophilia, were found in all those who were using this "filler," which proved on analysis to contain 27·2 per cent. soluble lead.

Painting of Buildings.—All the 75 reported cases occurred among male adult workers and were distributed widely over the country, 69 being employed each by different employers. The reports on the notified cases show that, with few exceptions, efforts have been made to comply fully with the Regulations. None of the cases was attributed to paint spraying. In addition to the notified cases there were 4 others reported of men employed in painting bridges.

Carbon Bisulphide.—In the early part of the year I was asked by Mr. Poore, the District Inspector, to visit an Artificial Silk Works with him, as, on the previous day when inspecting this factory he was concerned not only by the conditions existing in the churn room but also by the appearance of the men working there. I examined the three men engaged on the shift and found two of them to be suffering from well-marked symptoms of chronic carbon bisulphide poisoning; the third, who had only worked 10 shifts, was unaffected. Another man, who had been employed in the churn room until three weeks previously, was also examined and found to be more seriously affected. I also visited and examined a man employed on the night shift, who also exhibited marked symptoms. The cause of these unfortunate cases was due to the poor construction of the churns and the method adopted for removing the surplus carbon bisulphide before emptying, which consisted of blowing air into the churn with an escape to outside. The churn lids not fitting accurately the carbon bisulphide was to some extent evacuated into the churn room. Proceedings were taken against the firm for failing to notify the cases of poisoning, and for not providing efficient ventilation, and a conviction recorded.

In view of these cases all the artificial silk works were visited and as many as possible of the churn room men examined. No definite cases of carbon bisulphide poisoning in the other works visited were found, but several cases with some indication of absorption were noted. As a precautionary measure periodic medical examination was arranged for in all the works, and is being continued.

At a subsequent date, at the factory referred to above, a man developed acute mania after working in the churn room for only 17 days, three days after being examined at the routine medical examination. The attack was severe and necessitated his removal to the mental hospital. With the exception of his mental condition there were no other manifestations of poisoning. There was no previous personal or family history of mental disease, so that while the diagnosis of poisoning was difficult, there seems no alternative but to regard it as a case of acute poisoning, the man being possibly very susceptible to this drug. None of the other men working throughout the same period was affected.

Aniline.—The reported cases numbered 26, a reduction of 15 as compared with last year. In spite of the more continuous and higher temperatures prevailing, the cases were fairly evenly distributed throughout the year. There were no fatalities for the second year in succession, and this encourages one to hope that the danger of absorption through the skin, which in the past has been responsible for frequent severe cases of anilism, is now being realised.

The cases occurred in the following processes and call for no special comment :—Making intermediates (D.N.B., D.N.T., T.N.T.), 9 ; making aniline colours and dyes, 7 ; aniline black dyeing, 1 ; paranitraniline powder, 2 ; toluidine, 3 ; splashing of aniline oil, 2 ; others, 2.

Dr. Henry attended an inquest on a man aged 51, employed in a synthetic dye works, who, having been associated with sodium naphthionate for 13 years, and then numerous substances including dinitrochlorbenzene, aniline, phenyl-glycine and formadehyde for 2 to 4 years, contracted cancer of the urinary bladder. The growth was successfully removed, but 14 years later a second primary growth manifested itself, which caused death.

The question whether workers engaged in the manufacture of synthetic dyes are specially liable to cancer of the bladder is one which closely concerns the Factory Department, and arrangements have been made for the Department to co-operate in the research which has been proceeding for some time in connection with this matter. The research is, however, a difficult one and it is not possible to forecast when conclusive results may be obtained.

Chronic Benzene Poisoning.—One case has been notified. The man was employed for two years in a motor works, part of his time on spraying bodies with cellulose paint. Although the symptoms and history were not conclusive, the differential leucocyte count showed a deficiency of polymorphonuclears and an excess of large mononuclears, the blood picture in general being one associated with chronic benzol poisoning. Analysis of the spray paints showed the approximate proportion by volume of benzene and its homologues present to be, in one case 50 per cent., and in the other 35 per cent. The exact proportion of benzol was not determined.

Examination of workers exposed to benzol, xylol and toluol, together with blood films, has been made by Dr. Overton. Up to the present it has not been possible to obtain examples of exposure in industry to pure samples, but it is generally held that xylol and toluol are somewhat less toxic than benzol. A mixture containing benzol (*i.e.*, 84 per cent. benzol, 13 per cent. toluol and 3 per cent. xylol), with acetone and methylated spirit, was found in the manufacture of artificial leather to have given rise to changes in the blood of workers employed for long periods, *i.e.*, 22 and 36 years, although from clinical examination there was little evidence of injury to health. The solvent mixture consisted of 52·6 per cent. benzol (90 per cent.), 15·8 per cent. acetone and 31·6 per cent. methylated spirit. The ventilation in the proofing process admitted of improvement.

" Xylol," probably in this instance a mixture with toluol and benzol, in use for a photogravure process, gave rise to symptoms of nausea and dizziness on the part of young workers in a poorly-ventilated room. No changes in the blood were noted, but the longest period of employment was one month.

" Commercial toluol," given as 80 per cent. toluol, 15 per cent. benzol and 5 per cent. xylol, but evidently varying considerably within these limits, gave rise in a rubber solutioning process with inadequate ventilation to some evidence of ill-health resembling that of chronic benzol intoxication, and examination of blood films confirmed clinical findings.

Toxic Jaundice.—Two cases of toxic jaundice were notified, one due to the inhalation of the vapour of tetrachlorethane terminating fatally; the other from handling trinitrotoluol was a slight case and made a complete recovery.

In the fatal case recorded, the girl, aged 17, was employed in the manufacture of safety goggles. Her work consisted in dipping pieces of celluloid into a solution, subsequently found to contain 30 per cent. tetrachlorethane. She complained that the smell of the solution made her feel ill, and after four weeks' work she was at home a fortnight on account of gastric trouble. On returning to her employment she was put on other work in the same room and within a week or two she developed jaundice. Though still suffering from sickness she continued at work, with occasional days off, for about a further fortnight, when she finally gave up work, becoming rapidly worse and dying ten days later, after a total of 42 working days. Death was due to haemorrhages from the mucous surfaces, chiefly stomach and nose. The liver showed marked atrophy and weighed 26 ozs. Examination of five workers employed in the same room, and others previously employed, was made by Dr. Overton, some of whom had been engaged on the dipping process for several months; but no signs of ill-health were observed. Similar works where there was a possibility of tetrachlorethane being used, were subsequently visited, with negative results.

Anthrax.—The following is a table giving some details of the cases of anthrax arising from contact with wool, horsehair, hides and skins, etc., reported in 1929. The total number of cases is 40, with 5 fatalities, a slight reduction in both non-fatal and fatal cases compared with the previous year.

No.	Locality.	Sex.	Age.	Occupation.	Severity. F=Fatal. R=Recovery.	Situation.	Treatment. E=Excision. S=Serum.	Material.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Wool.								
1	Kilmarnock ..	F	18	Wool spinner	R.	Left side of neck.	E. & S.	East Indian wool (10 parts), home wools (9 parts).	—
2	Dewsbury ..	M.	42	Wet carbonisation of wool and rags.	R.	Left eyelid ..	S.	Raw foreign wools (origin not ascertained) and rags.	—
3	,, ..	M.	18	Scoured yarn doffer.	R.	Right wrist..	S.	English cow hair, woollen waste shoddy, China goat hair and East Indian wool.	East Indian wool infected.
4	,, ..	M.	62	Wool shaker	R.	Left temple..	S.	East Indian wool (Vicanere and Madras).	Madras wool infected.
5	Earlsheaton ..	M.	40	Wool shaker	F.	Right forearm.	S.	Blend containing 10 per cent. East Indian wool (Kandahar, Vicanere, Madras) and 90 per cent. Russian, Siberian, Continental and English cow, calf and goat hairs.	—
6	Liverpool ..	F.	20	Wool sorter..	R.	Right upper arm.	S.	East Indian wool (Vicanere).	—
7	Savile Town ..	M.	25	Wool spinner	R.	Chin.. ..	S.	Blend containing 70 per cent. English wool and 30 per cent. East Indian wool (Vicanere and Kandahar).	—
8	Heckmondwike	F.	16	Twister ..	R.	Right forearm.	N.A.B.	Irish wool, German skin wool, 8 per cent. East Indian wool (Vicanere).	—
9	Saltaire ..	M.	57	Top warehouseman.	R.	Forehead ..	S. & N.A.B.	Mohair, camel hair, alpaca and merino tops.	—
10	Heckmondwike	M.	49	Willeyer ..	R.	Forehead ..	S.	East Indian wool (Vicanere), white China wool, grey Russian wool, English locks.	—
11	Dewsbury ..	F.	28	Wool feeder	R.	Right wrist..	S.	Blend containing East Indian wool, shoddy, English cow hair, German wool.	—
12	Kilmarnock ..	F.	17	Yarn bundler	R.	Left forearm	E. & S.	Carpet yarn made from East Indian, Home and blended wool.	—
13	Liverpool ..	F.	45	Wool packer	R.	Right lower jaw.	S.	East Indian wool (Vicanere).	—
14	Kidderminster	F.	25	Yarn winder	R.	Right forearm	S.	Finished blended yarn (English and East Indian wool).	—
15	,,	M.	42	Carpet weaver	R.	Left leg ..	S.	Wool yarn (East Indian and Colonial wool).	—
16	Liverpool ..	M.	63	Wool warehouseman.	F.	Neck	S.	East Indian wool.	—

No.	Locality.	Sex.	Age.	Occupation.	Severity. F=Fatal. R=Recovery.	Situation.	Treatment. E=Excision. S=Serum.	Material.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Horsehair.								
1	Chesham ..	M.	22	Stoker in brush factory.	R.	Left eyelid ..	Not stated.	Not ascertained.	—
2	,, ..	F.	23	Brush filler ..	R.	Right forearm	E. & S.	Chinese bristles.	—
3	Stockport ..	M.	17	Hackler ..	R.	Left forearm	S.	Russian, Chinese and French bristles, South American horse-hair, Fibre.	Russian bristles infected
	Hides and Skins.								
1	Warrington ..	M.	53	Unhairer and scudder.	F.	Chin.. ..	S.	China (Hankow) hides.	—
2	Bermondsey	M.	42	Flesher ..	R.	Left side of neck.	E. & S.	Dutch and Saxony goat skins.	—
3	Street, Som...	M.	52	Lime jobber	R.	Neck ..	S.	West African (Nigeria) and East African (Mombassa) goat skins.	—
4	Worcester ..	M.	18	Unhairer ..	R.	Back of neck	S.	English, South American and Cape hides.	—
5	Runcorn ..	M.	29	Lime haulier	R.	Right eyelid	S.	East African (Mombassa, Abyssinia), Cape and South American hides.	—
6	Warrington ..	M.	36	Unhairer ..	R.	Left eyelid ..	S. & Stabil-arsin.	Buffalo hides from Singapore, Saigon, Siam, Hongkong, Canton, Algeria, Cape and Mombassa.	—
7	Runcorn ..	M.	26	Tanyard labourer.	F.	Right side of neck.	No special treatment.	Madagascar, East and West African, Cape, Australian, Mombassa and Nigerian.	—
8	Worcester ..	M.	40	Tanyard labourer.	R.	Chin.. ..	S.	South African sheep skins.	—
9	Warrington ..	M.	26	Unhairer ..	R.	Left side of neck.	S. & Stabil-arsin.	Buffalo hides from Singapore, Saigon, Siam, Hongkong, Canton, Algeria, Cape and Mombassa.	—
10	Runcorn ..	M.	23	Tanyard labourer.	R.	Right forearm	S.	Mombassa, Abyssinia, South America, English and Hankow (China) hides.	—
11	Bermondsey	M.	15	Trimming offal in lime yard.	R.	Right eyelid	S.	Hankow (China) hides, Columbian, Venezuelan.	—
12	Westbury ..	M.	40	Soaking skins	R.	Right side of neck.	E. & S.	Indian and West African goat skins.	—
13	Bermondsey	M.	42	Warehouse-man.	R.	Right angle of jaw.	S.	Cyprus sheep skins, Syrian goat skins.	—
14	Warrington ..	M.	52	Lime yard worker.	R.	Left cheek ..	S. & Stabil-arsin.	Cape, Mombassa, Abyssinia, English and China. (Hankow).	—
15	Derby ..	M.	22	Tanyard labourer.	R.	Right side of neck.	S. & N.A.B.	Indian and African goat skins.	—
16	Runcorn ..	M.	14	Apprentice fitter.	R.	Face ..	S.	Abyssinian, Karachi, Madagascar, Australian and South American.	—
17	Warrington ..	M.	60	Tanyard labourer.	R.	Left side of face.	S. & Stabil-arsin.	Saigon and China	This man subsequently died from Stabilarsin poisoning.
18	Leeds.. ..	M.	46	Tanyard labourer.	R.	Left lower jaw	E. & S.	Arabian and Mombassa goat skins.	—
19	Hull	M.	15	Cleaning hides	R.	Left forearm	E. & S.	English, Dutch and German hides.	—
20	Selkirk ..	M	38	Fellmonger..	F.	Ear	Not stated.	Scotch sheep skins	—
	Other Industries.								
1	Barnwell, Leicester.	M.	31	Heel polisher in boot factory.	R.	Forearm ..	E. & S.	Not definitely ascertained; probably tanned leather.	—

Wool.—Reference to the table shows the association of East Indian Wool in all but two of the 16 cases. In one of the two fatal cases there was definite delay in obtaining treatment. In another case, fortunately not fatal but very severe, there was a delay of three days before the patient sought expert treatment at hospital.

Horsehair.—Three cases were reported, none of them being fatal. The number of cases from horsehair has been consistently small for several years.

Hides and Skins.—From the handling of hides and skins 20 cases arose, three of which were fatal. Two of these latter cases call for some comment. In the first case the patient observed the pimple on a Friday but did not obtain medical advice until the following Monday. On the Saturday afternoon the man had been sufficiently well to play football. Such a case well illustrates the difficulty, even by constant warnings and notices of impressing upon workers the risks run by neglecting the early signs, even though not accompanied by constitutional symptoms. The other case was treated by serum and Stabilarsin, the latter being administered owing to the patient rapidly becoming worse in spite of the serum. Some four weeks later he developed acute exfoliative dermatitis with nephritis, and was re-admitted to hospital, dying in the course of a few days.

Dr. Jordan Lloyd and Dr. Madge Robertson, of the British Leather Manufacturers' Research Association, have continued their work on the disinfection of hides. A very long series of test experiments has been carried out on a laboratory scale, and disinfection experiments on a works scale have also been undertaken, so far with some degree of success, but much remains to be done. Efforts to find an effective method of disinfection have not been confined to this country, but experiments have been continued in other countries, where the problem is perhaps even more acute—notably on the Continent by Professor Ottolenghi, of Italy.

Professor Collis attended a meeting of the Anthrax Disinfection Committee at Geneva, when the progress made and other matters were considered. One of these was a method of determining the infection of a hide with anthrax, devised by Ascoli and Belfanti. During the summer I had an opportunity of discussing this method with Professor Hailer in Berlin. While the possibility of determining the infectivity of a hide is of considerable importance, the application of such a test would not appear to be of value until a method has been established of dealing with hides found to be infected. It can be stated that, as regards the actual disinfection of hides, there are many ways of effecting this, but so far none has been found which will not destroy the commercial value of a large percentage, especially of those most liable to be infected. Whether a process will eventually be found which will disinfect all qualities of hides

throughout, and at the same time will not affect their subsequent manufacturing value, is, I consider, open to doubt. It may be that in the end it will be necessary to have recourse to disinfection limited to the surface of the hide. There is no doubt that if some suitable surface disinfection could be devised, the risk of handling infected hides would be reduced. In this connection it is worth noting that in one large tannery where hides particularly liable to be infective are handled, an effort is being made to reduce the risk of anthrax by treatment with mercuric chloride. The hides are put into a soaking pit containing an acid solution of mercuric chloride and salt. The proportion of mercuric chloride is 1½-lbs. to 3,000 gallons of water. The hides are left in soak for about three days. It is claimed that the brine breaks up the blood clots and that the concentration of mercuric chloride is sufficient to kill any anthrax spores. It has no deleterious effect on the hides.

In another large tannery in this country imported dried hides are being put, without previous soaking, through the warm sulphide lime liquors recommended by the British Leather Manufacturers' Research Association as a routine procedure in one of the tanning processes employed in the works. The leather made by this process is of good quality.

Chrome Ulceration.—The number of cases of ulceration of the skin due to chrome is larger than in previous years. The increase of chromium plated articles of all sizes and descriptions must be apparent to all who note the finish of metal parts of motor cars and house furnishings, and it is from this source that the cases have mainly arisen. The effects of chromic acid or chromium compounds are local, affecting either the skin or mucous membrane. With due care on the part of the employer and the employed, the localised effects on the skin and mucous membrane can be to a great extent avoided. The precautions necessary may be summed up as follows :—Localised exhaust ventilation to remove dust or spray; suitable protective clothing, and attention to all minor accidents. As an illustration of the necessity of exhaust ventilation being maintained efficiently, Dr. Merewether reports as follows :—

> An outbreak of ulceration of the nasal septum due to chromic acid, affecting nearly all the workers in the plating room, occurred at one works in the autumn. Of 17 workers whom I examined, 14 showed effects of chromic acid on the nasal septum, nine having definite ulceration, and one a large perforation. The outbreak followed the transference of the chrome plating department to new premises, where, at first, the exhaust ventilation was not always efficient owing to electrical causes and the effect of high winds on the outlet of the exhaust system to the open air. It seems, however, that the proximate cause of this outbreak was a blow-back of chromic acid laden air through the exhaust duct connected with a plating tank. As the tank was empty the fan connected with it had been stopped, allowing a blow-back from an exhaust trunk common to several plating tanks. This persistent leakage was not appreciated for some days owing to the absence on leave of the chemist in charge.

A Code of Regulations dealing with this new industry is in course of preparation.

Cases of chrome ulceration in the manufacture of bichromates with one exception, occurred in the first six months of the year at a factory commencing manufacture.

A cutting fluid to prevent encrustation of debris from surface grinding on cast iron, introduced from abroad, was tried by one firm. This solution contained a small percentage of potassium bichromate. After a fortnight the man engaged developed ulceration of the skin.

Epitheliomatous Ulceration.—The distribution of the cases in relation to the causative agent is given in the following table :—

Causative Agent and Industry.	1925.	1926.	1927.	1928.	1929.
Pitch and Tar :—					
Patent fuel works	25^{3}	27	20	20	27^{1}
Tar distilling	23^{4}	18^{3}	14^{1}	23^{4}	36^{3}
Gas works	9^{2}	15^{9}	14^{5}	17^{13}	16^{10}
Other industries	6	16^{2}	10^{3}	8^{2}	8^{1}
Paraffin :—					
Shale oil works	4	2	6	2^{1}	4
Mineral oil :—					
Cotton mule spinning ..	78^{35}	88^{20}	101^{31}	101^{36}	54^{24}
Other industries	15^{11}	21^{15}	9^{9}	4^{3}	20^{11}
Total	160^{55}	187^{49}	174^{49}	175^{59}	165^{50}

The long period which elapses in some cases between contact with known carcinogenic substances and the appearance of the disease, makes it by no means an easy matter in all cases to determine whether or no the disease can be ascribed properly to such contact. While every effort is made to ensure only the inclusion of cases strictly reportable, a few may be incorrectly included. Further, the early recognition of papillomata at the voluntary periodic medical examinations made at a number of works—and this year this examination has been extended to a number of Tar Distilleries—has led to the notification of these papillomata. Proof of the malignancy or otherwise of all of these has not been possible, treatment otherwise than by excision rendering examination impossible. Unless the growth has been examined and found to be benign, the case has been included. On the other hand, it is obvious that cases are not reported which might unquestionably be regarded as due to employment, and information of these cases is only obtained when the returns of deaths from this cause are received. The number so recorded

has gradually decreased in so far as they occur in the well-recognised employments, and it is hoped that with an increasing recognition of the causation of the disease they will become negligible and all cases reported during life. A slight decrease in the total number of cases is shown this year, and a very considerable one in those due to oil—a result, one would hope, of detection and treatment of the early condition in previous years.

Efforts to establish a periodic medical examination in the patent fuel industry have continued. This examination, it is hoped, will be commenced at an early date. One case among these workers is of special interest. The man, aged 52, gave a history of dust containing pitch entering the right eye in the early part of 1926, and had had trouble with his eye on and off since that date. He was first seen by Dr. Tudor Thomas*, of Cardiff, who found greyish white patches, one on the cornea, one on the inner limbus, and one on the bulbar conjunctiva. He was kept under observation and in September, 1929, Dr. Tudor Thomas operated and dissected away the growth, which was examined and showed microscopical appearances having some similarity to those found in pitch warts.

The greater number of cases in the Tar Distilling industry may be accounted for by the detection of growths, some unfortunately severe, at the first periodic medical examination, previously referred to as having been instituted.

The Factory Department have, up to the end of 1929, records of 920 cases of skin epithelioma in cotton mule spinners, 758 (82·3 per cent.) in spinners who were still employed in the mule room when the disease was recognised, 36 (3·9 per cent.) in spinners who had retired before recognition, and 126 (13·6 per cent.) in ex-spinners who had passed into other employment for 1 to 30 years.

The period of delay from the time when the irritant ceases to be applied to the time when the disease manifests itself is not recognised as occurring in animals by experimental pathologists, and it may serve a useful purpose to study it in human beings by examining in detail some of the above cases.

In 27 of the 36 cases in retired spinners, the records of duration of retirement are complete, the average duration of retirement being 4 years (1 to 16), and the average duration of previous employment in the mule room 52·3 years (33 to 63).

The following is an example of a primary growth being recognised during employment in the mule room, while a second primary growth occurred after retirement :—cotton mule spinner 46 years—epithelioma of scrotum (right)—unemployed

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* *See* the Proceedings of the Royal Society of Medicine, Vol. XXIII, No. 3, pages 288 and 289.

3 years—epithelioma of leg (left); while the following is an example of a primary and second primary growth occurring after retirement:—cotton mule spinner 45 years, retired 8 years —epithelioma of forearm (right) and one year later epithelioma of scrotum (right).

Dr. Henry examined 6 workers employed in the manufacture of oil gas for lighting railway carriages for periods varying from 11 to 43 years, and noted acneiform folliculitis in 3, and keratotic areas on the skin of the forearms, which was generally thickened, in 3. The mineral oil used was mainly composed of shale oil, and two cases of skin cancer in similar workers were notified during the year.

Dr. Henry also investigated a case of epithelioma of the left hand in a machine minder at a rope works in contact with mineral lubricating oil on a compound rope-making machine.

Dermatitis.—Special inquiry has been made into several processes in which the incidence of dermatitis appeared high. Thirty-one firms were visited and nearly 150 workers on lithographic processes (including photo-lithography) examined by Dr. Overton in an inquiry into dermatitis among lithographic printers. About 7 per cent. were found to have dermatitis, the chief processes involved being transferring, photo-lithography and litho-machine printing. The majority of the cases were probably caused by contact with chromic acid or compounds of chromium, while several were caused by the use of paraffin and turpentine. By the co-operation of the Joint Industrial Council of the Printing Industry the practical results of this inquiry have been circulated.

Dermatitis in photographic work has been the subject of an investigation, which showed that the handling of " acid hypo " in solid form is liable to cause injury to the skin, while " metol " dermatitis may be avoided by those who are not especially susceptible, by washing off splashes with a dilute mineral acid. Soap with free alkali should not be used for this purpose.

Dr. Overton has found dermatitis to be fairly common among tobacco workers on a " stripping " process. The use of an implement to aid the work materially reduced the incidence. Dermatitis among " strippers " is now more common than in the manufacture of roll tobacco, due chiefly, perhaps, to an increase in the former work, which is both relative and absolute.

A questionnaire as to the incidence of dermatitis among bakers and flour confectioners was circulated by the Joint Committee of the Baking Industry, representing employers and operatives. An analysis of returns did not contribute any new factor to the question. Dr. Overton attended Conferences of this Committee to consider the subject of dermatitis. The feeling of the Committee was that while the Bakehouses Welfare

Order had improved conditions of work and had promoted knowledge of dermatitis, further research as to the exact causation of the complaint was desirable.

This year there have been, voluntarily reported, 834 cases of dermatitis—77·7 per cent. of these among males. The number of cases of dermatitis reported in this way shows an increase year by year.

Cases of dermatitis among painters, varnishers, enamellers and lacquerers include a number of workers who have had more than one attack and a high proportion of elderly subjects. Many of the operations could be performed in gloves to avoid soiling the hands, and it has been found that where these are not practicable a thin film of vegetable oil on the skin before starting work facilitates very considerably satisfactory cleansing of the hands with no other aid but soap and water.

Oil dermatitis is very prevalent where the skin and clothing of the worker are daily soiled by the cutting lubricants and cooling liquids used in engineering. It has always been realised that cleanliness is the only satisfactory defence against this oil "acne," but only recently a high standard of cleanliness has been made easier and quicker of attainment by the worker. An alkaline antiseptic wash (similar to the Liq. Chlorinated soda with boric acid (B.P.C.)) if used to remove oil from the skin, in a dilution (1–10) has proved very efficacious in preventing oil dermatitis, for the oil is removed more thoroughly by the alkalinity of the lotion than is possible by a superficial wash in soap and water, while its antiseptic qualities are invaluable in counteracting the effect of injuries which render the skin more vulnerable to the onset of dermatitis. Buckets of such an alkaline antiseptic liquid, in warm water, can be provided with advantage in the wash-houses twice daily, and the use of it followed by washing with soap and water.

The value of regular inspection of hands and arms for dermatitis and neglected cuts has been proved repeatedly, while one large engineering firm stated "by this means we were able to detect many minor troubles before they developed, and since we have instituted this inspection there has only been one case of lost time due to dermatitis."

It only remains to reiterate that dermatitis may be prevented in a very large number of instances by close and daily attention to

(1) Cleanliness, effected by non-irritating substances.
(2) Prompt First Aid treatment of injuries.
(3) Periodic inspection of hands and arms.
(4) Use of a lanoline and vaseline ointment at night, and where work permits, before work.
(5) The use and care of protective gloves where provided.

The following lists give the incidence of dermatitis calculated as a percentage of reported cases, due to the more important causative agents, together with the occupations of those affected.

Causative Agents.

	1929.	1928.	1927.	1926.	1925.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Alkalies	18·8	19·5	13·7	12·1	6·7
Oil	12·5	9·8	11·2	7·6	6·3
Dyes	4·9	4·8	6·5	7·1	10·1
Acids	3·7	2·4	6·5	4·1	5·4
Sugar	7·8	7·7	6·1	8·7	5·4
French polish	2·0	1·2	5·5	9·4	5·1
Paraffin	3·0	2·2	5·2	3·2	3·9
Turpentine and substitutes ..	8·0	10·0	6·2	7·1	9·5
Dough	3·6	6·0	4·0	11·4	6·2
Accelerators	1·3	1·1	3·6	1·6	1·8
Petrol and naphtha	1·2	2·6	2·8	2·0	·9
Lime	—	—	1·6	·9	3·0
Wood dusts	·5	1·1	1·6	·7	1·5
Methylated spirit	1·2	1·4	1·3	·9	·3
Nickel compounds	2·0	2·0	1·3	3·0	—

Industries.

	1929.	1928.	1927.	1926.	1925.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Engineers	13·6	16·3	15·4	11·5	11·9
Chemical workers	6·9	5·6	9·9	5·5	5·0
Dyers and calico printers, etc.	6·5	7·5	8·8	7·1	12·5
French polishers and stainers	4·8	6·8	7·2	10·2	5·8
Rubber workers	2·3	4·4	5·9	3·0	2·6
Labourers	3·7	4·7	4·2	6·7	9·6
Platers	6·4	7·1	4·0	6·9	4·4
Metal workers	3·2	2·4	3·6	2·5	3·5
Bakers and confectioners ..	6·0	8·8	6·2	11·4	6·1
Painters	10·3	6·9	3·4	6·4	—
Cotton workers	·6	1·5	3·4	2·1	1·7
Sugar confectioners	4·4	3·9	2·1	3·0	2·0
Woodworkers	·6	1·0	2·1	·7	2·4
Biscuit makers	1·4	·6	·4	2·8	·9

Silicosis.—The coming into force of The Various Industries (Silicosis) Scheme, 1928, on the 1st February, 1929, has been the means of bringing to the notice of the Department a number of cases of total disablement and death from silicosis or silicosis with tuberculosis.

The cases arising in the Pottery Industry are of special interest because of the number of processes in the industry in which cases have occurred. These are shown in the following table :—

Process.	China.	Earthenware.				Total.
		General.	Tiles.	Sanitary.	Electrical.	
Flint-millers	—	1[1]	—	—	—	1[1]
Flint-millers' labourers ..	—	2[2]	—	—	—	2[2]
Sliphouse	—	1	1	—	—	2
Potters' shops :—						
Turners	3[1]	—	—	—	—	3[1]
Pressers and casters ..	1[1]	13[4]	3[1]	8[1]	—	25[7]
Jiggerers and jolliers ..	—	6[3]	—	—	—	6[3]
Plate makers	1[1]	1	—	—	—	2[1]
Dish makers	—	3	—	—	—	3
Saucer makers	1[1]	1[1]	—	—	—	2[2]
Cup makers	—	1	—	—	—	1
Handlers	—	2	—	—	—	2
Tower	—	1	—	—	—	1
Biscuit placers	1	2[1]	—	—	1	4[1]
Biscuit oddmen	2[1]	—	—	—	—	2[1]
Biscuit warehouse	1	—	—	1	—	2
Glost placer	—	1[1]	—	—	—	1[1]
Tile slabbers..	—	—	2	—	—	2
Polishers and grinders ..	—	3[1]	—	—	1	4[1]
Totals	10[5]	38[14]	6[1]	9[1]	2	65[21]

The raised figures indicate fatal cases.

Asbestosis.—The inquiry into the effects on the lungs of workers exposed to the dust of asbestos was completed by Dr. Merewether. The following is a brief summary of the main features of the report :—

The prime object of this inquiry, of which fuller details are published elsewhere*, was to determine what pulmonary affections, if any, workers exposed to the inhalation of asbestos dust are more prone to contract than the general population.

The essential distinction between the fibrous silicate minerals commercially known as asbestos, and the minerals known to cause true silicosis is that, in the former, the silica is found combined with metallic bases, and not free as the dioxide (SiO_2). This distinction, and the fact, amongst others, that an excess death-rate from pulmonary tuberculosis has not been shown to be associated with occupations involving exposure to dusts containing silica in the combined, as opposed to the free form, have led to this great class of industrial dusts being dismissed as comparatively innocuous. Amongst this class,

* Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry. H.M. Stationery Office, 1*s.* 3*d.* net.

however, the varieties of asbestos form a small group with many curious attributes, not the least of which is the crystalline nature and the infinite sub-divisibility of the component spicules. For these reasons it was evident that great care must be exercised to avoid attributing to asbestos dust effects due to recent or remote exposure to other dusts, especially those containing free silica. By elimination of processes in which mixed dusts were encountered, and a meticulous enquiry into the entire medical and industrial history of each individual examined, it was possible to eliminate this and other more obvious sources of error.

Of the 374 workers of both sexes examined, 105 were found to have a diffuse fibrosis of the lungs attributable to the inhalation of dust. Ten of these, and one other in which there were earlier signs of the same condition, were excluded, inasmuch as it was felt that previous work in other dusty occupations might have been the prime or a contributory factor in the development of the pulmonary lesions found. Thus, 95, or 26·2 per cent. of 363 workers showed a definite fibrosis due to asbestos dust, while in addition 21, or 5·8 per cent., showed precursive signs of this disease. It was not, of course, feasible to obtain technically sufficient radiograms of the chests of all of the 374 workers examined, derived as they were from factories scattered over the country, some in districts remote from a radiological centre ; therefore, a number (133) of those examined clinically, were radiographed.

The selection of workers for radiographic examination was dictated by the needs of the situation, with the object of elucidating material points germane to the investigation, e.g., the elucidation of complicating lesions, in measuring the extent and progress of the disease and locating the point at which the earliest radiographic signs appear, and finally as a check on the human factor presented by the examiner himself. Since the original observations were made, certain of the cases examined have come to autopsy and the existence of the diffuse fibrosis previously diagnosed, confirmed.

Of the 133 radiographed, 62 presented radiographical signs of a diffuse fibrosis, and in a further 25 there were suggestive radiological changes not definitely diffuse fibrosis. In 10 of the former group and 3 of the latter the changes were possibly referable to prior work in other dusty occupations or to other cause, and they were therefore excluded, leaving 52 cases of fibrosis, and 22 with signs suggestive of early changes in the lungs due to asbestos—sufficient radiological confirmation.

The distribution of the 95 cases of asbestos fibrosis was further examined in respect of age, length of employment and process in which the worker was longest employed, and it became evident that the risk of fibrosis varies directly as the length of employment and hence the length of exposure to dust, and is unaffected by the age of the worker.

Although no definite case of fibrosis clearly due to asbestos dust was found amongst workers with less than 5 years' exposure, the possibility of such cases occurring with exposure to high concentrations of dust could not be ruled out. Of those employed for longer periods the incidence rates ranged from 25·5 per cent. in the 5–9 years' period, to 80·9 per cent. in the 20 years' and over group. The disease may be fully developed after from 7 to 9 years' exposure and be the cause of death after about 13 years' exposure, exceptionally in a shorter period.

There is no doubt that fibrosis of the type produced by asbestos can of itself lead to complete disablement and finally to a fatal termination, and this in the absence of a superadded tuberculous infection.

Particulars were collected up to the end of 1929 of 10 cases in which an advanced degree of the asbestos fibrosis without tuberculosis was the primary cause of death. In 9, the cause of death was verified by post-mortem examination, and in the tenth, repeated clinical, radiological and sputum examinations confirmed the diagnosis. It is not suggested that these few fatalities, in which the cause of death has been verified by strict enquiry, are any criterion of the true effect of the disease on the mortality rates of asbestos workers. Others are known to have occurred in which the existence of the asbestos fibrosis had been determined in life, but no post-mortem examination was possible.

The relative dustiness of a number of processes was estimated by means of the Owens' Jet Apparatus, and the effect of local exhaust ventilation and damp methods in reducing the dust content of the air of the workrooms illustrated. The investigation disclosed no outstanding susceptibility to pulmonary tuberculosis either amongst asbestos workers as a class, or amongst the cases of fibrosis. It should be noted, however, that only employees at work were examined, and the onset of pulmonary tuberculosis in a lung already the seat of fibrosis produces an exacerbation of symptoms, previously unnoticed or disregarded, and causes the worker to consult his doctor, and to seek a non-dusty occupation. There is thus a drift of such cases from the fibrosis producing industry. On the other hand, while there is no evidence of an increased liability of asbestos workers with fibrosis to contract pneumonia, broncho-pneumonia, or other acute respiratory infection, the existence of a clinically recognisable degree of the asbestos fibrosis in any individual is an adverse factor in the prospects of recovery from these respiratory infections.

The outcome of this enquiry is to establish, without doubt, the occurrence of a definite type of fibrosis, differing in character from that produced by free silica dust, and giving a radiological picture distinct from that of true silicosis and that the damage to the lung is much greater than it appears to be, judged by the silicotic standard. The asbestos fibrosis is much more diffuse: it spins its fine web, as it were, criss-cross throughout the lung, enveloping and eventually strangling the ultimate lobular

structure, rather than depositing itself in numerous more or less isolated foci as in silicosis. Thus, at any rate in the less advanced stages, the radiological picture does not impress the eye, unconsciously viewing it from the standpoint of silicosis. It is true that the radiographic picture may show soft and fairly coarse nodulation, but it is never so impressive as the nodulation in the silicotic film. Paradoxically, the distinctive feature both clinically and radiologically, of the absestos fibrosis is its uniformity; the unobtrusive, but diffuse impairment of the percussion note; the homogeneous stippling of the skiagram, are all fragments of an entity, unmistakeable when assembled, but enigmatic when divorced.

Fumes and Gases.—The reported cases of gassing are given in the table below, showing a comparison with former years :—

	1925.	1926.	1927.	1928.	1929.
Carbon monoxide	118^{10}	101^{6}	88^{4}	81^{9}	113^{10}
(*a*) Blast furnace	25^{6}	9	13	22^{8}	25^{5}
(*b*) Power	34^{1}	32^{2}	19^{1}	20	55^{3}
(*c*) Coal	26^{2}	26^{1}	38^{2}	14	21^{1}
(*d*) Other	33^{1}	34^{3}	18^{1}	25^{1}	12^{1}
Carbon dioxide	10^{2}	4	3	8^{1}	—
Sulphuretted hydrogen ..	4	3	9	9^{3}	7^{2}
Sulphur dioxide	3^{1}	2	5^{1}	10	6
Chlorine	12	13	14	17	14
Nitrous fumes	10^{2}	5^{1}	7	6^{1}	11^{2}
Ammonia	5	5^{1}	5	12^{1}	18
Benzol, benzine, naphtha and petrol	3^{1}	4^{1}	7^{2}	7^{2}	7
Other (ether, acetone, nickel carbonyl, etc.)	35^{3}	17^{1}	23^{2}	17^{2}	36^{1}

The raised figures relate to deaths.

Carbon Monoxide.—The number of cases is higher this year than for many previous years, the reason being due to cases which have occurred at a large works where water gas is used. Accidents from carbon monoxide are often very difficult to avoid, and while the number of fatalities is not high, the possibility of many non-fatal accidents becoming so is apparent. Accidents of this class can only be avoided by the greatest care and supervision. Workers must have impressed upon them the necessity of making every use of the appliances available—breathing apparatus, rescue lines, etc. "Familiarity breeds contempt", and employers should realise that workers, in order to carry out necessary work, often take risks, they would hesitate to do, if warned fully of the dangers. There is no accident more tragic than a fatal gassing by carbon monoxide, because, almost invariably, one has the feeling that with foresight it could have been prevented. Unfortunately, one man, overcome by carbon monoxide gas, in doing some simple job, jeopardises the lives of other men who attempt rescue. It is not sufficient to have appliances for rescue or resuscitation available; the workers

should be instructed in their use. Every accident of this character, even slight cases, should be carefully inquired into by every person responsible and by those who actually do the work. In such a way a better sense of the danger of ordinary jobs would be established. If the results of such an inquiry had the fullest publicity, then those engaged on similar work might be in a position to anticipate and provide against similar accidents.

Blast Furnace Gas.—There were 25 cases reported, 5 of which were fatal. Of these, 12 (1 fatal) were due to escape from gas mains, valves, water seals, etc.; 5 (2 fatal) to escape from the furnace; 5 (1 fatal) to charging the furnace; and 1 fatal case to escape of gas into a boiler which deceased was cleaning out.

Power Gas.—Fifty-five cases (3 fatal) were reported, of which 28 occurred at a water gas plant recently installed by a large firm of chemical manufacturers. Of the remaining cases 12 (2 fatal) were due to attending, repairing or cleaning work; 6 to escape from leaky pipes, valves, flues, water-seals, etc.; 3 (1 fatal) to starting up the producer, and 2 to charging the producer.

Coal Gas.—Of the 21 cases (1 fatal) reported, 3 were due to removing oxide from the purifying boxes; 3 to repairing a gas main; 2 (1 fatal) to repairing inside a gas holder; 3 to escape from leaky pipes, valves, etc.; and 2 to escape from gas jets.

Other sources of CO.—Of the 12 cases (1 fatal) reported, 4 were due to fumes from coke rivet fires in confined spaces; and 2 to exhaust fumes from motor omnibus engines. The fatality occurred to a man who was found dead inside a furnace flue which was being dried by lighted fires, the main damper being closed so that the fumes could not escape.

Sulphuretted Hydrogen.—The 5 non-fatal cases were due to escape of H_2S in gasworks; 3 of them in emptying purifiers. The 2 fatal cases were of an entirely different character and affected 3 men engaged on the enlargement of a cesspit on factory premises. The hydrogen sulphide gas accumulated during the night and arose from the decomposition of organic matter. No tests were made before descending the pit in the morning, and the first man to descend was immediately overcome and fell from the bucket in which he was being lowered. Brave efforts were made at rescue, and in these attempts another man also lost his life.

Chlorine.—Fourteen cases were reported, none of which was fatal. Four of these were due to escape in artificial silk works; 3 to escape from bleach plants; and 2 to escape from a chlorine cylinder.

Nitrous Fumes.—Of the 11 cases (2 fatal) reported, 5 (1 fatal) were due to escape from nitric acid plant, 2 to escape from nitration plant; and 3 cases (1 fatal) to evolution of nitrous

fumes in cleaning copper or brass with nitric acid. In the fatal case a sponge respirator was provided. It cannot be too strongly emphasised that no protection is afforded by such a respirator.

Ammonia.—Eighteen non-fatal cases were reported, 12 being due to escape from a new ammonia plant in a large chemical factory, and 3 to escape from refrigerator plants. At the factory where the 12 cases occurred, special precautions are taken and a safety service established, which includes the supervision of all breathing apparatus, and safety officers to supervise all work in which danger from this gas is likely to arise.

Nickel Carbonyl.—Six cases of poisoning by nickel carbonyl occurred at one works. Fortunately, none of the cases was serious and no permanent injury to health resulted, and the steps taken by the firm appear to be such as will prevent the possibility of a recurrence. The Medical Officer, Dr. Amor, has kindly sent me the following notes :—

> The management held an inquiry into the origin of the trouble. It was possible to exclude the liberation of free carbonyl from the main on account of :—
>
> (1) The tests made immediately prior to opening up.
> (2) The length of time it had been under inert pressure.
> (3) Only those men working on the cleaning and dismantling of the main were affected, men working on other parts of the same floor were unaffected.
>
> The conclusions arrived at pointed to the dust in the main as being the cause. There is definite experimental evidence to prove that matte may retain in a state of adsorption a quantity of carbonyl, which varies directly with the pressure and concentration, and within certain limits inversely with the temperature, being completely dissociated at the temperature at which matte fires. Whilst it may seem unnecessary to draw an arbitrary distinction between carbonyl poisoning per se and the inhalation of " active matte," the differences in the site of action, *i.e.*, pulmonary alveoli mainly in the inhalation of gas and the bronchi and finer bronchioles in the case of active matte seem to merit this. Active matte, however, may, and does, liberate its adsorbed carbonyl, but the quantity is very small.
>
> All the men complained of headache, retrosternal soreness, and inability to take a deep breath. In one case the retrosternal soreness was complicated by the complaint of a throbbing at the root of the neck. A dry purposeless cough was present in all, a bout of coughing tending to the production of slight cyanosis in one case. In no case was dyspnoea a marked feature except that during the period of convalescence one man complained of palpitation and slight shortness of breath. Epigastric pain and tenderness on deep palpation were present in three of the cases, one man developing a slight icteroid tinge of the conjunctivae on the sixth day. Apart from the headache there were no marked symptoms or signs of involvement of the nervous system except the complaint that two men had " wanderings of the mind " during the night, and that one of these suffered with marked depression for two or three days.
>
> Two cases ran a pyrexial course, the temperature being under 102° F. in both. With the exception of one man, all ran a pulse rate for three or four days varying between 90 and 110. The exception showed evidence of bradycardia for three days, the pulse rate being about 60. There was no evidence of myocardial disease in this man. The typical picture of marked pulmonary involvement was not present in any case, neither was there any haemoptysis. All showed evidence of involvement of the finer bronchi and bronchioles by the presence of fine ronchi both on inspiration and expiration. The classical signs of harsh inspiration and prolonged expiration at the apices with generalised crepitations were not present. There was no pleural involvement. The sputum was extremely scanty and purely of a mucoid nature. The reflexes in all cases were normal. There was no evidence of any

gastro-intestinal affection. The examination of the urine is interesting as all cases excreted a minute quantity of nickel, though there was no complaint of renal pain. In two cases there was a marked deposit of urates, and in one of phosphates. All were acid and none showed the presence of either albumen or sugar. The blood reactions for nickel were negative.

The differential blood counts were as follows :—

Case.	1. Per cent.	2. Per cent.	3. Per cent.	4. Per cent.	5. Per cent.	6. Per cent.
Polymorphs ..	57	57	64	71	67	72
Eosinophiles ..	5	7	1	4	3	4
Basophiles	0	0	0	0	0	0
Lymphocytes S ..	34	29	31	20	24	20
,, L ..	4	7	3	3	4	3
Mono-nuclears ..	0	0	1	2	2	1

In future, when any work out of the ordinary routine is to be undertaken on the plant, a gas-free report is to be given by the Medical Officer to both Engineering and Process Departments, prior to the opening up of such plant. When carbonyl mains are to be cleaned, it must be assured that the matte dust therein is fired, and a sample taken to ensure its freedom from occluded carbonyl.

Trichlorethylene.—A severe case of poisoning by trichlorethylene arose in cleaning out the residue of a small tank in which this material had been used. The operation had been previously performed without ill-effects, and the firm, unaware of the narcotic properties of trichlorethylene, had not taken steps to prevent the inhalation of the fume. In cleaning out such tanks, unless they are previously adequately ventilated, the worker should be protected with a helmet connected with a fresh air pipe line.

Crude Wood Spirit.—One operative who had been inhaling the fumes from Bakelite varnishing solutions containing formaldehyde, phenol and wood spirit during the day, was, the same evening, mentally affected. Delirium necessitated his removal to a mental ward of a hospital for two days. The same delayed effect has, I believe, been noted elsewhere. Since ventilation has been installed no further ill-effects have been noted.

Ethyl-Chlor-Hydrin.—Two cases, one of which was fatal, occurred from the inhalation of ethylene-chlor-hydrin. The men were engaged in a vessel in which this chemical had been used. The case presented some difficulties and Dr. Middleton, who investigated, reports as follows :—

The medical evidence was definitely against carbon monoxide. The amount of irritation in the respiratory passages was not of itself sufficient to account for death. It seemed certain that a systemic poison had acted. The course of the symptoms—sickness of a very severe degree, sleepiness, and even sleep while waiting in the ambulance room, and post-mortem findings entirely in agreement with post anaesthetic poisoning, appeared to point to the narcotic action which characterises organic chlorine compounds. A possible distinction from the chloroform group is the presence of more irritation in the respiratory passages than would be expected.

Artificial Silk.—Conjunctivitis affecting spinners in the viscose process has received very considerable attention. As far as information can be obtained, cases of conjunctivitis, while

still occurring from time to time, have been considerably less in number. The relationship between outbreaks of cases and failure of the ventilation at the spinning frames has established, without doubt, that the remedy for this condition is localised exhaust ventilation to remove the gas generated by the action of the bath on the viscose.

After careful inquiry no case of permanent injury to the eye following conjunctivitis from this cause has come to the knowledge of the Department.

Gastritis resulting from work in the spinning room has been complained of, but so far as it has been possible to ascertain, there is no evidence that this condition is produced in artificial silk spinning nor in other departments of artificial silk works.

I have dealt elsewhere with poisoning by carbon bisulphide, a hazard of this industry.

Dr. Henry examined 27 men dealing with acetic anhydride in a department of an acetate artificial silk works, and reviewed the sickness record of the department. There was definite evidence of acetic anhydride causing conjunctivitis, associated with photophobia, not usually necessitating absence from work for more than one day, and occurring more in summer than in winter. Out of a total of 162 workers, 12·1 per cent. were affected during the months of June to September, necessitating the loss of an average of 1·4 shifts per person, while a temporary effect on the gastro-intestinal and upper respiratory tract was also noted. No evidence was obtained that acetic acid affected the eyes to a sufficient extent to cause absence from work, but a temporary effect on the gastro-intestinal tract and upper respiratory passages was noted when the acid was breathed in excessive quantities.

First Aid.—The requirements of the Workmen's Compensation Act as to provision of First Aid equipment in factories generally meet with ready compliance, but many occupiers have yet to appreciate that maintenance is a statutory obligation. The most common irregularity is failure to maintain the number and specifications of dressings, and where First Aid treatment is not under the care of a trained person, supplies of lint and bandages may replace sterilised dressings. A small point, but an important one, is that labels indicating contents are a necessity on all medicaments ; it is not infrequently found that labels are not affixed to all bottles.

The use made of First Aid treatment in factories more than justifies legal requirements. One large firm had a record in 1929 of 40,000 First Aid treatments, with only 640 reportable accidents. The most serious results of neglect to obtain First Aid treatment are fortunately comparatively infrequent, but a sufficient number are reported to make it clear that vast numbers of grave illnesses and fatalities must undoubtedly have been

prevented by prompt treatment. There is still too high an incidence of septic cases among reportable accidents, and in at least half of these no First Aid treatment had been obtained at the time of injury. A false idea of the " triviality " of the injury is at the root of this, and many are the attempts by the employer to educate the worker on this, including slogans on pay envelopes and daily figures of First Aid treatment in the Works. Safety Committees are paying especial attention to the necessity of obtaining prompt First Aid treatment for every injury, however slight.

It is a matter for satisfaction that the number of industrial workers gaining qualification in First Aid is steadily increasing, and credit is due both to employers and workers for their co-operation in endeavouring to provide that the initial treatment given in factories shall be of the most skilled available. A number of whole-time Works Nurses have more than justified their appointment.

There has been an increase in the voluntary provision of Ambulance Rooms, while it is reported from some Divisions that applications for Certificates of Exemption from the maintenance of First Aid boxes, by reason of an Ambulance Room, are fewer because of the provision and maintenance of both.

The newer method of the treatment of burns by tannic acid has been considered in its application to factories. While this method is undoubtedly very successful where proper facilities for its application exist, the value of the standard dressing in First Aid boxes for burns has been endorsed by recent enquiry, and there seems no justification for a change in the recommendations for the First Aid of minor injuries.

A large proportion of the reportable accidents occurring in the Fish Curing Industry are due to septic injuries of the hands. Injuries due to trauma from fish bones, etc., include deep punctures and these are particularly liable to become septic. The condition of the fish when handled has some influence on the occurrence of sepsis, while both brine and salt have a deleterious effect on the skin. An inquiry in England and Wales indicated that if loss of time from sepsis is to be reduced in this industry, better use must be made of First Aid for injuries ; this with a higher standard of personal cleanliness among the workers, could materially reduce the incidence of reportable accidents.

Certificates of Fitness.—The number of young persons between 14 and 16 years of age examined for certificates of fitness in 1929, was 344,336, and the table below shows that the rejections for (*a*) medical and non-medical reasons were 2·47 per cent., and for (*b*) medical reasons alone 1·36 per cent., while similarly, for rejections and conditional certificates combined, 5·67 per cent. and 4·49 per cent. respectively.

Young Persons Rejected or Certified Conditionally (or with advice to Occupier).

Defect.	Number of		Total.
	Rejections.	Certificates under conditions or advice.	
(1)	(2)	(3)	(4)
A.—Medical Reasons.			
1. Defective Bodily Development ..	188	483	671
2. Deformity (including old infantile paralysis)	56	164	220
3. Specific Fevers	34	—	34
4. Pediculosis	1,964	1,175	3,139
5. Disease of Skin	328	307	635
6. Disease of Bones and Joints ..	50	113	163
7. Disease of Glands	89	240	329
8. Disease of Lungs	125	182	307
9. Disease of Circulatory System ..	236	716	952
10. Disease of Nervous System ..	128	305	433
11. Disease of Ear, Nose or Throat ..	457	2,213	2,670
12. Disease of Eyes and Eyelids ..	974	2,995	3,969
13. Other	62	1,883	1,945
Total Medical Reasons ..	4,691	10,776	15,467
B.—Non-Medical Reasons.			
14. Legal: Under Age, Prohibited employment	188	—	188
15. Non-production of Certificate or other evidence of Age	3,084	—	3,084
16. Non-production of General Register	484	—	484
17. Falsification of Certificate of Age..	35	—	35
18. Unsuitable Attire (including loose hair)	18	242	260
TOTAL	8,500*	11,018	19,518

* The total number of rejections given in the above table differs from that given in Table 5A, page 139. This is due to the fact that the specific reason for a number of the rejections was not given in some of the returns furnished by the Certifying Surgeons.

CHAPTER IV.

WEIGHT LIFTING.

(*a*) ANALYSIS OF ACCIDENTS REPORTED DURING THE PERIOD FEBRUARY—APRIL, 1929.

By Sibyl G. Overton, M.B., B.S., D.P.H.,

H.M. Medical Inspector of Factories.

To gain further knowledge as to the number and nature of accidents caused by the manipulation of heavy weights, all accidents of this character, reported during the period of three months, February—April, 1929, were specially investigated by the District Inspectors. Data as to the nature of the accidents, the size and manipulation of the load, the presence or not of mechanical appliances for lifting, together with the estimated weight and height of the injured person, were recorded on forms drawn up for the purpose.

The number of such accidents reported within the period was 948, of which 866 occurred to male adults, 33 to women adults, 36 to male young persons, and 13 to female young persons. The total is considerable and it must be remembered that only those accidents are reportable which disable the workman for more than three days from earning full wages for the work at which he was employed.

In the analysis of these accidents, some attempt has been made to compare the hazards in the different industries by estimating the annual accident rate per 10,000 persons employed of the class under consideration. In order to avoid figures of artificial value no such rate has been calculated where the number of accidents to any class of worker is less than *three* (i.e. one per month for the period of investigation). The return of numbers of persons employed in factories prepared by the Statistical Branch (*see* Table 11A) has been utilised. These figures, corrected to the nearest thousand, give with the accident occurence an estimated annual accident rate per 10,000 persons employed.

MEN.

(*a*) *Industries.*—The largest number of accidents and the highest calculated accident rate occurred in the metal industries, while shipbuilding presents a considerable hazard to workers from the handling of loads. The accident rate (9·6) due to weight lifting among dock workers nearly approximates to that for glass workers and for the clay, stone, lime and cement industries, while it is less than that for the rubber, paper, textile printing, etc., and chemical industries.

(*b*) *Causation of Weight Lifting Accidents.*—The commonest cause of accidents in work involving lifting or carrying of loads is loss of balance. Such loss of balance may occur with either a moderate or a heavy load. The moderate load may not be the actual cause of the loss of equilibrium but the heavy load is very often the primary cause. There is little need to emphasise that with a load equal to or greater than the worker's body weight, failure to maintain equilibrium becomes a serious factor, and among the 866 accidents no less than 134 loads come under this description. This is excluding trucked loads and is equal to 15·5 per cent. of all the accidents to men reported in the period. In 65 instances, not necessarily with a load equal to or greater than his body weight, the injured person gave "loss of balance" as the cause of the accident.

Closely associated with loss of balance is uneven lifting where man power is multiplied in order to divide a load. For this method to give good results a number of criteria must be satisfied; (1) the man power must be appropriate to the load; (2) the lifters must not be handicapped from taking each a fair percentage of the load by gross inequalities in height or physique; (3) each lifter must be able roughly to estimate the effort required of him; and (4) manipulation must be synchronised.

It is a matter of common knowledge that muscular strains from over-exertion include those from efforts expended which are out of proportion to those required. To prevent strain, muscular effort must be in a direct ratio to the load to be manipulated, otherwise loss of equilibrium—perhaps brought about by antagonising groups of muscles will result. Seeing how difficult it would be in practice to fulfil these criteria it is not surprising to find that 28 per cent.—more than 1 in 4—of the accidents to men from weight lifting occurred when two or more were employed in manipulating a load. Elderly men seemed frequently chosen, and with misfortune to themselves, for this class of lifting. In two instances accidents followed when men and boys were lifting "together."

The volition of the worker in the selection of heavy loads has not played any considerable part in the causation of these accidents, for in no less than 658 out of the 866 instances of injury, the loads have been "set weights," that is, the size and weight of the load has not been under the control of the worker.

The ages of the men sustaining injury is of interest (Table 3). It is seen that the largest number were from 25–34 years of age, the age groups (35–44) and (45–54), suffering almost equally numerically, come next, followed by the (18–24) age group, while the oldest men are last.

(*c*) *Mechanical Appliances for Loads.*—An analysis of the 866 accidents to men revealed that (1) there was "no mechanical appliance" for lifting in 69 instances; (2) Mechanical appliance

was possibly on the premises but "not available" for the particular work in 50 instances, and (3) Mechanical appliance was said to be "available" but not used in only 22 instances.

Injuries sustained.—(Table 2.). The most common injury resulting from heavy weight lifting is muscular strain, generally of the back. This was the effect in 719 of the 866 cases of injury investigated. Hernia is the next most frequent, being the cause of disability in 128. Two fractures were sustained and seventeen other injuries.

The most serious case of injury was to a man, aged 19, weighing 10 st. 6 lbs., resulting from a crush by overbalance of a packing case weighing 330 lbs. These packing cases were moved by mechanical appliance but had to be manipulated by hand, being "tilted and balanced on edge." Traumatic pleurisy and pneumonia were succeeded by purulent pericarditis, with a fatal issue.

WOMEN.

Only thirty-three (3·5 per cent.) of the investigated accidents concerned adult female labour. This but bears out the conclusions from earlier inquiries into weight lifting by women, i.e., that the work required of women in industry is, as a rule; well within their capacity. It was pointed out in an earlier report that women workers in heavy industries occupy a position midway between two great classes of workers who act as buffers to them, and they owe their immunity from injury to health to this unique position. They are not so strong as the men, and hence are not required, where male labour is available, to do the most arduous weight lifting while female labour is too costly to permit of it being generally employed on continuous lifting and carrying, which accordingly falls to the lot of the Young Person.

Of the accidents to women, textiles contributed 14, of which the cotton industry accounted for 10; the manufacture of foodstuffs 5, and metal work 4 (Table 1). The order of industries is altered, however, when the figures of incidence of weight lifting accidents are calculated on a basis of the numbers of women employed in the different industries. Then the manufacture of foodstuffs with an incidence of 4 per 10,000 employed is highest and textiles (1·1) lowest. The Tin plate industry is largely responsible for the accident rate of 2·1 for metal work. It is evident that the calculated accident rate for women is insignificant when compared to that for men, while it is smaller than that for male Young Persons.

In 9 of the 33 accidents to women lifting, the injured woman was assisted. If women lift together, or have male assistance, the lifters do not appear to exceed two. In 5 instances the load reported to have caused an accident was greater than 50 per cent. of the woman's body weight. Choice of size of load was not possible in 3 of these 5 instances. In 23 other cases of

injury, where the load attempted was less than 50 per cent. of the body weight, the size of the load was not variable at the wish of the worker.

The younger women from 18–34 account for more than half the accidents. (Table 3.) The injuries sustained were muscular strains in 28 instances, and herniae in 4. (Table 2.)

YOUNG PERSONS.

The number of accidents sustained by Young Persons was 49 (13 female Young Persons) and exceeds by 50 per cent. the number of such accidents among women for the same period.

1. *Male Young Persons.*—Of the 36 injured male Young Persons, 8 were under 16, and 28 between 16 and 18 years of age. The maximum weight lifted and recorded in these accident cases was 130 lbs.—the weight of a wagon axle box. This load, to be raised a height of 2 ft.—was a usual one apparently for the boy aged 17 (weight 9 st.) as he normally did an average of 12 such lifts daily. There are other instances of excessive weights being handled by male Young Persons—a 1-cwt. sack of coal lifted, a 2-cwt. bag of sugar dragged along the floor—and already one sees the influence of the male tradition as to "joint lifting." In nearly a seventh of these accidents to male Young Persons it is reported that more than one person was lifting. In one instance 2 boys and a man were manipulating an iron pillar of 196–224 lbs. One of the boys sustained a "strained abdomen." The size of the load was not variable at the option of the boy worker in 22 out of 36 instances.

Industries.—Engineering—employing the largest number of male Young Persons—has the largest number of accidents, metal works follow. (Table 1.) However, the highest incidence rate (15) occurs in brick, pipe and tile making, followed by the Engineering groups (9·8). Metal founding and the conversion of metals are evidently the branches of the metal industry most productive of accidents to boys from weight lifting.

2. *Female Young Persons.*—Only 13 female Young Persons appear among the 948 cases of injury. Five of these were under 16. The maximum load recorded was 63 lbs.—a tray of metal articles, lifted from 18 inches to 3 feet level. A "strained back" was sustained, but it is noted that the girl was not expected to lift this load without assistance. A load of 56 lbs.—a crate of beer bottles—was, however, considered the normal work of a fairly sturdy girl of 17. In stacking crates six high she sprained her back. The weight of loads which appear to have caused injury was not variable at the will of the girl workers in six of the 13 recorded cases. Girl workers evidently do not favour "joint lifting"; there is only one instance of this method.

The metal industries are the only group reporting a minimum of three "accidents" to female Young Persons, and the annual accident rate per 10,000 female Young Persons thus employed is 3·6. (Table 1.)

Conclusions.—The injuries sustained are in a number of cases severe.

Men are concerned in 91·3 per cent. of the accidents and injuries to young persons are 50 per cent. more numerous than those to women workers. According to the figures for employment prepared by the Statistical Branch of the Home Office, there are more than one and a half times as many women as young persons in industry, yet the weight lifting accidents to young persons during the three months amounted to about 50 per cent. more than those to women injured in this way.

The industries in which these accidents have occurred have been compared (*see* page 1 for omissions) by considering the estimated annual accident rate for each group of workers per 10,000 of the class employed. By this calculation the metal industries are outstanding for all groups of workers, while engineering has a considerable incidence for men and boys.

Textiles contributed 83 accidents (male 63, female 14, male young persons 4, female young persons 2). Jute and allied industries, followed by cotton, give the highest estimated accident rate of the textiles for men. Woollen and worsted, with regulations for weight lifting, the lowest. The cotton industry has the highest rate of textiles for women and male young persons.

Although these particular accident rates are compared on a new basis, the results strengthen in a very striking way the conclusions of earlier work on weight lifting.

Loss of balance is the commonest cause of accidents in work involving the manipulation of loads.

Factors in the causation of accidents in weight handling that are brought out by this analysis are :—

(1) "*Joint lifting*", i.e., the multiplication of man power to divide the load, is *not* a satisfactory substitute for mechanical appliances, for it appears in no less than 28 per cent. of the accidents to men. Women and girls either do not favour or have not the need to use this method, but boys are being brought up in the male tradition as to its application.

(2) *Too high a ratio between load and body weight.*—For men a load equal to or greater than body weight was so regarded, while for women the standard was a load exceeding 50 per cent. of body weight. The high ratio of load to body weight was, in many cases, due to " set weights " having to be handled. These would be loads, i.e., casks, sacks, coils of wire, etc., the size and weight of which were not alterable at the volition of the worker.

(3) *Mechanical appliances not sufficiently provided or used.*—Mechanical appliances are not used, even if available, unless they are convenient and no serious loss of time will result.

The age incidence of the men and women who have sustained injury from weight lifting is compared in (Table 2), while senior young persons of both sexes have in these accidents, as would only be expected, outnumbered the junior group.

The commonest injury from the handling of weights is muscular strain. Sprains are about 5½ times for males, and 7 times for women, as frequent as hernia. (Table 2).

TABLE 1.

Industry.	Weight Lifting Accidents, February–April, 1929.				Estimated Annual Accident Rate from Weight Lifting per 10,000 Persons Employed.			
	Adults.		Young Persons.		Adults.		Young Persons.	
	M.	F.	M.	F.	M.	F.	M.	F.
1. Metal industry	271	4	9	3	23·5	2·1	5·9	3·6
2. Aircraft construction	6	—	—	—	20	—	—	—
3. Tobacco and matches, manufacture of	5	2	1	—	20	—	—	—
4. Shipbuilding	57	—	—	—	19·5	—	—	—
5. Oilcake manufacture, oil refining and extraction	11	—	—	—	18·3	—	—	—
6. Rubber industry	8	—	—	—	15·2	—	—	—
7. Engineering works, machine and other tools	91	1	6	1	14·4	—	5·5	—
8. Paper industry	12	—	—	1	12·6	—	—	—
9. Chemical industry	25	—	—	—	11·6	—	—	—
10. Textile printing, bleaching, dyeing	19	2	1	—	11·5	—	—	—
11. Dock workers	34	—	—	—	9·6	—	—	—
12. Glass industry	6	—	—	—	9·2	—	—	—
13. Clay, stone, lime and cement industries	20	1	3	—	9·1	—	10	—
14. Machinery, lifting appliances, railway and tramway plant (other than locos.), conveyances	103	1	7	—	9·1	—	4·3	—
15. Textile industries	63	14	4	2	7·9	1·1	3·1	—
16. Foodstuffs, manufacture of	27	5	2	2	6·8	4	—	—
17. Building and warehouse workers	25	—	—	—	No figures of employment available.			
18. Miscellaneous	83	3	3	4	—	—	—	—

TABLE 2.

Injuries.

	Men.	Women.	Young Persons.
A. Sprains	719	28	45
B. Herniae	128	4	1
C. Fractures	2	—	1
D. Other injuries	17	1	2

TABLE 3.

Ages of Injured Persons.

Ages.	Nos. Injured.	
	M.	F.
(1) 18–24	146	15
(2) 25–34	237	10
(3) 35–44	190	5
(4) 45–54	193	1
(5) 55 and older	89	2

(*b*) SUMMARY OF REPORT BY DR. SIBYL OVERTON ON WEIGHT LIFTING IN THE JUTE AND ALLIED INDUSTRIES.

1. *Introduction.*

In 1928 a deputation was received at the Home Office from the Dundee and District Union of Jute and Flax Workers. The Deputation stated that the Union wished to secure for the Jute and Flax Industries weight lifting regulations similar to those made in 1925 for Woollen and Worsted Textiles, but had been unable to secure the agreement of the Jute Spinners and Manufacturers' Association. As a result of this deputation an Inquiry was instituted with regard to weight lifting in the jute and allied industries. It was carried out by Dr. Overton, who was assisted by Dr. Merewether, in the examination of the male workers. Inquiry was made as to the weights actually lifted in these industries, the physique of the persons employed, and evidence of injury. Two hundred and fourteen persons who might handle heavy loads in the course of their work were examined; of these, 32 were men, 109 women, and 73 young persons under 18–36 males, 37 female. Records of accidents were also scrutinised.

2. *Loads handled.*

(*a*) *Men.*—The heaviest weight lifting in the Jute and Flax Industries falls to the "stowers" who handle bales of jute weighing 400 lbs. It has been calculated that the day's work of a "stower" is equivalent to the carrying of between 60 and 70 tons. With each load the "stower" is carrying more than twice his own body weight, if he scales 14 stone or under, but the "stowers" were found to be men of exceptional physique and skill in moving heavy loads.

Excluding "stowers," in about a fifth of the mills weights lifted by a man alone were found to exceed 150 lbs. Beamers, loom tenters, cloth room lifters, loaders, yarn chain carriers, calender workers and, occasionally, weavers, may under certain circumstances lift these weights, but the loads lifted in different mills vary somewhat according to the use or not of lifting tackle.

The average percentage relation between the load and the body weight of the 30 men (other than "stowers") examined was 96·8 per cent. for average loads and 102·1 per cent. for maximum loads. The average body weight of the 30 men (other than "stowers") examined was about 138 lbs.—i.e., less than 10 stone.

(*b*) *Male Young Persons.*—The work of male young persons involves weight lifting and carriage of an almost continuous character; in fact, with the exception of certain of the above-mentioned specialised occupations for men, the heaviest *continuous*

work involving weight lifting was performed by male young persons, and this statement gains in importance when due consideration is given to the body weight, development and age, coupled with the relative inexperience of this group of workers.

Male young persons, whose work involved the lifting and carrying of weights, were found employed as bobbin setters, bobbin cart, cop, calender room and card boys, and exceptionally as yarn chain carriers. Amongst the bobbin cart boys was found :—

(1) the largest individual load, with the exception of that of yarn chain carriers, i.e. 75 lbs. ;
(2) the largest individual output per shift, i.e., 7 tons ; and
(3) the highest individual percentage relation between load and body weight, i.e., 87·5 per cent.

At 11 mills a load exceeding 50 lbs. might be accorded to male young persons over 16, with a maximum load of 124 lbs. in one instance.

The average percentage relation between load and body weight for the 36 male young persons examined was found to be 55·7 per cent., with an average daily output of 2·8 tons. The average body weight was 100 lbs. for boys between 14 and 16 years of age, and 111 lbs. between 16 and 18.

(*c*) *Women* in the Jute Industry, whose work involving the lifting of heavy weights was investigated, included cop winders, spool winders, weavers, attendants on finisher cards and ball machines. In some instances there is actual *lifting*—there may or may not be carriage as well—while in others, as in the case of spool winders and attendants of ball machines, the load is *dropped* to the floor.

The chief example of weight *lifting* for women in the Jute Industry is found among cop winders. As the cops are wound they are packed into bags. There is no standard weight in the industry for a cop bag ; 56 lbs. is usual, but weights varying between 51 and 64 lbs. were observed. The heaviest cop bag was 80 lbs., but this was exceptional.

Although some diversity of method was found in the disposal of cop bags when full, it is held in general to be part of the work of the cop winder to carry the full bag to the weighing machine, weigh, and close the bag. She may, however—and often does—make other arrangements for the completion of the bag.

Although the above is but incidental to the process of cop winding, and occurs approximately 8 to 12 times daily, it must be taken into consideration that winding in itself is a laborious and exacting task, demanding constant attention on the part of the worker.

The average percentage relation between the load and the body weight of women cop winders was found between 55·2 per cent. for a cop bag of average weight, and 71 per cent. where a bag of maximum size is made up.

Women weavers are not expected to lift out unassisted any but the smallest "cuts" of cloth. For heavier "cuts" the tenter takes charge or another weaver helps. The "cuts" are not actually lifted by women, but being on cloth rollers, are tilted on end and dropped into the "pass," where they are removed by male labour.

The average percentage relation between the load and the body weight for women weavers was only 43 per cent.

The average percentage relation between the load and the body weight of the 109 women workers examined (all of whom were engaged in one or another of the heavy processes in the Jute Industry) is 55·9 per cent. for average loads, and 62·9 per cent. for maximum loads. The average body weight was about 117 lbs.

In about a quarter of the mills a woman may be required to lift, unassisted, a load of 60 lbs.

Lifting of weights by women in the Jute and Flax Industries, except in a few instances, is intermittent.

(*d*) *Female young persons,* engaged on typical work involving the lifting of weights, were found in the processes of cop winding and weaving. Such lifting was in every instance intermittent and incidental to the process on which the female young person was engaged.

The average percentage relation between the load and the body weight for female young persons cop winding, was 64·8 per cent. for the junior group (14–16 years of age)—seven examined, and 62·1 per cent. for those over 16 years—30 examined. A load of 64 lbs. (cop bag) was the maximum encountered in a survey of weight lifting by girls in the Jute and Flax Industries.

Those female young persons who were weavers, were all over 16 years of age and their work need not entail heavy lifting unassisted.

Taking the work of female young persons in general, before the age of 18 they may have to deal with a load of 60 lbs. and over, while a load of 50 lbs. is fairly common. Very few girls under 16 years of age seem to be engaged in arduous processes in Jute Mills, and this accounts for the smallness of the number examined.

The average percentage relation between the load and the body weight for the 37 female young persons examined was 64·8 per cent. for those under 16 years, and 54·9 per cent. for those over 16 years of age, average loads being considered. The average body weights of the workers examined were nearly 99 lbs. in the case of female young persons between 14 and 16 and nearly 113 lbs. between 16 and 18.

3. *Injury to health from weight lifting.*

Evidence on this question has been obtained from (1) physical examination of workers in mills; (2) a scrutiny of such records as were available of injuries attributed to weight lifting.

(1) With the exception of the "stowers," who were of exceptional physical capacity, *men* on heavy processes in the Jute and Allied Industries were not remarkable for their physique. A low average body weight gave a high figure for the percentage relation between load and body weight. Five men among those examined gave an account of strains sustained on heavy work, while others complained in more general terms of fatigue.

The average body weight of the *male young person* in the Jute Industry was also rather low, and there was a certain amount of evidence of injury to health caused by their undoubtedly arduous work. Physical signs of trauma (e.g., grazed knees, chafed backs) were found, and instances of abnormal curvature of the spine were present. Nearly one-half of the boys examined admitted that they found the work over heavy. Bearing in mind that maturity has not yet been reached and a still plastic frame is bearing the burden, injury to health from the character of the work for male young persons may be said to have been disclosed in its more insidious and less obvious form.

The *woman* jute worker, however, was well up to average in weight, while her physique and development was normal. In addition, an impression of bodily vigour and fitness was given. From this examination, no injury to health among women in the Jute Industry, on the heaviest tasks allotted to them, has been found.

Examination of *girls* revealed a somewhat low average body weight compared with others of similar age in heavy industries. Certain common skeletal deformities were noted, but these were such as would be apparent in almost any group of young persons, whether engaged in heavy work or not. In only four cases was there any suggestion that the capacity of a girl worker was overreached, and, while the individual load may be considerable, insidious injury to health is not so liable to occur as in the case of the male young person, in view of the incidental character of weight lifting in the girls' work compared with the practically continual nature of work of this character for boys.

It must be remembered, however, that this examination of workers employed in the mills was confined to those who were performing the work required. It was not, therefore, to be expected that the more serious forms of injury which might arise from work involving heavy physical strain would be found amongst them, and for evidence of such injuries it was necessary to include a scrutiny of such records as were available.

(2) Records of accidents reported to the District Inspector of Factories and attributed to weight lifting in the Jute and allied industries were available, and an analysis was made covering a period of nearly 2 years. During this time there were 35 such accidents. The majority of these accidents were among men. Factors causing loss of balance played a very important and frequent part in the causation of accidents in the handling of heavy loads.

An accident occurring in a factory or workshop is only reportable when the injured person is disabled thereby, for more than three days, from earning full wages at the work on which he was employed, and to obtain information as to injuries which did not incapacitate the worker for more than three days, the records of cases treated at the Royal Infirmary, Dundee, were also scrutinised, by permission of the authorities. In 1927, out of 17 instances of injury to mill workers, believed to be due to heavy weight lifting, 12 occurred among men. Stowers and calender workers accounted for the majority of these. Evidence of hospital treatment to women and young persons for injuries sustained by work on heavy processes in mills was scanty.

4. *Conclusions.*

From this inquiry it appears that weight lifting gives rise to some injury to health in two classes of labour in the Jute and allied industries, i.e., men and male young persons. Men, by reason of their superior strength and endurance, and also from long custom, are the class on whom falls the heaviest individual load and amongst whom most of the accidents occur; while boys, being neither strong enough as yet to play the man's part, and not sufficiently skilled for the lighter woman's work, find themselves in the position of being required to do the comparatively heaviest continuous work of lifting.

Men.—From a study of reported accidents occurring in weight lifting operations, and from general considerations, it is suggested that the load required of a man unaided should not generally exceed his own body weight. Exceptional physique and skill may, as in the case of the " stowers," justify a heavier burden, but generally speaking, when the load manipulated by a man, unassisted by another, exceeds his body weight, a condition is approached in which a relatively slight adventitious cause, such as a temporary loss of balance—normally and with a lesser load recoverable—may precipitate an accident. It is possible that some of the heavy work carried out by men could be rendered less arduous and more easily negotiated if a wider use were made of lifting tackle, and of accessories such as straps and hooks attached to the worker's person.

Male young persons.—Consideration of the loads common to male young persons, together with recognition of the fact that much of their work involves almost continuous weight lifting, suggest that too great a burden is being imposed on a frame that is yet short of maturity. This suggestion is borne out by medical examination of male young persons engaged in heavy work in the Jute industry, and there can be little doubt that the average percentage relation between load and body weight for male young persons (55·7 per cent.) is too high for continuous lifting.

In the case of male young persons over 16, 55 per cent. might be allowed for occasional lifting, bearing in mind the much heavier loads which may have to be handled after passing the age

of 18, but it is suggested that 40 per cent. should be the limit for continual lifting. A distinction between continual lifting and occasional lifting seems preferable to that between compact and non-compact loads adopted in the Woollen and Worsted Textiles Regulations. The term " continual lifting " is intended to include all cases where the lifting forms a substantial part of the work.

For young persons under 16, however, no distinction can be drawn between limits for continual and occasional lifting, for a load which is suitable for continual work should not, for these young workers with bodies still plastic, be exceeded for occasional lifting. It is suggested that the load should not in either case exceed 35 per cent. of the average body weight.

Women and female young persons are not, generally speaking, employed in the Jute and allied industries on processes involving continual lifting. Women are not considered fitted, by physique or skill, to perform tasks of the heaviest kind, and it has been found uneconomic to employ women on continual lifting work when their dexterity in weaving and winding might be utilised. Such lifting as they do is nearly always occasional and incidental to the main process. These women, too, have not reached their positions in a day ; in all probability they will have entered the industry as young persons and gradually acquired skill and facility in work which appears difficult and arduous to observers. No injury to health has been found.

Female young persons are not required to do work involving continual lifting, but the older ones, over 16, often lift—without evidence of injury to health or development—similar loads to those of the women—employed as they are on the same processes involving some occasional and incidental lifting.

In this connection reference must be made to the Report issued by the Medical Research Council on " The Physique of Women in Industry " (Report No. 44 of the Industrial Fatigue Research Board), to which Dr. Overton contributed a chapter on the lifting of loads by women and young persons. In the General Conclusions of this Report Professor Cathcart states that the results of laboratory experiment and of actual observation in factories as to the optimum load—stated as a percentage of the worker's body weight—are in fair agreement. Dr. Overton had suggested, from observation in factories, that in the case of loads for continual carriage, they should not exceed a weight represented by 40 per cent. of the body weight, and that for incidental or occasional lifts or carriage, they should not exceed 50 per cent. of the body weight of the worker. On this basis for average women a load of about 45 lbs. appeared optimal for continual carriage, but Professor Cathcart was of opinion that the body of the average healthy woman worker would not be in any way strained if the maximum load were placed at 50 lbs., and that the load might be increased by as much as perhaps one-fifth (i.e., to a limit of about 60 lbs. for continual carriage) in the " healthy well-trained adult, without throwing any undue

strain on the organism when the load is a compact one and easily handled so that it does not interfere materially with the gait and balance of the worker."

This further study of practical weight lifting suggests as maximum loads to be lifted by women in the Jute and allied industries:—For continual lifting, 56 lbs. ; for occasional lifting, 65 lbs.

In the case of young persons, Professor Cathcart considered that, from a health and development point of view, the percentages of 40 per cent. and 50 per cent. of the body weight suggested by Dr. Overton for continual and intermittent lifting should not be utilised for assessing the weight to be carried. He suggested a load for continual carriage of 25–30 lbs. for female young persons under 16 and one of 40 lbs. for female young persons over 16. These, however, were put forward as optimum loads, and Dr. Overton, after this further investigation, considers that the maximum of 35 lbs. already recommended in the case of male young persons under 16 is suitable for female young persons of the same age. Young persons of both sexes under 16 years of age may, in fact, be considered together when a limiting load for weight lifting and carriage is considered. In the case of young persons over 16, however, it is necessary to bear in mind the nature of the ultimate work required of male and female young persons on attaining adult years. The much heavier loads, which may have to be handled by males after passing the age of 18, were a consideration in the assessment of the maxima already recommended for male young persons over 16, and slightly lower limits are recommended for girls of 16–18, namely, 40 lbs. for continual lifting and 56 lbs. for occasional lifting.

Effect of suggested maxima.—The adoption of the limits suggested above for women and young persons would not appear likely to cause any serious difficulties in the Jute and allied industries. A maximum load of 65 lbs. for women would mean that they could not be responsible for the weighing and finishing of cop bags exceeding this weight. The work of attendants on finisher card machines (if women) would have, too, to be modified. The limiting load recommended should not cause alteration in the recognised unassisted work of women weavers.

Some modification of work for young persons would be required. In the process of cop winding, for female young persons, suitable arrangements would have to be made for the weighing and sewing-up of cop bags, but this is often done at the present time. Bobbin-setting for male young persons under 16 —a common occupation for these workers—could be undertaken as at present, unless spinning frames, requiring large bobbins, were to be set ; then the system of work would call for some simple alteration. An increase would probably be needed in the number of bobbin-cart boys in the team supplying the spinning rooms with bobbins, if the boys were under 16, while the junior male young persons employed as cop boys would need to be replaced by older boys.

CHAPTER V.

REPORT OF THE SENIOR ELECTRICAL INSPECTOR,

G. Scott Ram, O.B.E., M.I.E.E.

The use of electrical energy in industry continues to extend rapidly. Although no figures are available to show precisely what the rate of this advance may be, an indication is afforded by the returns given in the last Annual Report of the Electricity Commissioners, which show that the number of units sold to consumers by Electricity Supply Undertakings had more than doubled during the six years ending in 1928. The rate of increase at the present time is probably considerably greater. The number of electrical accidents occurring on factory premises might be expected to increase in like proportion and it is satisfactory to note that this has not been the case. Comparison of the number of accidents occurring in any year with those occurring in the previous year does not afford a reliable indication of the real trend of increase or decrease, for which an average over longer periods is necessary. Actually the number of reportable accidents notified was slightly less in 1929 than in the previous year, being 420 against 427. The average number of accidents during the five years, 1925 to 1929, is 393, whereas the average of the preceding five years, 1920 to 1924, is 363, showing an average increase in five years of 30 accidents, or 8½ per cent.—a very small increase in view of the fact that the use of electrical energy must have increased over 100 per cent. during the same period.

Looking still further back to the period before the War, the figures are very instructive as indicating the enormous advance in safety which has come about since that time, mainly, I believe, due to the effect of the Regulations in bringing about improvement in design of apparatus and methods of installation and working, and, latterly, to the effect of greatly increased inspection and enforcement of the requirements. For the five years, 1910 to 1914, the average number of accidents was 403, actually greater than during the last five years, although the use of electrical energy was probably less than a fourth part of that in the latter period. The high-water mark was reached in 1913 with 512 accidents.

It is thus evident that whilst the average yearly number of accidents is less than it was fifteen years ago, it is now slowly rising, as is only to be expected. Compared, however, with the rate of increase in the use of electricity, it is a diminishing quantity. A like result cannot, however, be claimed in respect of the number of fatal accidents. The number of fatal cases included in the figures for 1929 is 35, as against 26 in the previous

year—a pronounced increase. Here again, however, comparison of the figures for any one year with those of the previous year does not give a true indication of the tendency to increase or decrease. Taking the same five-year periods in respect of fatal accidents, the average numbers in 1910 to 1914 were 15·8, in 1920 to 1924, 20·4, and in 1925 to 1929, 25·8. It appears, therefore, that the proportion of fatal accidents is slowly rising.

In my report for 1925 I compared the number of accidents occurring on direct and alternating current systems not exceeding 250 volts to earth, such as are mainly used for distribution in factory premises. In the four years ending 1925, the direct current accidents were just double those on alternating systems, an average for each year of 172 and 85 respectively. In 1929 the number of accidents on direct and alternating systems was practically identical, 139 and 141 respectively. This alteration in the proportion is no doubt due to the fact that practically all new systems of supply are by alternating current and many of the direct current systems have been changed over to alternating, a process which is still in progress in all parts of the country in giving effect to the scheme of the Electricity Commissioners in standardising the systems of supply. Although the number of low-pressure accidents on the two systems is identical those on the alternating system are, unfortunately, far more dangerous to life.

The primary injuries from electrical accidents are shock, burns and eye-flash. These may occur separately or in combination. The most dangerous to life are those from or including shock. In my report, already referred to, I showed as regards low-pressure accidents that for the four years ending 1925, the proportions of these injuries were, from direct current, shock 11·6, burns 81, and eye-flash 7·4, and from alternating current shock 61, burns 37, and eye-flash 2. Of the direct current shock accidents 2½ per cent. only were fatal, but of the alternating shock accidents 25 per cent. had fatal results. The returns for 1929 are very similar. Of the 139 direct current low-pressure accidents the main injuries were shock 14, burns 113, eye-flash 12, and of the 141 alternating current accidents 97 were shock, 42 burns and 2 eye-flash. Of the direct current accidents (250 volts or less) none were fatal, whilst of the alternating, 21 proved fatal.

It is thus evident, as alternating current is coming more and more into general use, that it is becoming increasingly important to guard against the possibilities of persons receiving a shock. This difference between the danger of a direct current low-pressure shock and one from alternating current is by no means yet generally realised, particularly by people who have been accustomed to dealing with direct current, or even by people who by virtue of their responsible position in regard to the safety of others ought to be fully cognisant of the facts. Recently, at an inquest on a person killed by shock from an unearthed metal

lampholder, an electrical engineer on the staff of an important electricity supply undertaking, actually stated that he did not think that 250 volts alternating current was a dangerous voltage. Lighting and power installations which may be reasonably safe with direct current, and in compliance with the Regulations, may be quite the reverse when changed over to alternating. Direct current low-pressure installations are exempted from many of the requirements of the Regulations which, however, become operative when a change is made to alternating current. This may involve a considerable overhaul or renewal with replacement of fittings, such as insulated type of lampholders and switches and fully protected type of fuses for those previously existing. Before changing the system of supply, permission has to be obtained by the Electricity Supply Authorities from the Electricity Commissioners. One of the conditions imposed by the Commisioners is that, unless by special agreement with the consumer, the cost of effecting the necessary alterations rests upon the Electricity Supply Undertakings, who, in general, carry out the work themselves. They have, of course, inevitably to replace motors or other apparatus which will only work on direct current with others suitable for alternating current, and, if a change of voltage is involved, to supply new lamps. Unfortunately, they do not always appear to realise their responsibilities in regard to the extent of the alterations required in respect of the Regulations on matters of safety. The consumer may understand nothing about the matter and will raise no question as to the remainder of the installation and may remain in ignorance of any defect until trouble occurs or an electrical inspector happens to pay a visit.

Of the 420 accidents, 43 occurred on high-pressure systems, twelve of them being fatal. Of these, 29, including nine fatal, were on premises of electricity supply or traction undertakings. With few exceptions they occurred to skilled persons. Eleven were due to assistant engineers or switchboard attendants thinking that the sections of switchboards or conductors on which they were about to work were dead when they were not, the mistakes being due mostly to carelessness in omitting thoroughly to investigate the conditions. Three of them were caused by the men, when about to work on switchgear, attempting to attach the "safety" earth connection to the conductors, without having first isolated the section. One was due to an assistant engineer opening an isolating switch on a feeder circuit whilst the oil switch was closed.

Several accidents occurred to contractors' workmen in erection of new or extensions to existing switch gear. In one case the man engaged in fitting up some new switchgear in a large power station wished to look inside a corresponding cubicle of the existing switchgear to see exactly how the apparatus was arranged and applied to the shift engineer to open one for him. The shift engineer opened the door of a cell—a large one—and

the man entered. The shift engineer drew his attention to an insulator and struck a match so that he could the better examine it and an explosion followed. The contractor's man, although very seriously burned, was not killed. The shift engineer, a man of long experience, had in a moment of forgetfulness, or mental aberration, opened a live cell, 33,000 volts, instead of a dead one. The mistake is the more remarkable in that the cell was in connection with a generator, and there were only two generators in the station, only one of which was running. Incidentally, the mistake led to the shutting down of the supply over a large industrial area and involved several thousands of pounds of damage to plant in the station. Further, there was no need to have opened any cell at all as detailed drawings of the work in hand were available in the contractor's office on the works.

Another accident, having several features similar to those in the above case, occurred also to a contractor's workman. An extension was being made to 33,000 volt switchgear in a large substation. A jointer's mate, engaged in connecting cables to the new switchgear, required a nut, and, not finding one handy in any of the new cubicles, proceeded to look for or to "borrow" one from the live and locked-up cubicles of the old portion. How he came to be in possession of the key of the live cubicle was not definitely cleared up, but it appeared that it had been loaned to the foreman some weeks earlier for a specific purpose and had not been returned, indicating gross carelessness on the part of those responsible for the custody of the keys. The man was severely burned by the arc which he set up, but was not killed.

Ten accidents, including three fatal, were due to the men themselves or those in charge of the work deliberately taking risks. In one fatal case, at an outdoor substation, men were removing overhead lifting tackle which had been temporarily erected, necessitating approaching 33,000 volt conductors. One of them slipped and made contact. There was no reason for taking the risk as the conductors in question could have been made dead without in any way affecting the working of the sub-station at the time. Another fatal case was due to working at a dead high-tension switch cell having a live cell below it from which the screen had been previously removed and not replaced.

Another fatal case, due to the victim's own carelessness in neglecting to carry out the standing instructions made for his safety, occurred in the repair shop of an electric railway. The man had a small repair to carry out on an interconnecting cable on a car and presumably as this would only occupy a few minutes he did not trouble to take the prescribed protective precautions. He should have placed a red flag on the switch controlling the current to the track (1,200 volts d.c.) and should have placed a short-circuiting bar, specially provided for the purpose, across the track rails. Whilst he was at work an additional car was brought into the shed, the current being switched on for the purpose, no warning signs being exhibited.

Totally unwarranted risks, in contravention of the regulations, are sometimes taken by employees of electricity supply undertakings with the connivance of their superiors in order to avoid interruption of the supply for a short time to perhaps only quite a few consumers. In a small substation it was decided to put in an additional meter, necessitating the connecting of a potential transformer to the high-tension switch-fuse board. The switch fuses were drawn out, thus shutting down the supply from the substation, but to make the board dead and safe to work upon involved shutting down three or four other small substations; to avoid having to do this, the workman had to make the connections behind the board, which was only about six inches from the wall within a few inches of bare live terminals (2,800 volts). Almost inevitably, he met with an accident, and was severely burned on the face, hand and arm. He was fortunately standing on a rubber mat or he would probably have been killed.

A case in which a contractor's experienced workman met with an accident as a result of his own folly occurred in a large substation. Extensions were in progress and additional transformers had been placed in position in compartments or bays. On the opposite side of a gangway there were other bays containing transformers which were in use. The bay containing the live transformers was taped across and danger notices were affixed. The man's job was to fix and connect certain cables at the new transformer which would, however, have to be taken later on across the gangway alongside the transformers on the other side. He proceeded to prepare for the latter work by threading a rope through cleats on the wall near the live transformers necessitating the use of a ladder. Apparently the rope was damp and sagged and touched a live terminal (22,000 volts) causing a short circuit. He fell to the ground with his clothes in flames and was severely burned. He subsequently admitted that he knew the transformer was live, but thought it was unnecessary to wait until it could be shut down.

An accident of an unusual kind occurred to a switchboard attendant when engaged in opening an isolating switch on an 11,000 volt switchboard in a generating station. The circuit was a heavy one, the isolating switches consisting of three blades per phase. He had successfully opened those on one phase by means of the ordinary type of isolating pole, a metal hook and socket attached to an insulating rod. The blades of the isolator on the next phase proved stiff and he obtained the assistance of another man to help him pull on the rod. He himself held the rod only some twelve or fifteen inches from the brass socket, the second man grasping the rod further down. Apparently they did not pull together and the switch blade opened suddenly at a moment when the first man was not expecting it, with the result that the rod slipped through his hands bringing the brass socket, which was then live, in contact with his hand. The floor was of

concrete so that he was not insulated from earth. As a result of the accident he lost an arm. The obvious precaution against such an accident is to provide an insulating disc on the rod between the operator's hands and the metal socket. This has now been done on all the isolating rods on the undertaking in question, and further guarding of isolators which may be within reach of the operator is being carried out.

Several accidents, including three fatal cases, were due to reliance being placed on insulation of conductors by means of tape. I have commented on similar accidents in several previous reports and have pointed out how even experienced electrical engineers are apt to be deceived by the apparently excellent insulating qualities of such tapes. When new and unstretched a single thickness may withstand puncture tests by pressures of several thousand volts and it is assumed that a number of layers will withstand a correspondingly increased pressure. In practice, however, in applying the tape it is considerably stretched, especially as it is generally used in covering joints, and is thus strained over more or less sharp corners such as of brass ferrules or cable end sockets. Under such strain the resistance to electrical puncture may be reduced a hundred fold or more, making it quite unreliable and the taped joint quite unsafe to touch. These further fatalities fully warrant once again drawing attention to this danger.

A fatal accident occurred in a large sub-station due to the explosion of an oil switch. A man working about six feet away was so severely burned that he died the next day. The explosion was not due to the usual cause in such cases, i.e., the failure of the switch to break circuit on overload or a fault, but to failure of a part of the mechanism whereby the switch was making a bad contact and heating up in normal working, leading eventually to failure of insulation and explosion.

Two accidents, one with fatal consequences, again illustrate the risks of employing unskilled persons to clean electrical apparatus, when there is even a remote possibility of danger, otherwise than under the immediate and constant supervision of an authorised person. In the fatal case, the cleaner was set to dust down high tension switchgear of the completely protected iron clad type. One of the switches had been racked out of contact with the busbars and was itself isolated and dead. The busbar contacts from which the switch was disengaged are automatically protected by metal shutters or flaps which are held in position by springs requiring a pull of ten or twelve pounds to open them. These protecting flaps could be padlocked in the closed position, but it was not thought necessary to do this, the man, it was stated, being specially warned not to open them. Evidently, however, he did open a flap and presumably started to clean the insulator within. The result was a short-circuit causing severe burns from which he died two days later.

As a result of the accident the electricity supply of an important industrial area in London was cut off for half an hour. I have described several similar accidents in former reports.

In the other case, which was not fatal, a labourer was instructed to brush down the back and top of the slate panelling, of an old type high tension (2,000 volt) open cellular switchboard. Having done this, he proceeded to brush inside one of the cells and made a short circuit from which he was severely burned.

Five accidents, three fatal, occurred in the high tension testing departments of electrical manufacturing works. One of the fatal cases was typical of a number of previous accidents in showing how the human element may fail. The man was a test-room labourer in a cable works. His duties were to prepare the ends of cable for test and to connect up to the transformer. The test area and tanks were surrounded by a five-foot fence with gate. Red lamps were automatically switched on when the testing transformer was excited and green lamps when no pressure was on. The man, who had been engaged on this work for several years, had prepared a drum of cable for test and had gone outside the enclosure. The pressure was duly put on and the red lamps were showing. For some unaccountable reason he entered the enclosure and went to the drum under test whilst the pressure was still on (10,000 volts) and the red lamps alight and was killed. The test was to have been of five minutes' duration and it would have been his duty afterwards to change the connections. Such accidents, apparently from absent-mindedness, are preventable by interlocking the gates of the enclosure with the excitation of the transformer, a method now widely adopted in testing departments, although not applicable to all classes of testing.

In the case of another works, a large test department had two sets of high tension test busbars running along one side at some 15 feet to 20 feet from the ground. Connections to the busbars were made by a man getting up by a ladder and bolting the test leads directly to the busbars. Such a method is obviously open to grave risk where many tests are carried out, safety depending on verbal exchange of information and mutual understanding between different testers. A man was making connections to one set of busbars for a particular test, when the pressure was switched on by the man in charge of another test, not knowing the first man was working at the busbars. Such a method of making connections to busbars is bound to be risky. There should be terminal boxes in suitable positions, protected by isolating switches, which the man making the connections can see are in the " off " position and terminals dead before he handles them. No mistake on the part of anyone else can then bring about such an accident.

A serious fire at a large power station, causing a complete shut-down of the electricity supply in a large city, again draws attention to the design and layout of cable trenches and passages so that escaping oil from transformers or switchgear shall not

be able to extend the fire beyond the immediate apparatus concerned. In the case in question the failure of a terminal bushing on a 33,000 volt transformer led to burning oil running into a cable passageway and to the destruction of certain main cables and pilot cables, rendering the switchgear control circuits inoperative. Incidentally, attempts to extinguish the fire by "foam" proved unavailing.

Of the low-pressure and medium-pressure accidents sixty occurred to men, mostly described as "electricians", when working on live switchgear or other live conductors. In most of these there was no need to carry out the work whilst the conductors were live. Twenty-eight accidents occurred at fuses, or distribution fuse boards. One hundred and three accidents, five fatal, occurred with portable apparatus, or flexible cables and connectors used therewith. One fatal case was due to the use of an unearthed ordinary metal lampholder as a portable lamp and another to an unearthed cargo cluster fitting, a fault in one of the six lampholders causing the whole fitting to become live. In the latter case an earth wire had originally been provided, separate from the flexible cable supplying the current, but had become broken and had not been repaired. It is interesting to note that employers of labour outside the scope of the Factory Acts may be held liable for the use of dangerous apparatus. At an engineering undertaking, not covered by the Act, a man was killed by a shock from a hand lamp of a type which does not comply with the Regulations. The widow obtained £1,600 damages in an action against the employers.

Two fatal accidents were due to the use of bakelite lampholder adapters as connectors for joining lengths of flexible wires, the bakelite shell becoming broken, in one case apparently by being knocked against a girder and in the other by being dropped on a concrete floor. In each case the bakelite shell protecting the terminals had broken away exposing the live metal. This recently introduced insulating material, whilst very excellent for certain purposes, is not strong enough for use in thin sections for fittings liable to rough usage. Incidentally, in these cases two pole connectors should not have been used at all, as the earthing connections were not provided for. Strongly constructed metal connectors arranged to be earthed and to provide for the through earth connection are available and should be used. Two accidents, fortunately not fatal, were due to persons wrongly connecting three-pin plugs so that the casings of electric drills were made live. Some patterns of three-pin plugs in general use are found to be unreliable as regards the earth connection. On the plug being moved about when fully home in the socket it is found that the earthing connection can be made and broken and that it can remain in the disconnected position. This is a very important matter as regards connector plugs used for portable apparatus, which although apparently earthed may not be so at all. One firm using a large number of electric tools,

on alternating current, has experienced much trouble in this respect. At their suggestion experiments were made to ascertain whether, with specially wound motors, it would be practicable so to reduce the voltage of the circuit that danger from shock would be so remote that the earth wire might be dispensed with. It was agreed that the tests should be taken under as severe conditions as may often occur in practice, e.g., the workman, as on a wet day, having damp boots and standing to his work on iron floor plates. The case of a drill weighing about 20 lbs., was connected to the circuit, which had one pole earthed. The man, a specially big and strong one volunteering for the purpose, held the drill in the usual way. Owing to its weight he was bound to make a very good contact. The pressure was gradually raised from zero, but before it reached 25 volts the man shouted that he had had enough. Although with dry boots nothing whatever could be felt at that pressure, it was clearly demonstrated, and confirmed by further trials, that under these conditions, which might at any time prevail in practice, the proposal was impracticable, that is to say, however low the pressure within practical limits, it is necessary, with alternating current, to retain the earth wire.

Once again a fatal accident was due to the use of an old type screw socket lampholder. Many people do not yet realise the danger of this type of lampholder, where the metal screw of the lamp cap is in direct connection with the circuit and projects outside the holder. Skirted type of screw socket lamp holders made in insulating material are available and should always be used. The old unprotected type, of course, does not comply with the Regulations and Factory Occupiers using it are liable to penalties whether an accident occurs or not.

Twenty accidents, including eight fatal cases, occurred to persons making contact with trolley wires of travelling cranes. Such trolley wires are necessarily bare. They should be and in general are placed far out of reach of any place where workers in the factory may have to be in the course of their employment. Further, they should be so guarded that the driver cannot touch them from the driving cabin or when entering or leaving the cabin by the proper means of access. Should it be necessary for anyone, e.g., painters, to work in proximity to the wires is it the duty of the occupier to ensure that the pressure shall first be switched off. Two of the accidents, one fatal, were due to inadequate guarding at the driving cabin, the driver reaching out of the cabin and touching the wires. One fatal case was due to the absence of a proper permanent ladder or other means of access, a movable ladder being used on each occasion. This was placed in such a way that the driver presumably slipped in getting into the cabin and grasped the wires. In another fatal case, where the wires were twenty feet from the floor, a gallery had been erected at one point seven feet below the wires. A youth working on the gallery made contact with one of the wires through a metal tool which he was using

in his work. In another, men carrying out structural alterations to the building were working on a gantry near the trolley wires and, although they knew the wires were live, one of them made contact and was killed. In two non-fatal cases, the men, one a painter, were at work close to the wires which had been made dead. Some person, unknown, switched on the current. The shock caused the painter to fall some twenty feet, but although severely injured he was not killed. The proper course where any work has to be carried out in proximity to the trolley wires is not only to switch off, but to lock the switch in the " off " position or to remove and lock up the fuses of the circuit. Two cases, one fatal, occurred to crane drivers forgetting to switch off in the cabin before going on to the platform above to oil the crab, and coming into contact with the cross trolley wires. Such accidents can be prevented by providing a trap door in the roof of the cabin through which the driver must pass to reach the upper platform, the trap door being arranged to trip the switch on being opened.

Two accidents, one fatal, occurred to men getting on to the crane gantry whilst in no way engaged on any work necessitating their approach to the wires. In the fatal case the man was taking a short cut to get to a hydraulic valve.

Two accidents were due to inadequate supervision, when labourers had to work near the trolley wires, in not ensuring that the current had first been switched off. Six accidents, of which two were fatal, occurred to electricians or electrical fitters, who should have fully realised the risk, in knowingly working close to the live trolley wires and omitting to see that the current has been switched off.

A similar type of fatal accident occurred in a works yard where overhead bare wires had been run about 2 feet 6 inches above a line of pipes which required periodical removal for cleaning. Two men were lying on the pipes and were engaged in hoisting another. One of them slipped and grabbed one of the wires. The firm's excuse was that the men had been warned of the danger.

Whilst there is no difficulty in protecting crane trolley wires at such points as may be necessary, as indicated above, there are other forms of travelling machines, notably at coke ovens, where difficulties may arise owing to the wires, although out of personal reach of the workmen, being unavoidably within reach of the metal tools which they have to carry about and use. In such cases where alternating current is used very complete guarding is essential, necessitating *inter alia* the use of specially designed trolley collectors. In view of the difficulties of efficiently guarding the wires, occupiers of coke ovens have in several instances been persuaded to adopt direct current at 220 volts, thus very greatly reducing the risk of serious accident. The chief difficulty in persuading the engineers of these undertakings to adopt this proposal has been that they have regarded the use

of direct current as being retrograde and out-of-date, whereas it has certain very pronounced advantages for this class of work besides that of safety which they have eventually recognised.

Broken overhead wires are always a danger in the absence of any automatic device for cutting off the pressure. They usually fall where they are in the way and someone picks them up intending to put them on one side. Two accidents, one fatal, occurred from this cause.

Five shock accidents occurred through metal conduit not being electrically continuous and earthed and a fatal case occurred to a youth taking hold of a lead covered wire of which the lead was neither continuous nor earthed.

A remarkable accident, also due to omission of proper earthing, occurred in a large shed where fertilisers were mixed. The shed was lighted by lamps in metal shade reflector fittings suspended by hooks attached to the screwed conduit. Although the conduit was earthed, the lamp fittings were normally earthed only through the contact between the hooks and there was some five or six inches of wire between the conduit outlets and the fittings. The fertilisers were mixed by an electrically driven portable mixer, a machine on wheels and weighing probably over a ton. Switch plugs with proper earthing connections were provided at different points in the shed so that the mixer could be moved about and used where required. On the day in question seven men were engaged in shoving the mixer along the shed, the floor of which was damp and slimy. The flexible cable and plug were withdrawn and the machine was therefore entirely disconnected from the electricity supply and from the earth connection. The mixer which was some nine feet in height touched one of the lamp fittings which happened to be live, thereby charging it up at 220 volts alternating, all the seven men receiving a severe shock. Six of them were held by the current and were unable to let go. Fortunately, the seventh man managed to get free and had the sense to run to the lighting switches and switched off. One of the men was found to be unconscious and, in spite of artificial respiration, he succumbed. Had it not been for the presence of mind of the man who got free in running to switch off all the six men would probably have been killed. It was subsequently discovered that the lamp fitting was off the hook and hanging by the wires and had apparently been so for a considerable time, probably having been unshipped by the mixer on some previous occasion. It was further noticed that the lamp fitting being opposite a doorway was swinging in the draught and the constant movement had caused the hook to wear through the insulation on the wire and hence the fitting to become live.

Another unusual type of fatal accident occurred in a works yard where the cables from one building to another were laid underground in ducts. A new cable was being drawn in whilst

the other cables were live. An obstruction was met with near a draw box and a lad used a stiff iron wire hook in an attempt to drag it through. In doing so he abraded the insulation on one of the live cables whilst he was pulling on the draw wire. He was held by the current and, in spite of artificial respiration, which was kept up for over an hour, he succumbed.

Four accidents were due to the explosion of oil switches on low tension circuits. A number of other switch explosions are known to have occurred but fortunately not resulting in personal injuries. It is not generally realised that switch explosions are now reportable as " dangerous occurrences " even when no one is injured. Failures of switches and automatic circuit breakers appear to be on the increase and are likely so to continue not only on electricity supply distribution systems, but on consumers' premises. Much of the switchgear now in use both on high and low-pressure circuits and which was no doubt adequate for the purpose when put into commission is no longer so owing to the vastly increased power now behind it and the enormously increased possible short circuit current with which it may have to deal, a condition intensified in many places by the linking-up of large electricity supply systems.

Where the conditions of the supply are thus rendered much more severe it is very important that the Electricity Supply Undertakings should ensure that not only their own sub-station switchgear, but also the consumers' main intake switchgear is of a capacity capable of dealing with the conditions. At the present time there are few large consumers who know what the capacity of their switchgear really is and few Electricity Supply Authorities who are able to tell them what it should be in view of the possible short-circuit conditions obtaining at the particular spot. This is a matter which demands much more careful attention than has hitherto been necessary.

Nineteen prosecutions were taken, mostly arising out of accidents. Six were in respect of Electricity Supply Undertakings (three Local Authorities and three Companies). Twelve were in respect of other factory premises including steel works, dockyard, sugar factory, and laundry, and one was against a workman (works electrician). Penalties varying from £1 to the maximum of £100 were obtained in thirteen cases, in one costs only, whilst four were dismissed. In two of these appeals are pending.* The workman was convicted, but let off with a caution and payment of costs only. The £100 penalty was against a Local Authority, in respect of the protection of high-tension conductors in a sub-station by taping only. Previous warnings had been given and the neglect resulted in a fatal accident.

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* In one of them, the appeal has now been heard, and the High Court have referred the case back to the Magistrates with instructions to convict. It referred to a fatal accident due to a man working on a dead cable within a foot or so of a joint in a live 6,600 volt cable protected only by taping.

The Electrical Inspectors have been very fully occupied in their respective areas, and their reports contain many useful comments on the matters dealt with, which cover a range from power supply and the making of steel to the gilding of silk fabrics and the ageing of wire. Some of their most useful work has been accomplished in regard to new plant by getting into touch with consulting engineers, power supply engineers, manufacturers of switchgear, etc., and with contractors, before the work has commenced and thereby preventing the repetition of faults previously found in other similar undertakings.

One of the matters which has again occupied attention has been that of outdoor transforming stations. As I reported last year, many of these have been put up regardless of the safety of those who subsequently have to operate or maintain them and quite contrary to the requirements of the Regulations. The designers of some appear to have assumed that the Regulations would not apply nor the question of safety matter at all just because they are out of doors in the open air, whereas Section 149 (5) of the Factory Act of 1901, expressly provides to the contrary.

With the usual indoor types of high tension switchgear, the conductors and apparatus are completely enclosed so that ordinary routine operation can be carried on without the possibility of touching any live conductors. The switchgear is also capable of being divided into sections, any one of which can be made dead before opening up for cleaning or repairs, the live sections remaining completely screened. With the outdoor type of switchgear provision for operation without risk of touching live conductors can be readily effected by placing all conductors and apparatus at a sufficient height from the ground, or from any working platform, to be well out of reach. The further question of safety when cleaning, painting or repairs become necessary, requires very careful consideration which it has not always hitherto received.

In come cases it is practicable to erect screen work between sections which can be made dead, but such screen work has its own disdavantages in that it may be difficult to arrange for and will itself in time require painting and repair. In the absence of suitable screen work, the obvious and only precaution which is available, if as is usually the case, it is desired that cleaning or other work may be carried on without making the whole station dead, is so to space the sections from one another that a man working on a section which has been made dead will be so far out of reach of any live conductor of an adjoining section, that he is in no danger therefrom. On this matter Mr. Swann observes :—

> It should, I think, be quite clear that in the absence of segregation of sections by screen work the only safe course to be followed is so to space the sections as to secure a reasonable degree of safety having regard to the nature of the work anticipated. This work may cover such things as constructional extensions, renewal of insulators, maintenance of mechanical parts, switch levers, isolating switches, etc., cleaning and painting, and regard

should be paid not only to the actual extent of a man's reach, but to the length of the tools or material he is likely to handle. Where the ground space is inadequate to allow the erection of switchgear with adequate clearance between sections it is evident that indoor constructions should be considered as an alternative.

Mr. Preston, on the same subject, remarks :—

> The position in respect of outdoor substations continues to be less satisfactory than that of the indoor type, and many cases are still noticed in which the design makes routine cleaning and maintenance operations an extremely hazardous operation.
>
> Actual experience by electricity supply undertakings of the danger and difficulty involved in operating and maintaining the smaller type of outdoor transformer stations is making many of them hesitate to add to the number. In spite of various developments, such as rocker arms, enabling fuses to be changed at ground level, etc., there is a decided tendency to revert to the semi-outdoor type in which all switchgear is housed in buildings, the transformers only being placed outside.

Mr. Swann refers to recent developments in rectifying plant :—

> A feature of the year has been the return of the metal clad type of mercury rectifier. This class of rectifier was installed about five or six years ago in small numbers, but the present day patterns embody marked improvements and contracts are in hand for the production of units up to 3,000 K.V.A. each. Whilst those so far installed are of continental manufacture, it is interesting to note that one of the home manufacturing firms have rectifiers in hand for delivery to one of the large electric railway systems.

Mr. Swann has also given special attention to the matter of flame-proof apparatus for use in works connected with the manufacture or use of inflammable materials, petrol, refineries, etc., and for cellulose spraying. He has also dealt specially with high frequency induction furnaces, film printing and fish yard lighting.

Mr. McColgan refers to one of the most notable events in his area, the making live of the first section of the 132,000 volt National Grid System under the auspices of the Central Electricity Board. In connection with the change of frequency from 25 to 50 cycles over large areas in Scotland, he states :—

> Certain stations are operating on two different frequencies, and maximum efficiency cannot, therefore, be obtained at present. Change over of apparatus on consumers premises is in progress. The change over has necessitated temporary alterations or additions to E.H.T. switchgear in certain substations for maintaining supply at both frequencies, and the arrangements have been the subject of discussion with the authorities concerned as regards requirements of the Regulations.

He refers to five public supply generating stations in Scotland which have ceased to generate on taking a bulk supply. In one now supplying A.C. to surrounding districts at 3,000 volts, the new A.C. switchboard was designed so that no work could be done upon it without shutting the station down. Two of the largest private generating plants in the country have been put to work during the year, and several new water power plants for general supply. In referring to a new crude oil engine he states :—

> A factor which is rather perturbing some public supply engineers is the advent of very economical crude oil engines. Generating costs with these engines are very low and can compete successfully with public supply prices, so much so that in some districts certain factories have discontinued the use of the public supply and installed their own plants. Others, after due

consideration, have put in oil engines instead of taking local supply. This competition is useful, as it promotes progress and development of both systems on an economical basis, to the advantage of industry as a whole.

In regard to the rupture capacity of switchgear under the new conditions he observes :—

> Discussions with most supply engineers in the area indicate that steps have been or are being taken to improve switchgear where necessary, at any rate in important switching centres.
>
> The construction of the " Grid " system has caused much of this activity. Where direct connection to the Grid is made, risks cannot be taken and suitable switchgear is installed. For instance, on the first section of the " Grid " to be made alive an entirely new switchboard was installed at a large power station, replacing one of insufficient capacity for the new conditions.
>
> In a power scheme submitted for a large works, calculations showed the capacity of the proposed switchgear to be under-estimated for the intended supply from the " Grid." The switchgear in the Supply Authorities sub-station, which at first it was not intended to alter, was also found to be too small under the new arrangement. As a result of discussions with both parties, the specification for the works E.H.T. switchgear was altered to call for switchgear of 50 per cent. additional capacity, and in the case of the Supply Authority I understand the existing substations switchboard is now to be replaced by one of double the breaking capacity. These alterations were based on agreed figures, and considered necessary to provide for safe operation.

On this important matter of ascertaining the necessary rupture capacity of switchgear, Mr. Swann reports :—

> Bearing on the question of switch rupture capacities, it is interesting to note that in connection with the determination of the switch capacity required in complicated inter-connected networks one or two manufacturers possess electrical plug tables, which can be manually operated, to give a replica of the electrical conditions which obtain in a given distributing network, and the resulting switch capacities desirable are indicated by instruments.

Mr. McColgan, in conjunction with Mr. Price, has made an investigation into the prevention of fires and explosions due to ignition of vapours of solvents by static electrical charges in rubber works. They have found from records kept over a considerable period that a relative humidity of the atmosphere of not less than 50 per cent. appears to provide the desired result. Since introducing this method in a large rubber spreading works where there had previously been a number of fires and explosions no accidents have occurred.

Mr. McColgan also deals at some length with the organisation of the electrical departments in large works in reference to the prevention of electrical accidents.

Mr. Brown, in the Midland Area, who transferred his services at the end of the year to the Central Electricity Board after eight years as an Electrical Inspector, comments in his report on the improvements which he has found to have taken place during that period. As regards substations he states :—

> During the eight years I have been with the Department I have seen very great improvements in the general standard of work both in industrial installations and in central stations. When I first took up my duties in the Midland Area, it was quite unusual to come across even a new installation which fully complied with the Regulations, even when the work had been done by a good firm of contractors. To-day it is the exception to find an installation which has been put in by a good firm which does not comply with the Regulations, except perhaps, in some small detail. Even the small one-man contractor is now beginning to realise that there are such things as Electrical Regulations, and that these have to be complied with. I find that many electrical undertakers are glad to avail themselves of our services when they find bad installations, the owner of which will not put them in order.

The same thing applies to central stations and sub-stations. Eight years ago a great many of the new switchboards put in by large manufacturers contravened the Regulations; now their requirements are well known and the makers do their utmost to comply with them. When in doubt they invariably ask for an interview to discuss any conflicting points.

Similarly, I find that sub-stations constructed by the larger undertakers are invariably regular, as they fully understand what is required, and standardise a design which has been approved by our Department.

A great deal of attention still requires to be paid to installations used under dangerous conditions, such as explosive vapours. It is surprising how few contractors really understand the dangers to be met from this source, and the precautions to be adopted.

In dealing with sub-stations he makes a useful suggestion :—

Most undertakings have standardised their designs with the result that construction costs have been reduced and interchangeability secured. One point requires the attention of the standardising authorities, and that is the transformer cable boxes. At present each manufacturer has his own design and his own dimensions which means that in the case of a transformer failure the cable box has to be remade as well as the transformer changed. If all transformers of a certain capacity had cable boxes of standard size maintenance would be greatly facilitated.

Amongst the new applications of electricity he cites the following :—

Electricity is now being used for heating drying cylinders in bleach works where constant temperatures are required; the cylinders are loaded with 3 k.w. each, the temperature being thermostatically controlled. The system is stated to be far more satisfactory than steam heating.

The number of sub-stations in which there is no constant attendance, on the Registers at the end of the year, was 14,496.

Fatal Accidents in 1929.

Table Showing Pressure and System.

Fatalities.	Voltage of System.	Probable Voltage of Shock.	System.
1*	33,000	19,000	3-phase.
1†	11,000	—	3-phase.
1	10,000	10,000	1-phase.
2	6,600	3,800	3-phase.
1	5,500	3,200	3-phase.
1	5,200	3,000	3-phase.
1	2,500	2,500	1-phase.
1*	2,400	2,400	1-phase.
1	2,000	2,000	1-phase.
1	1,200	1,200	Direct.
1	1,000	1,000	1-phase.
1	440	440	Direct.
8	440	250	3-phase.
1	425	245	3-phase.
2	415	240	3-phase.
1	400	400	3-phase.
8‡	400	230	3-phase.
1	210	210	1-phase.
1	200	200	1-phase.
35			

* Shock and fall.
† Explosion of oil switch.
‡ Three cases of shock and fall.

CHAPTER VI.

REPORT OF SENIOR ENGINEERING INSPECTOR,

Leonard Ward, O.B.E.

The pressure of work in this Branch, to which reference has been made in previous reports, has in no way abated, but some relief is now in prospect as the Factory Staff Committee, appreciating the past efforts of the Branch (which they referred to as " a vital element in the whole work of the Inspectorate "), recommended a substantial increase in the number of engineering inspectors. The additional staff when in full working order will permit of current work being dealt with more expeditiously, which will result in the greater usefulness of the Branch to the Department generally. It will also enable the Branch to undertake work which, so far, has been much neglected, more particularly in regard to the design of machinery and plant from the safety point of view, a subject which in the past it has not been possible to follow up in any systematic manner. There are, perhaps, few channels in which more really useful work could be undertaken and which, if successfully pursued, would have more telling effects in the field of industrial accident prevention. Indications are given below where activities of this nature have been opened and give promise of successful results.

The overloading of cranes has long been recognised as a fruitful source of accident, involving loss of life and serious personal injuries, together with considerable material damage. With a view to eliminating the risk of overloading, which may take place without conscious intent on the part of the crane driver, a new type of overload detector for jib cranes has been tried and found successful. The appliance shows by an " indicator " whether the load, which is being lifted, is within the safe working limit of the crane, or whether the limit has been passed. The appliance which gives the indication consists of a fixed plate and a revolving pointer working in conjunction with it. Three stages are marked on the fixed plate (1) the lower, in which any position of the pointer indicates " safe," (2) a narrow region in which the safe working load is attained, and (3) a region in which the point indicates danger. The device takes account not only of the weight lifted, but also of the radius of working; it marks a departure and a distinct advance in the design of safety appliances for jib cranes. A number of cranes fitted with this device have been found to be very satisfactory under actual working conditions. The makers have placed the device on the market and are preparing a descriptive advertising pamphlet; when available this will be considered for issue to the Inspectorate.

A decrease in the number of bursts of hydro-extractors in this country has been noted, particularly of machines used in chemical processes; this is no doubt due to incorporating in the design more suitable materials from which the cages are made, and the better attention and more frequent examinations to which they are subject. The desirability of arranging for inspection by a competent person has been impressed on occupiers. Inspection by a competent person does not, however, always secure safety, as is shown by the following case of a serious burst. A machine, on conversion from steam to electric drive had been insured and an inspection made. The cause of the burst was a defect which had developed in the body of the cage and was not discovered by the firm which converted the device, or the insurance surveyor who inspected the machine. This is a subject which has been discussed with the designers of the machines.

As the strength of a structure is determined by its weakest part, the design of even the simplest attachment forming part of a structure needs adequate attention, as indicated by the following instance. The failure of a wire rope used on an inclined hoist was at first thought to be mysterious, but on investigation it was found that an incorrect method of " capelling " the rope end had been adopted. This allowed unequal stresses on the strands and breakage resulted. This question again has been discussed with the makers.

The design of the moveable covers of vessels subject to high internal pressure also calls for attention, as indicated by the explosion of a large foreign-made vulcaniser. The closing arrangements, consisting of three internal shoes which clamped the door against the vulcaniser body, were operated by an external lever handle, all the working parts except the handle being enclosed in the vulcaniser, so that if the action was faulty the defect could not be seen. When the vulcaniser was in operation the door blew off, very severely injuring one of the workers. Examination after the explosion indicated that the clamping arrangement had not worked properly and that the design was such that a defect could develop unless considerable care was exercised. Enquiry was made and it was found that this was probably the only vulcaniser of its kind in this country and that the makers had gone out of business.

The explosions of small vulcanisers, used for motor tyres, have shown that even in what would appear to be unimportant details the question of correct design is of real importance, such as placing the safety valve and pressure gauge connections at a level at which access of dirt and scale from the body of the vulcaniser would be avoided, and the necessity of fitting readily-removable plugs to allow the accumulations inside being cleaned out periodically. As a result of representations by this Branch, the makers agreed to alter the design of the body of the vulcaniser to accommodate the fittings at a level so that access of scale would not be possible and to provide gun-metal plugs which can

be removed to allow the necessary cleaning and inspection of the interior. This enquiry involved several consultations with an Insurance Company particularly interested in this type of vulcaniser. A number of users have had the older type of vulcaniser reconditioned to comply, as far as possible, with the new arrangements. The action taken has resulted in a substantial advance in the safety of these appliances.

Another instance pointing to the necessity for care in the design of the details of safety appliances occurs in the case of hydraulic valves used in connection with acetylene generators. A recent fatal explosion at an acetylene plant was found to be due to flame passing back through a badly-designed hydraulic valve and entering the generator. Upon cutting open the hydraulic valve it was found to be entirely wrong in design, the relief pipe and the gas inlet pipe both dipping equal distances into the water seal. The accident shows how important it is for occupiers who use such plant to see that the hydraulic valves supplied are of such construction that it is possible to examine the internal arrangements and so make sure that they are properly designed for effective use. This question has been taken up with the British Acetylene Association.

As the matter of design is involved in much of the work undertaken by the British Engineering Standards Association, it follows that this Branch becomes increasingly called upon to represent the Department on different Technical Committees set up by that Association. This necessarily involves a fairly heavy call on the time of the Engineering Inspectors, but it is obvious that the time is well spent. At present one or other member of the Branch is a member of one or more of the following Committees of the British Engineering Standards Association :— Mechanical Industries Committee ; Derrick Cranes ; Travelling Jib Cranes ; Overhead Travelling Cranes ; Chains ; Chain Fittings (i.e., rings, shackles, swivels and slings) ; Ships Blocks ; Air Receivers ; Compressed Gas Cylinders ; Manilla Ropes ; Portable Railway Tracks ; Bridges and Steel Frames (Building Construction) ; Grinding Machinery and Paints and Varnishes. Mr. Pollard has been elected as Deputy-Chairman of the Cranes Committee and has acted as Chairman for some time past, owing to the Chairman's absence abroad.

Another field of enquiry which appears to offer useful results, is that relating to the possibility of securing standards for the testing and inspection of vessels which have to withstand comparatively low internal pressure. The inspection of gas-holders is an example. In consequence of the wreckage of the two gas-holders at Manchester, and the occurrence of other failures, inspections of a number of gas-holders have been made. The inspections, though small in number relatively to the whole number of holders in use, have revealed that in some holders an appreciable amount of deterioration has taken place. In some instances the body of the holder, in others the guide structure,

in others both body and guides have been found to be doubtfully secure. Different causes and circumstances have operated to bring about this state of affairs. In one instance the general impoverishment of the district, due to bad trade, was given as the reason for not spending money on necessary repairs. It might be assumed that the oldest holders are the worst, but this is by no means the case. The condition appears to depend upon several factors in addition to age, the material of which holders are constructed being one of the most important. There are, for instance, wrought-iron plate holders which have been in use for about sixty years and which still appear to be in good condition. On the other hand there are some steel-plate holders which have been in use between thirty and forty years which are in bad condition and which will require replacement in the near future. The deterioration of external surfaces has in some cases been hastened by lack of paint or other preservative coating. Another factor is the direction of the prevailing wind : this cause of deterioration shows up very prominently in some works. Further failures may occur unless attention is paid to these matters. The failure of a gasholder may involve not only employees, but may be more far-reaching, as the temporary cessation of the gas supply would, in some degree, be accompanied by danger to the gas-consuming public.

A good practice is followed in some works when the holders are regularly inspected by the works engineers or by makers' representatives. The matter, however, does not appear to lend itself to uniform treatment and the matter is under discussion with the National Gas Council.

Similarly, bursts of air receivers, having fusion-welded joints, point to the necessity of attention to the design of the joints of such vessels, and the provision of proper means for the inspection of the interior of the receivers. A large number of fusion-welded receivers are in use in this country. It is probable that some have badly-made joints, but owing to the lack of facilities for internal inspection it is impossible to ascertain whether such joints are likely to fail owing to bad construction, or what amount of corrosion is going on. Explosions of such receivers may be expected from time to time, but the position can be rectified by the operation of such provisions as are contained in Clause 29 of the new Bill, the inspection required being made by a competent person. As regards new receivers, the work which is being undertaken by the British Engineering Standards Association will, when completed, operate to give a standard of security against the defects in design which are not now possible.

Hot blast stoves used in connection with blast furnaces afford another example where the design of the structure, coupled with periodic inspection, needs to be carefully considered. Explosions of hot blast stoves, the plates of which were extremely deteriorated, were referred to in the Annual Reports of 1927 and

1928. Another case occurred during 1929, causing two fatal and four non-fatal accidents. The three explosions have caused, in all, five deaths and injuries to 12 other persons. Within the same period there have been a few cases where the dome plates of old stoves have been partially disrupted, some debris falling to the ground, though without causing personal injury.

The fatal explosion in 1929 occurred at a Ford & Moncur stove; this differs from the Cowper Stove (the type involved in the cases reported in the previous years) in the arrangement of the internal flue and of the regenerative brickwork. The stove had been on blast for about 20 minutes. In this interval, the metal was tapped from the blast furnace. At the conclusion of the tapping, the blast was shut off to enable the tapping hole to be closed. The explosion occurred almost simultaneously with the closing of the blast valve at the furnace. The dome and the top tier of plates of the shell were torn away and the debris which fell killed or injured the workers involved. The disrupted iron plates of the stove, which was about 40 years old, were considerably wasted, both at and away from the riveted joints, being reduced almost to "paper" thickness in several places; the wasting was mainly internal. The stove was designed when the maximum blast pressure was about 8 lbs. per square inch. Since its erection, pressures have been raised considerably, as at other similar works. Just before the valve was closed the turbo-blower supplying the blast was working at a pressure of 15 lbs. per square inch. After the valve was closed, the pressure rose to 16·5 lbs. per square inch, at about which pressure the accident must have occurred. A series of tests of sections of plate, taken from the less corroded portions indicated (*a*) general wastage; (*b*) reduced strength, breaking stresses of only just over 10 tons per square inch were found in some cases; (*c*) an almost entire loss of ductility in all the samples; (*d*) alteration of the nature of the metal to a considerable depth from the inside face, the metal showing much fibrous lamination with a cindery-burnt appearance.

Having regard to the reduced strength and thickness of the plates, an internal air pressure of 16·5 lbs. per square inch was capable of causing the explosion, which appears to have occurred under ordinary working conditions. The alternative view, viz., that an explosion of gas occurred in the stove (suggested in this and the previous cases) may therefore be rejected, since no convincing evidence supporting that view was furnished.

This danger is not one that can be readily detected by an inspector in the ordinary course of his duties, but a full report on the whole question has been sent to the Iron and Steel Traders Employers' Association, who have been invited to take it up with their members.

A joint enquiry was made by Mr. Price and Mr. McColgan, into methods of preventing the occurrence of fires in rubber-spreading rooms through ignition of inflammable vapour (given

off by solvents) by spark discharge of static electricity generated in the process. The occupiers of a factory where a number of fires (resulting in burning accidents) had occurred gave much assistance to the enquiry. In particular, the hygrometric condition of the atmosphere of the room was carefully observed over a considerable period, a record of dry and wet bulb temperatures being kept. American authorities have suggested that if the relative humidity is maintained above 50 per cent. risk may be eliminated, and attention was therefore directed primarily to determining whether such a minimum, if adopted, might secure immunity from accident. Fortunately, the period coincided with, on the whole, exceptionally dry weather when an increased incidence of fire outbreaks might have been anticipated, owing to the tendency for static charges to build up. There were, however, only two small fires, the humidity being below 50 per cent. on each occasion. With watch being kept on the humidity the daily practice was started, as a precautionary measure, of turning steam into the room during the mid-day meal time. In addition, when the relative humidity was found to be low, live steam was turned on until it was increased to a figure above 50 per cent. The meterological readings showed that the relative humidity was invariably much higher than that in the spreading room, the average values being 87 per cent. external and 48·5 per cent. respectively. The vapour content in the room was, notwithstanding, greater than that outside, the additional moisture being imparted by escaping and supplied steam, and by the presence of the workers. The low relative humidity results, of course, directly from the high room temperature, dryness of the external atmosphere having little or no effect, except in rare cases. A higher relative humidity could be obtained by reducing the room temperature, but this is a difficult matter where such hot processes are carried on. The other alternative is to increase the vapour content by adding moisture. The investigation appears to show that a relative humidity of 50 per cent. is the minimum necessary to prevent, as far as possible, static ignitions. There is little doubt that the relative humidity in spreading rooms is often so low as to introduce risk of static ignitions taking place. Although earthing devices may be of value if suitably placed, they are difficult to maintain and liable to impede the workers and to damage the fabrics in process of manufacture. If the humidifying of the air to the relatively low minimum of 50 per cent. does, in fact, eliminate the risk of static ignitions, the knowledge that such a simple safeguard exists would appear to be of considerable value to this and other trades.

The Home Office Industrial Museum, not unnaturally, has made frequent calls on the Branch, especially on Mr. Murray, not only in connection with the visits to the Museum of technical parties from Manufacturers' Associations, Trades Unions, Technical Institutions, individual works, etc., and for practical demonstrations of special exhibits, e.g., the Ventilation Building and the Explosions Exhibit, but also for special enquiries relating

to the selection of additional exhibits for the Museum. The latter activity cannot be allowed to slacken if the Museum is to maintain its present high standard of usefulness and to keep level with, if not in advance of, the latest developments in industrial safety.

The Branch has also undertaken its full share in giving addresses and lantern lectures on these subjects to different bodies, including the British Medical Association, Engineering Societies, Technical Colleges and Schools, Insurance Institutions, and at individual works.

Members of the Branch have participated in Conferences with the Building Trades employers and representatives of the Trades Unions at which measures to ensure greater safety in the use of cranes and lifting gear and proposals for amending the Building Regulations, were considered.

The revision of one or other of the Home Office Safety Pamphlets and of the Leaflets relating thereto is called for from time to time, and as a rule this work is undertaken by the Branch. The pamphlet on the Ventilation of Factories and Workshops has been dealt with during the year and its size has been appreciably increased so as to indicate the general principles (under the variable conditions which obtain) to be observed for securing, in industrial premises, health and comfortable atmospheric conditions for the workers, having regard particularly to the research carried out in recent years by the Industrial Health Research Board, and others. A section on the Heating of Factories and Workshops has also been added. In this connection it may be noted that Mr. Price has been selected as a member of the Committee of the Department of Scientific and Industrial Research, dealing with the Ventilation and Heating of Buildings.

The subject of industrial lighting is receiving increased attention mainly may be on account of its economic value, but improvement in lighting has undoubtedly a " personal " factor which is not unimportant. It has been found that there is a general tendency to increase illumination at factories, but the underlying scientific principles are not always observed ; the increase is often secured simply by using larger power lamps with reflectors of incorrect size and shape, or sometimes without reflectors. Lighting of this kind, which might fairly be called " uncontrolled " lighting, may not only be extravagant, but may also be harmful to the operatives' eyes by reason of the " glare " ; it may also increase the liability to accident, due to glare and to the time of eye adaptation required for adjustment between the brightness of the luminant and the work. Hence the use of correctly designed reflectors suitably positioned is of primary importance.

As in the past, members of the Branch have been called upon to give expert advice in prosecutions undertaken by the District Staff and have attended 13 such cases. In addition, 9 Inquests have been attended where technical assistance was called for.

Interviews to the number of 172 have taken place at the Central Office with occupiers, architects, consulting engineers, heating and ventilating engineers, etc., in connection with the work of the Branch.

Although accidents in Civil Engineering Works are not reportable to this Department, a few firms make a practice of reporting accidents at such undertakings, and reports of 65 accidents have been received. Of these, 21 were reported from a dock in course of construction, and 23 were reported by a firm which carries out much bridge and other reinforced concrete construction. The remaining 21 were mainly reported from pipe-laying jobs by contractors and departments of Corporations.

The causes of these accidents are shown in the tabular statement below. Although these reports do not, on account of their small number, give any accurate picture of the classes of accidents which occur on such undertakings, yet they do give some indication, perhaps, of the more common causes of accidents.

Accidents reported from Engineering Works.

Fall of persons..	13
Fall of earth, sand, etc.	7^{5}
Fall of material or plant	10
Cranes and pile drivers	8^{1}
Carrying, strains, splinters	6
Use of hand tools	12
Handling materials	4
Striking against objects	2
Scaffolding collapse	1
Gassed (carbon monoxide)	1
	65^{6}

The raised figures indicate fatal cases.

TABLE 1.—Inspectors' Districts, 1929.*

District	Textile Factories.	Non-Textile Factories.	Workshops, including Men's.	Docks, Wharves, Quays—not forming parts of Factories or Workshops.	Warehouses—not forming parts of Factories or Workshops.	Firms registered under Lead Paint Act, 1926.	Works or Departments under special inspection.		Accidents. (Tables 10, 11 and 12).		Dangerous Occurrences. (Table 11).	Cases of Poisoning. (Table 9).	Notices to District Councils. (Table 4).
							Regulations (Table 8).	Humid Textile Factories under s. 96.	Fatal.	All.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
N.E. London	29	2,233	2,260	8	9	456	3,161	—	3	786	11	1	502
E. London	13	2,534	3,270	236	203	285	3,084	—	14	1,878	15	5	1,233
Central London ..	6	1,368	824	35	346	123	1,650	—	10	568	5	2	165
S. Essex	13	2,065	1,126	73	2	745	3,439	—	24	4,124	28	16	142
Ipswich	23	1,550	1,774	15	11	186	1,560	1	2	1,286	2	1	81
Woolwich	12	2,286	1,427	233	63	714	3,770	—	39	5,051	30	14	142
S. London	28	3,058	1,990	100	62	1,111	5,371	—	16	2,026	10	6	297
Croydon	9	1,800	1,354	—	6	872	2,377	1	5	784	1	6	86
Maidstone	6	1,943	1,756	73	17	1,128	3,182	—	1	1,525	3	2	53
Brighton	3	1,995	2,295	47	7	983	3,004	—	2	677	1	1	209
	142	20,832	18,076	820	726	6,603	31,098	2	116	18,705	106	54	2,880
Finsbury	15	3,907	2,818	5	67	475	5,277	—	10	1,145	24	4	493
N. London	9	2,470	2,393	5	20	863	4,169	—	15	1,235	11	3	335
N.W. London ..	6	2,701	2,626	11	40	850	4,244	—	17	1,401	7	7	504
W. London	21	3,987	4,110	82	54	1,389	6,483	—	30	3,719	10	25	741
Richmond	8	1,405	1,308	20	2	837	2,285	—	3	655	2	1	73
Reading	12	1,940	1,860	5	5	937	2,949	—	6	1,272	4	1	130
Southampton ..	6	2,934	2,565	174	82	1,153	4,900	—	12	2,063	6	11	304
	77	19,344	17,680	302	270	6,504	30,307	—	93	11,490	64	52	2,585
Cardiff	5	1,674	1,854	46	71	403	2,260	—	16	1,809	45	13	208
Newport	2	928	942	19	20	238	1,244	—	9	2,292	6	8	122
Swansea	10	1,240	1,112	39	44	151	1,871	—	21	4,141	14	24	120
Carmarthen ..	97	970	1,345	54	50	233	1,343	—	3	1,488	3	3	88
Wrexham	27	1,336	1,259	63	25	443	1,829	2	5	1,269	1	1	154
Bristol	38	3,364	2,930	68	88	843	4,396	1	8	3,196	10	16	220
Gloucester	32	1,088	1,159	31	29	210	1,576	—	8	675	3	—	58
Exeter	8	1,415	1,370	26	5	709	2,224	—	6	302	3	1	91
Plymouth	26	1,953	2,014	113	55	406	2,722	—	8	1,177	8	2	263
Yeovil	28	1,114	908	14	10	194	1,286	—	6	358	5	2	79
	273	15,082	14,893	474	397	3,830	20,751	3	90	16,707	98	70	1,403
Birmingham, E. ..	6	2,900	1,452	18	85	364	5,032	1	16	4,464	20	16	240
Coventry	54	1,314	926	18	12	349	2,653	3	5	2,191	17	3	150
Birmingham, S. ..	2	1,416	795	10	17	281	2,349	—	4	2,273	5	7	153
,, W. ..	2	2,003	795	7	10	191	3,491	—	4	2,792	6	25	183
Wolverhampton ..	4	2,427	1,265	40	54	252	3,888	1	18	4,494	22	15	157
Walsall	6	1,244	604	32	32	121	1,976	—	13	1,750	18	4	78
Shrewsbury ..	4	964	920	9	15	269	1,362	—	4	830	8	1	63
Stoke-on-Trent ..	73	1,693	926	22	77	238	2,478	2	13	1,915	7	14	95
Worcester	41	1,176	1,088	20	54	417	1,731	—	3	871	3	4	73
	192	15,137	8,771	176	356	2,482	24,960	7	80	21,580	106	89	1,203
Leicester	454	2,292	1,230	6	36	258	3,517	2	10	1,639	11	3	105
Nottingham	277	1,810	1,403	7	26	127	2,878	1	8	1,423	6	2	157
Lincoln	4	2,015	1,749	43	27	267	2,310	—	20	2,505	316	2	176
Norwich	15	1,639	2,158	108	43	221	2,347	6	5	1,012	2	4	123
Cambridge	13	1,093	998	18	17	182	1,332	2	4	946	3	3	91
Luton	7	1,611	911	2	8	506	2,472	—	6	1,336	10	1	120
Northampton ..	—	1,647	836	2	51	216	2,102	—	4	995	6	2	98
	770	12,107	9,285	186	208	1,777	16,958	11	57	9,856	354	17	870
Sheffield	2	3,228	1,086	3	52	182	6,193	—	14	3,454	887	2	164
Rotherham	17	1,324	742	23	28	109	2,030	—	14	2,714	91	5	98
Derby	284	2,073	1,304	8	33	326	3,192	4	20	3,240	58	10	105
Wakefield	254	989	712	7	25	125	2,268	2	—	814	4	12	82
Huddersfield ..	390	1,319	756	7	27	162	2,540	9	12	1,387	8	21	91
Halifax	374	1,363	653	12	28	153	2,758	31	5	989	4	8	85
	1,321	10,296	5,253	60	193	1,057	18,981	46	65	12,598	1,052	58	625

* Columns 2, 3 and 4 include 187 "institution" works, under s. 5, 1907; but exclude docks, wharves, quays, and warehouses (s. 104) (columns 5, 6), "buildings" (s. 105), railway lines and sidings (s. 106), homework premises, and factories and workshops under the charge of H.M. Inspectors of Mines. Column 8 includes places under s. 106; otherwise the works or departments in columns 8 and 9 are also included in columns 2, 3, 4, 5 and 7.

TABLE 1.—Inspectors' Districts, 1929*—*continued.*

District.	Textile Factories.	Non-Textile Factories.	Workshops, including Men's.	Docks, Wharves, Quays—not forming parts of Factories or Workshops.	Warehouses—not forming parts of Factories or Workshops.	Firms registered under Lead Paint Act, 1926.	Works or Departments under special inspection.		Accidents. (Tables 10, 11 and 12).		Dangerous Occurrences. (Table 11).	Cases of Poisoning. (Table 9).	Notices to District Councils. (Table 4.)
							Regulations (Table 8).	Humid Textile Factories under s. 96.	Fatal.	All.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Leeds, S.	237	2,193	1,096	40	36	182	3,452	5	22	2,235	6	7	195
„ N.	31	1,899	1,236	14	59	149	2,600	1	4	942	4	5	258
Bradford	512	2,056	1,468	2	81	218	4,343	23	10	1,267	13	10	232
Keighley	314	799	430	3	20	116	1,543	9	3	534	11	1	37
Hull	8	1,767	1,415	92	120	137	2,354	—	17	1,669	5	2	89
Middlesbrough ..	9	1,790	1,256	24	19	267	2,894	—	68	6,714	26	34	82
Gateshead	9	1,735	1,145	53	20	195	2,764	—	39	4,105	132	5	115
Newcastle	8	2,061	1,485	60	71	201	2,701	—	19	2,902	5	5	150
	1,128	14,300	9,531	288	426	1,465	22,651	38	182	20,368	202	69	1,158
Manchester, W. ..	105	3,334	2,080	75	421	186	4,499	6	10	3,522	19	7	168
„ E. ..	73	1,884	913	4	79	95	2,714	13	11	2,332	37	13	126
Stockport	174	1,281	760	7	15	199	1,644	21	3	1,116	8	10	35
Ashton-under-Lyne	190	831	426	2	35	103	1,754	41	6	1,376	4	19	29
Oldham	337	724	381	—	18	120	1,376	49	10	2,739	10	19	41
Rochdale	338	874	372	1	14	167	1,795	48	4	1,470	6	4	5
Bolton	370	1,473	929	3	31	204	2,493	64	15	2,881	13	13	58
Blackburn	313	1,077	853	16	25	195	2,097	17	7	1,048	5	9	57
Burnley	444	978	697	7	30	143	1,881	—	6	951	7	1	76
	2,344	12,456	7,411	115	668	1,412	20,253	259	72	17,435	109	95	595
W. Cheshire ..	1	980	768	47	23	469	1,678	—	10	2,120	2	1	33
Warrington ..	6	1,462	1,040	60	43	267	2,247	1	10	4,459	17	13	40
Liverpool, N. ..	9	1,231	793	17	688	199	1,988	1	7	1,274	4	3	188
„ S. ..	13	1,665	1,572	196	583	287	2,826	—	22	1,646	9	8	195
Wigan	77	964	690	11	20	262	1,713	21	5	951	1	5	94
Preston	153	1,813	1,222	14	22	319	2,611	25	18	1,538	4	8	221
Barrow	29	1,296	957	25	2	212	1,825	—	11	1,513	8	3	86
	288	9,411	7,042	370	1,381	2,015	14,888	48	83	13,501	45	41	857
Glasgow	33	2,963	1,755	168	86	257	4,538	—	38	6,103	12	—	315
Lanarkshire ..	101	2,562	876	6	45	157	3,767	3	30	3,948	46	2	64
Renfrewshire ..	78	1,133	562	55	—	105	1,630	—	25	2,955	3	15	22
Ayr	108	1,136	868	26	13	126	1,280	1	5	447	1	2	36
Stirling	41	923	453	30	3	91	1,339	1	8	1,426	3	4	55
Edinburgh ..	105	2,622	1,833	27	65	254	3,188	2	13	1,511	5	9	52
Fifeshire	50	932	530	29	4	107	1,603	—	10	627	1	15	55
Dundee	138	1,411	1,011	31	47	165	2,026	—	8	1,211	4	—	146
Aberdeen	45	1,712	1,443	28	36	135	1,717	—	7	729	3	1	121
Inverness	22	838	1,050	93	—	77	642	—	—	72	4	—	69
	721	16,232	10,381	493	299	1,474	21,730	7	144	19,029	82	48	935
Total ..	7,256	145,197	108,323	3,284	4,924	28,619	222,577	421	982	161,269	2,218	593	13,111

* Columns 2, 3 and 4 include 187 "institution" works, under s. 5, 1907; but exclude docks, wharves, quays, and warehouses (s. 104) (columns 5, 6), "buildings" (s. 105), railway lines and sidings (s. 106), homework premises, and factories and workshops under the charge of H.M. Inspectors of Mines. Column 8 includes places under s. 106; otherwise the works or departments in columns 8 and 9 are also included in columns 2, 3, 4, 5 and 7.

TABLE 2.—Complaints Received, 1929.

(A complaint frequently deals with several subjects and this explains the difference in totals.)

Source and Subject of Complaints	Division or Branch. South Eastern.	Southern.	Western.	Midland.	Eastern.	North Midland.	North Eastern.	East Lancashire.	North Western.	Scotland.	Textile Particulars Inspectors.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	10)	(11)	(12)	(13)
Source of Complaint :—												
ANONYMOUS	339	197	78	90	81	74	99	163	65	79	4	1,269
OFFICIAL	64	76	2	23	19	6	26	20	9	7	7	259
OPERATIVES (including TRADE UNIONS) ..	212	185	57	84	98	42	101	113	48	71	32	1,043
OTHER..	136	203	78	74	41	32	51	101	42	37	—	795
Total ..	**751**	**661**	**215**	**271**	**239**	**154**	**277**	**397**	**164**	**194**	**43**	**3,366**
Subject of Complaint :—												
FORMS, &c.	48	37	2	7	11	2	5	5	8	2	—	127
SANITATION :—												
Cleanliness	53	62	15	18	10	17	22	38	9	3	—	247
Ventilation	75	99	24	35	17	12	29	48	7	14	—	360
Temperature ..	141	101	23	33	29	18	34	48	13	16	—	456
Sanitary Accommodation	78	59	17	14	21	4	26	24	8	15	—	266
Other ..	53	72	18	14	16	4	16	7	5	6	—	211
Total Sanitation ..	400	393	97	114	93	55	127	165	42	54	—	1,540
SAFETY :—												
Fencing	40	35	8	13	10	11	17	10	7	9	—	160
Boilers	4	6	—	2	2	1	—	2	1	—	—	18
Fire	23	23	—	7	5	3	6	10	2	1	—	80
Other	25	25	6	6	12	7	13	11	8	9	—	122
Total Safety ..	92	89	14	28	29	22	36	33	18	19	—	380
EMPLOYMENT ..	225	179	65	74	80	48	126	186	93	85	—	1,161
REGULATIONS ..	53	34	23	61	7	30	20	22	11	20	—	281
WELFARE ORDERS ..	25	27	8	10	6	4	10	10	3	7	—	110
FIRST-AID UNDER W.C. ACT, 1923	9	13	2	1	—	3	5	2	1	2	—	38
PARTICULARS.. ..	6	3	—	3	3	1	2	12	2	3	43	78
TRUCK..	12	2	2	7	3	3	2	7	7	3	—	48
OUTSIDE THE ACTS ..	114	143	60	33	69	24	50	30	41	42	—	606
Total ..	**984**	**920**	**273**	**338**	**301**	**192**	**383**	**472**	**226**	**237**	**43**	**4,369**
NUMBER VERIFIED ..	428	384	131	167	151	81	176	213	92	109	19	1,951

TABLE 3.—Contravention Notices issued to Occupiers, 1929.

Subject.	Division or Branch. South Eastern.	Southern.	Western.	Midland.	Eastern.	North Midland.	North Eastern.	East Lancashire.	North Western.	Scotland.	Textile Particulars Inspectors.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
FORMS, &c.	13,809	8,389	8,042	6,924	4,974	4,652	4,972	2,698	4,301	5,721	—	64,482
SANITATION :—												
Cleanliness	1,595	1,531	967	1,472	1,108	697	935	702	523	950	—	10,480
Ventilation	422	290	182	373	279	132	270	143	90	192	—	2,373
Temperature	579	243	273	144	131	51	137	139	86	111	—	1,894
Sanitary Accommodation	115	35	188	458	309	38	106	92	31	648	—	2,020
Other	140	166	68	74	94	55	111	35	37	58	—	838
Total Sanitation ..	2,851	2,265	1,678	2,521	1,921	973	1,559	1,111	767	1,959	—	17,605
SAFETY :—												
Fencing	5,830	5,150	5,246	5,048	4,298	3,603	3,511	2,377	2,877	4,549	—	42,489
Boilers	171	165	278	138	205	111	114	81	92	184	—	1,539
Fire	215	285	61	177	216	87	70	68	51	69	—	1,299
Other	315	318	228	387	333	166	302	161	139	274	—	2,633
Total Safety ..	6,531	5,928	5,813	5,750	5,052	3,967	3,997	2,687	3,159	5,076	—	47,960
EMPLOYMENT :—												
Age, *i.e.*, under 14 ..	2	5	1	5	2	2	2	2	7	6	—	34
At night												
a. Women	25	—	2	1	11	—	1	1	2	—	—	43
b. Young Persons ..	31	4	7	2	9	3	12	1	5	9	—	83
Other	1,566	1,589	995	1,228	907	683	1,021	819	725	898	—	10,431
Total Employment	1,624	1,598	1,005	1,236	929	688	1,036	823	739	913	—	10,591
REGULATIONS	4,338	4,275	3,975	3,987	2,514	2,719	4,014	1,680	2,217	3,354	—	33,073
WELFARE ORDERS ..	1,364	936	1,652	460	732	308	540	524	556	764	—	7,836
FIRST AID UNDER W.C ACT, 1923	4,093	4,028	4,041	2,703	2,006	1,811	2,682	2,201	1,714	2,430	—	27,709
PARTICULARS	499	85	37	36	21	7	28	115	5	29	134	996
TRUCK	13	14	13	14	8	2	9	8	5	—	—	86
Total ..	**35,122**	**27,518**	**26,256**	**23 .6**	**18,157**	**15,127**	**18,837**	**11,847**	**13,463**	**20,246**	**134**	**210,333**

TABLE 4.—Notices to District Councils, 1929.

(In pursuance of Sections 5, 14, 97—100, and 127 (3), Factory and Workshop Act, 1901)

Subject.	Division. South Eastern	Southern.	Western.	Midland.	Eastern.	North Midland.	North Eastern.	East Lancashire.	North Western.	Scotland.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Air Space: overcrowding ..	20	25	4	3	—	—	—	1	4	3	60
Ventilation	67	20	11	15	2	11	16	13	4	7	166
Effluvia..	5	5	3	1	1	—	5	1	2	—	23
Cleanliness	493	180	212	137	34	23	31	62	48	70	1,290
Sanitary Conveniences*:—											
Factories	302[7]	261[8]	155[61]	244[4]	172[26]	194[6]	233[1]	159[5]	130[6]	—[135]	1,850[369]
Workshops	263[4]	123[1]	64[14]	51[1]	35	24	63[1]	11[14]	56	2[67]	692[102]
Drainage of Floors	—	4	2	—	4	—	3	—	1	1	15
Fire:—											
Over 40	29	24	6	33	28	13	43	10	7	8	201
40 and under	151	199	14	60	35	25	52	26	27	57	646
Other:—											
Factories	67	92	110	60	32	35	51	38	58	61	604
Workshops	137	29	11	16	6	7	15	15	1	26	263
Total	1,534	962	592	620	349	332	512	336	338	235	5,810
Occupation of Workshops ..	1,335	1,614	736	578	495	287	644	240	513	498	6,940

* The small figures on these lines are additional, and represent non-statutory notices sent for the information of the District Council in districts to which s. 9 of the 1901 Act applies.

TABLE 5.—Medical Examinations, 1929.

A.—Examinations by Certifying Surgeons for Certificates of Fitness.

Ages.	Areas.	Examined: Number	Examined: Increase or Decrease per cent. compared with 1928	Certified: Males	Certified: Females	Certified: Total	Rejected: Males	Rejected: Females	Rejected: Total
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Young Persons between 14 and 16.	**Great Britain**	**344,336**	+ **3·0**	**145,152**	**190,580**	**335,732**	**3,147**	**5,457**	**8,604**
	Lancashire	54,534	+ 2·2	20,614	31,994	52,608	601	1,325	1,926
	Yorkshire	34,727	+ 4·9	14,853	19,133	33,986	310	431	741
	London	53,203	+ 4·2	18,233	32,537	50,770	968	1,465	2,433
	Warwickshire ..	28,892	+ 0·8	13,703	14,782	28,485	182	225	407
	Staffordshire ..	21,210	+ 5·7	9,936	11,079	21,015	65	130	195
	Cheshire	9,586	+ 5·3	4,209	5,160	9,369	63	154	217
	Rest of England* ..	101,411	+ 5·1	45,659	54,138	99,797	578	1,036	1,614
	Wales*	5,626	+ 14·7	3,443	2,022	5,465	67	94	161
	Lanarkshire ..	12,967	+ 3·9	5,011	7,445	12,456	177	334	511
	Rest of Scotland ..	22,180	− 0·7	9,491	12,290	21,781	136	263	399
Boys over 16 years of age for employment at night. (Each examination of each boy is counted.)	**Great Britain**	**883**		**877**	—	**877**	**6**	—	6
	Lancashire	46		43	—	43	3	—	3
	Yorkshire	145		142	—	142	3	—	3
	London	29		29	—	29	—	—	—
	Warwickshire ..	17		17	—	17	—	—	—
	Staffordshire ..	65		65	—	65	—	—	—
	Cheshire	104		104	—	104	—	—	—
	Rest of England* ..	87		87	—	87	—	—	—
	Wales*	156		156	—	156	—	—	—
	Lanarkshire ..	197		197	—	197	—	—	—
	Rest of Scotland ..	37		37	—	37	—	—	—
All Ages—Great Britain ..		**345,219**		**146,029**	**190,580**	**336,609**	**3,153**	**5,457**	**8,610**

The reasons for rejections (Col. 9) are given on page 98.

The statistics are based upon the reports of 1,600 Certifying Surgeons. 152 failed to furnish reports, but with few exceptions these represent unimportant districts.

* Monmouthshire is included in Wales.

B.—Examinations by Certifying (or Appointed) Surgeons in Dangerous Trades.

Industry.	Examinations. (Each examination of each Worker is counted.)		Persons Suspended from Work.			Rejections on *first* examination as unfit.	Suspensions ended by Certificate.
	Males.	Females.	Males.	Females.	Total.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UNDER REGULATIONS OR SPECIAL RULES:—							
Pottery	**26,881**	**18,597**	**1**	**2**	**3**	**6**	**1**
Glaze and colour mixing	4,782	873	—	—	—	1	—
Dipping	5,211	5,838	1	2	3	4	1
Majolica painting, glaze blowing	99	1,780	—	—	—	—	—
Ware-cleaning	687	2,352	—	—	—	—	—
Glost placing	11,234	791	—	—	—	1	—
Ground laying, colour dusting	423	1,601	—	—	—	—	—
Colour blowing	1,900	2,947	—	—	—	—	—
Litho-transfer making	295	1,195	—	—	—	—	—
Other lead processes	1,742	387	—	—	—	—	—
Biscuit ware scouring and emptying.	12	204	—	—	—	—	—
Carrying clay	495	629	—	—	—	—	—
Wheel turning	1	—	—	—	—	—	—
†Lead Compounds	**44,948**	**2,119**	**6**	**—**	**6**	*	**5**
†Lead Smelting	**44,065**	**121**	**30**	**—**	**30**	*	**14**
(*a*) Smelting of lead and making of flaked litharge.	25,311	61	19	—	19	*	12
(*b*) Making of spelter	12,296	60	1	—	1	*	—
(*c*) Making of red and orange lead.	6,458	—	10	—	10	*	2
†Vitreous Enamelling	**3,664**	**1,956**	**2**	**6**	**8**	*	**1**
†Tinning of Hollow-ware, &c.	**1,345**	**335**	—	—	—	*	—
†Paints and Colours	**20,223**	**1,652**	**8**	**1**	**9**	*	**4**
†Heading of Yarn	**539**	**2,031**	—	**1**	**1**	*	—
†India-rubber	**6,539**	**1,255**	**6**	**1**	**7**	*	**3**
(*a*) Lead processes	3,423	355	4	1	5	*	3
(*b*) Fume processes	3,116	900	2	—	2	*	—
†Chemicals	**33,464**	**3,015**	**60**	**—**	**60**	—	**47**
(*a*) Nitro and Amido processes	29,710	3,001	60	—	60	—	47
(*b*) Chrome processes	3,754	14	—	—	—	—	—
†Electric Accumulators	**51,748**	**10,264**	**53**	**1**	**54**	**2**	**17**
Processes involving use of Lead Compounds. (Periodical medical examination required under the Women and Young Persons (Employment in Lead Processes) Act, 1920.).	**1,572**	**1,300**	**12**	**2**	**14**	*	**15**
	234,988	**42,645**	**178**	**14**	**192**	**8**	**107**
VOLUNTARY:—							
Shipbreaking	**639**	**10**	—	—	—	—	—
Metallic Capsules	**244**	**1,258**	—	—	—	—	—
Lead Rolling	**204**	—	—	—	—	—	—
Other Lead Processes	**3,463**	**400**	—	—	—	—	—
Mercury or its Compounds or their use.	**153**	**9**	—	—	—	—	—
Doping	**363**	**1,712**	—	—	—	—	—
Bronzing	**34**	**33**	—	—	—	—	—
Chrome Processes	**1,629**	**1,117**	**9**	—	**9**	—	**4**
Paraffin Shed Workers	**371**	—	**3**	—	**3**	—	**3**
Pitch & Tar Workers	**432**	—	—	—	—	—	—
Trinitrotoluene	**2,612**	**810**	**3**	**10**	**13**	—	**11**
Chlorine Manufacture	**2,388**	—	—	—	—	—	—
Miscellaneous	**1,548**	**49**	**50**	—	**50**	**31**	—
	14,030	**5,398**	**65**	**10**	**75**	**31**	**18**
Total	**249,068**	**48,043**	**243**	**24**	**267**	**39**	**125**

* No provision.
† Examinations made by an Appointed Surgeon, who is not necessarily the Certifying Surgeon.

TABLE 6.—Prosecutions, 1929: Offence, Number, Result.

The column headed *number of charges* shows each item of prosecution, *e.g.*, proceedings for employing three women beyond legal hours appears as three charges.

Penalties in England and Wales are applied in the first place to the payment of Court and Police fees, and the amounts in Col. 4 are net penalties after deducting such fees. The total costs paid by defendants in addition to net penalties amounted to £937 6*s.* 1*d.*

Offence or Requirement. (Offences connected with Regulations, Welfare, or First Aid under Section 29 of Workmen's Compensation Act, 1923, are classified under Groups V. or VI.)	Number of Charges.	Convictions.	Net Penalties.		
(1)	(2)	(3)	(4)		
			£	*s.*	*d.*
I.—Forms, &c.	**172**	**132**	**142**	**19**	**7**
Notice of occupation	3	3	3	10	0
,, air space	1	1	2	4	0
,, accident	44	42	62	13	7
,, dangerous occurrence ..	1	1	3	0	0
,, poisoning from occupier ..	1	1	4	16	0
,, special exception	1	—		—	
Overtime register, report, record ..	9	9	6	0	0
General register	60	25	15	8	0
Abstract	23	23	15	16	0
Workmen's Compensation Act Summary	15	14	10	2	0
Accident Book	7	6	8	16	0
Regulations (*Table* 7)	7	7	10	14	0
II.—Sanitation	**68**	**66**	**148**	**9**	**0**
Limewashing	39	39	89	14	0
Cleanliness	4	4	16	10	0
Air-space	2	2	1	14	0
Ventilation, general, elsewhere than in humid Textile Factories not under Regulations	1	1	1	16	0
Temperature	22	20	38	15	0
III.—Safety	**289**	**200**	**1,371**	**11**	**11**
Fencing machinery, &c.	*165	92	382	3	6
Neglect causing death or injury—					
(*a*) Unfenced machinery	102	88	903	12	8
(*b*) Other breaches	1	1	24	13	0
Steam boilers—					
(*a*) Maintenance	1	1	4	18	0
(*b*) Valves and Gauges	1	1	9	16	0
(*c*) Examination	13	11	19	7	9
Means of escape in case of fire ..	6	6	27	1	0

* Including 61 charges withdrawn on conviction on an alternative charge.

TABLE 6—*continued.*

Prosecutions, 1929: Offence, Number, Result.

See Notes prefixed to Table.

Offence or Requirement. (Offences connected with Regulations, Welfare, or First Aid under Section 29 of Workmen's Compensation Act, 1923, are classified under Groups V. or VI.)		Number of Charges.	Convictions.	Net Penalties. £	s.	d.
(1)		(2)	(3)	(4)		
IV.—Employment		**1,250**	**1,230**	**1,108**	**10**	**9**
Adults		*689*	*684*	*583*	*2*	*11*
Young persons		*561*	*546*	*525*	*7*	*10*
Age		2	2	1	12	0
Parent allowing illegal employment of Y.P. or Child		1	1	0	10	0
Certificate of fitness: Neglect to obtain		102	102	97	8	3
On Sunday	W.	180	176	107	7	6
	Y.P.	104	94	62	5	6
On holiday	W.	4	4	3	4	0
	Y.P.	2	2	1	12	0
In meal hours	W.	86	86	49	14	0
	Y.P.	16	16	20	7	0
At night (*a*) W.& Y.P.Act,1920	W.	4	4	6	6	0
	Y.P.	23	23	20	16	7
(*b*) Other offences	W.	48	48	38	13	0
	Y.P.	69	69	68	3	0
Before or after legal hours (*a*) Saturday	W.	47	47	23	4	6
	Y.P.	33	33	27	18	6
(*b*) Other week day	W.	270	270	315	14	11
	Y.P.	179	174	196	3	0
Before or after legal hours in Laundry	W.	7	6	2	18	0
	Y.P.	9	9	1	8	0
Beyond legal limits outside works	W.	3	3	4	12	0
Continuous spell	W.	24	24	12	19	0
	Y.P.	16	16	20	4	0
Conditions of special exception for— Overtime	W.	12	12	13	6	0
Substitution of Sunday	W.	4	4	5	4	0
	Y.P.	5	5	7	0	0
V.—Regulations (other than Lead Paint) (*Table 7*)		**230**	**176**	**1,023**	**19**	**9**
Breaches causing death or injury		41	35	642	11	3
Other	(*a*) Occupier or Owner	179	131	373	17	6
	(*b*) Worker	10	10	7	11	0
VI.—Welfare		**74**	**72**	**125**	**9**	**1**
First Aid and Ambulance Room— (*a*) Workmen's Compensation Act		56	56	114	3	7
(*b*) Welfare Order		6	6	3	19	6
Messrooms, cloakrooms, restrooms		1	1	1	16	0
Protective clothing, means for drying clothing		2	1	0	18	0
Washing accommodation (including baths)		6	5	3	5	6
Other (Forms, etc.)		3	3	1	6	6
VII.—Particulars:		—	—	—		

TABLE 6.—*continued.*

Prosecutions, 1929 : Offences, Number, Result.

See Notes prefixed to Table.

Offence or Requirement. (Offences connected with Regulations, Welfare or First Aid under Section 29 of Workmen's Compensation Act, 1923, are classified under Groups V. or VI.) (1)	Number of Charges. (2)	Convictions. (3)	Net Penalties. (4)
			£ s. d.
VIII.—Obstruction, &c.	**5**	**5**	**5 5 0**
False document	1	1	1 0 0
Personation of Y.P.	1	1	0 10 0
Obstruction of Inspector	3	3	3 15 0
IX.—Truck Acts	**7**	**6**	**15 6 0**
Charges for damaged goods—			
Contract not signed by workman or affixed	3	3	7 18 0
Contract providing for charges not fair or reasonable	1	—	—
Charge not under legal contract ..	1	1	4 16 0
,, without due particulars ..	2	2	2 12 0
X.—Lead Paint Act, 1926.—	**24**	**21**	**13 12 0**
Forms	11	10	2 3 0
Failure to notify lead poisoning ..	1	1	0 1 0
Other	1	1	0 16 0
Regulations—			
(*a*) Breaches causing death or injury	2	2	2 12 0
(*b*) Other—Employer	9	7	8 0 0
Total ..	***2,119**	**†1,908**	**3,955 3 1**

* Of these, 10 were withdrawn on payment of costs, 132 were withdrawn on conviction on an alternative charge (defendants paying costs in 52 of them), and 65 were dismissed. On 4 charges judgment was respited.

† This includes all charges, other than withdrawals, in which defendants were mulcted in costs only, 57 of them being dismissed on payment of costs by defendants.

TABLE 7.

Prosecutions relating to Regulations, 1929.

(Also included in Table 6.)

Code and Subject. (1)	Occupiers or Workers (O. or W.). (2)	Number of charges. (3)	Convictions. (4)	Net Penalties. (5)
				£ s d.
Locomotives:				
Locomotive pushing more than one waggon	O.	1	—	—
	W.	2	2	3 12 0
Warning by person in charge	W.	1	1	1 16 0
„ „ driver	W.	2	2	1 16 0
Danger Signal	O.	1*	1	14 3 6
		1	—	—
Paints and Colours:				
Employment of Women, Young Persons or Children	O.	1	1	1 3 3
Brass Casting:				
Ventilation	O.	1	1	2 16 0
Electricity:				
Affixing Regulations	O.	2	2	1 8 0
Protection of conductors	O.	6*	4	175 6 0
		5	1	0 16 0
Protection of apparatus	O.	1*	1	—
		1	1	4 16 0
Protection of portable apparatus	O.	3*	3	19 8 0
		5	2	4 15 0
Protection of High Pressure Switchboards	O.	3*	2	44 14 0
		1	—	—
	W.	1	1	—
Prevention of metal other than conductors from being electrically charged	O.	1*	1	24 16 0
		1	—	—
Pottery:				
Age and Sex	O	3	3	19 3 0
Suppression of dust	O.	2	2	6 19 0
Boards	O.	2	2	7 9 0
Cleaning of workplaces	W.	1	1	—
Shipbuilding:				
Openings in decks and lighting	O.	2*	2	19 3 3
Celluloid:				
Amount in Workroom	O.	1	1	2 16 0
Open lights or fires	O.	1	1	2 16 0
Means of escape	O.	1	1	7 16 0
Aerated Waters:				
Fencing Machinery	O.	1	1	4 18 0
First Aid Boxes	O.	1	1	0 18 0
Chemical Works:				
Vessels containing dangerous material	O.	1*	1	9 16 0
		2	1	4 12 0
Washing accommodation	O.	1	1	4 16 0
Bath „	O.	1	1	4 16 0

* Under s. 136.

TABLE 7.

Prosecutions relating to Regulations, 1929—*continued.*

(Also included in Table 6.)

Code and Subject. (1)	Occupiers or Workers (O. or W.). (2)	Number of Charges. (3)	Convictions. (4)	Net Penalties. (5) £ s. d.
Woodworking Machinery:				
Affixing regulations	O.	2	2	5 16 0
Provision of stopping and starting appliances	O.	1	1	1 16 0
Natural lighting of machinery	O.	1	—	—
Temperature	O.	22	17	46 14 11
Training and instruction	O.	2*	2	1 12 0
		1	—	—
Fencing circular saws	O.	3*	2	29 1 0
		22	17	44 2 6
Using prohibited machines	O.	1*	1	2 3 3
		3	1	0 1 0
Fencing planing machines	O.	4	3	6 12 0
Maintenance, etc. of fencing	O.	1*	1	4 16 0
		3	2	5 12 0
	W.	3	3	0 7 0
Docks, &c.:				
Access to ship	O.	2	2	2 4 6
Access to hold	O.	7	7	37 10 0
Lighting of holds, &c.	O.	1*	1	4 16 0
Maintenance, etc., of hatch coverings	O.	2	2	2 12 0
Testing and examining machinery	O.	7	4	10 14 0
" " " chains, ropes, &c.	O.	3	3	2 14 0
Use of ropes	O.	1	1	1 16 0
Fencing machinery	O.	4	4	14 6 0
Locking arrangements on cranes	O.	1	1	5 1 0
Fencing driver's platform on cranes	O.	1	1	1 16 0
Safe loads	O.	3	2	2 14 0
Exhaust steam	O.	2	1	5 1 0
Fencing open hatchways	O.	4*	4	88 13 3
		7	3	11 6 0
Securing beams of hatches	O.	3*	3	125 2 0
		7	5	13 14 0
Using prohibited machines	O.	2	2	9 18 0
Keeping prescribed register	O.	2	1	0 18 0
Grinding of Metals (Miscellaneous Industries):				
Dust removal at dry processes	O.	11	11	37 0 0
Specification of speeds	O.	2	2	1 13 1
Sweeping and cleaning rooms	O.	1	1	—
Examination of ventilating plant	O.	3	2	2 1 0

* Under s. 136.

TABLE 7.

Prosecutions relating to Regulations, 1929—*continued.*

(Also included in Table 6.)

Code and Subject. (1)	Occupiers or Workers (O. or W.). (2)	Number of Charges. (3)	Convictions. (4)	Net Penalties. (5)
				£ s. d.
Painting of Vehicles:				
Washing Accommodation	O.	1	1	2 0 0
Buildings:				
Affixing Regulations..	O.	1	1	1 18 0
Construction and security of scaffolds	O.	1*	—	—
		2	1	4 9 0
Obstruction on gangways, etc. ..	O.	1*	1	9 13 0
		2	1	1 16 0
Guard rail on platforms	O.	1	1	0 16 0
Stripping scaffold poles	O.	2	2	3 4 0
Openings in floors	O.	1*	1	24 18 0
		2	—	—
Examination of hoisting apparatus	O.	1	1	1 16 0
Construction and security of apparatus	O.	1*	1	10 0 0
		2	2	1 16 0
Safe-loads	O.	1*	—	—
Testing and registering chains ..	O.	2	2	1 12 0
Fencing machinery	O.	2*	2	29 14 0
		3	1	0 6 0
First-Aid boxes	O.	1	1	2 4 3
Horizontal Milling Machines:				
Fencing cutters	O.	1*	1	4 16 0
		2	1	4 16 0
Lead Paint:				
Affixing Regulations	O.	2	2	1 12 0
Dry rubbing of painted surface ..	O.	1*	1	0 16 0
		2	1	4 17 0
Washing accommodation	O.	3	3	2 2 0
Health instruction leaflet, &c., ..	O.	1*	1	1 16 0
		4	3	1 1 0
Total ..		248†	192	1,045 5 9

* Under s. 136.

† Of these 1 was withdrawn on payment of costs, 35 were withdrawn on conviction on an alternative charge, 19 were dismissed, and on one charge judgment was respited.

TABLE 8.—Works or Departments under Regulations, 1929.

CODE.	DIVISION. South Eastern.	Southern.	Western.	Midland.	Eastern.	North Midland.	North Eastern.	East Lancashire.	North Western.	Scotland.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Regulations—											
Felt hats	—	—	—	1	1	—	—	22	3	—	27
File-cutting by hand	2	1	1	43	—	36	7	12	10	2	114
Self-acting mules	—	7	83	8	3	321	143	796	86	106	1,553
Wool sorting, combing, etc.	1	—	—	1	—	8	40	—	2	3	55
Flax	1	—	8	—	—	2	11	2	2	97	123
Locomotives	202	150	544	423	318	382	629	230	366	724	3,968
Paints and colours	38	11	19	43	—	13	38	19	27	29	237
Heading of yarn	—	—	—	—	—	—	—	14	—	5	19
Hemp and jute	14	2	15	1	2	3	10	2	4	103	156
Horsehair	77	42	23	33	36	29	28	22	17	38	345
Casting of brass—											
Under exemption 1	127	104	148	294	79	105	181	154	92	186	1,470
Not under exemption 1	63	70	46	320	38	96	46	70	39	42	830
Vitreous enamelling	7	7	—	36	2	3	2	3	6	13	79
East Indian wool	—	7	1	9	2	81	17	13	6	18	154
Electricity	14,943	14,645	8,975	10,663	8,899	8,476	11,106	10,449	7,119	11,590	106,865
Tinning of Metals	13	4	3	67	2	1	8	3	11	6	118
Lead smelting, etc.	8	4	8	6	1	3	12	3	5	5	55
Bronzing	153	146	58	141	108	56	95	152	60	112	1,081
Cotton cloth factories	2	—	2	1	—	60	137	1,063	150	30	1,445
Pottery manufacture and decoration	20	18	45	391	4	64	21	11	6	28	608
Shipbuilding	20	12	52	—	5	—	58	1	28	53	229
Refractory material	2	—	28	14	5	43	21	1	5	13	132
Lead compounds	9	2	4	—	1	8	7	8	3	3	45
Celluloid	228	354	180	389	160	500	75	82	87	117	*2,122
Aerated water	179	154	274	134	184	128	211	126	147	184	1,716
Hides and skins	104	18	45	9	11	14	45	31	214	24	515
India-rubber	36	35	12	22	38	5	2	36	13	20	219
Chemical works	161	76	205	118	87	129	219	123	165	216	1,499
Woodworking machinery	3,639	3,420	3,621	2,937	2,674	2,131	3,311	2,657	2,422	3,810	30,622
Electric accumulators	106	79	30	45	24	15	39	32	26	30	426
Docks, etc.—											
Separate premises	827	270	549	181	215	58	334	107	379	521	3,441
Parts of F. or W.	621	254	215	228	189	104	296	110	151	53	2,221
Woollen and Worsted Textiles (Lifting of Heavy Weights)	13	13	171	48	75	1,176	1,632	97	25	228	3,478
Grinding of Metals— (Miscellaneous Industries)	1,023	1,247	405	3,076	622	1,105	1,047	797	443	979	*10744
Grinding of Cutlery and Edge Tools	17	18	19	127	28	1,516	22	19	18	31	*1,815
Painting of Vehicles	480	496	288	352	233	296	356	219	120	238	3,078
Building	201	306	174	131	134	92	90	115	121	89	1,453
Lead Paint—Painting of Buildings	6,603	6,504	3,830	2,482	1,777	1,057	1,465	1,412	2,015	1,474	28,619
Cinematograph Film Manufacture	4	32	1	4	1	—	—	—	1	1	44
Cinematograph Film Stripping	3	7	—	3	1	—	—	2	—	—	16
Horizontal Milling Machines	1,151	1,792	669	2,229	999	870	890	1,238	494	509	10,841
	31,098	30,307	20,751	24,960	16,958	18,981	22,651	20,253	14,888	21,730	222,577

* Including tenements of tenement factories.

TABLE 9.—Cases of Poisoning reported during 1929 under Section 73 of the Factory and Workshop Act, 1901, or Section 3 of the Lead Paint (Protection against Poisoning) Act, 1926.

The *principal numbers* are those of attacks (fatal or otherwise) reported during the year, and not reported 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.

Disease and Industry.	Adults.		Young Persons.		Total.	
	Male.	Female.	Male.	Female.	1929.	1928.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lead Poisoning	**231**[30]	**10**[1]	**3**	—	**244**[31]	**326**[43]
Smelting of Metals	19	—	1	—	20	36[2]
*Plumbing and Soldering	8[1]	—	—	—	8[1]	11[1]
Shipbreaking	18	—	—	—	18	32
Printing	8[1]	—	—	—	8[1]	3
Tinning of metals	—	3	—	—	3	1[1]
Other contact with molten lead	12[2]	—	—	—	12[2]	9[1]
White and red lead works	8[1]	—	—	—	8[1]	9[1]
Pottery	10[10]	4[1]	—	—	14[11]	23[10]
Vitreous enamelling	7	1	1	—	9	23
Electric accumulators works	23[2]	—	—	—	23[2]	33[1]
Paint and colour works	8[1]	—	—	—	8[1]	12[1]
India-rubber works	1	—	—	—	1	1
Coach and car painting	9[2]	—	—	—	9[2]	18[3]
Shipbuilding	3	—	—	—	3	7[2]
*Paint used in other industries	10	—	1	—	11	11
Other industries	12	2	—	—	14	10
Painting of Buildings	75[10]	—	—	—	75[10]	87[20]
Phosphorus Poisoning	—	—	—	—	—	—
Mercurial Poisoning	—	—	—	—	—	**4**
Arsenical Poisoning	—	—	—	—	—	**2**[1]
Carbon Bisulphide Poisoning	**6**	—	—	—	**6**	**1**
Aniline Poisoning	**24**	**2**	—	—	**26**	**41**
Chronic Benzene Poisoning	**1**	—	—	—	**1**	—
Toxic Jaundice	—	**1**	—	**1**[1]	**2**[1]	**6**
†**Anthrax**	**28**[5]	**6**	**4**	**2**	**40**[5]	**45**[8]
Wool	9[2]	5	—	2	16[2]	14[2]
Horsehair	1	1	1	—	3	4[1]
Hides and skins	17[3]	—	3	—	20[3]	24[3]
Other industries	1	—	—	—	1	3[2]
Epitheliomatous Ulceration	**163**[49]	**2**[1]	—	—	**165**[50]	**175**[59]
Pitch	53[3]	—	—	—	53[3]	32
Tar	34[12]	—	—	—	34[12]	36[19]
Paraffin	4	—	—	—	4	2[1]
Oil	72[34]	2[1]	—	—	74[35]	105[39]
Chrome Ulceration	**80**	**10**	**8**	**11**	**109**	**70**
Manufacture of Bichromate	13	—	—	—	13	3
Dyeing and finishing	23	1	—	—	24	28
Chrome tanning	—	—	1	—	1	4
Other industries	44	9	7	11	71	35
TOTAL	**533**[84]	**31**[2]	**15**	**14**[1]	**593**[87]	**670**[111]

* In addition to those included in the Table, 17[2] cases of lead poisoning were reported among house plumbers not employed under the Acts.

† In addition, 4[2] cases among dock labourers were reported.

TABLE 10.

All Reported Accidents, 1929 : Industry, Age, Sex.

In the Accident Tables the injured person is the unit.

The principal numbers are the totals of fatal and non-fatal accidents; the small figures at the right are those of fatal accidents only.

An accident means an accident which is either fatal or disables the workman for more than three days from earning full wages for the work at which he was employed.

Industry.	Adults.		Young Persons.		All Ages.		Total.
	Males.	Females.	Males.	Females.	Males.	Females.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Textiles	6,222[43]	4,602[5]	1,388[7]	1,620	7,610[50]	6,222[5]	13,832[55]
Cotton	3,654[19]	2,823[2]	961[3]	1,005	4,615[22]	3,828[2]	8,443[24]
Wool, worsted and shoddy	1,353[13]	922[3]	227[2]	256	1,580[15]	1,178[3]	2,758[18]
Flax, hemp and jute	289[4]	456	93[1]	175	382[5]	631	1,013[5]
Silk and artificial silk	597[3]	139	39	41	636[3]	180	816[3]
Lace	57[1]	14	8	6	65[1]	20	85[1]
Hosiery	118[1]	162	31	88	149[1]	250	399[1]
Other textiles	154[2]	86	29[1]	49	183[3]	135	318[3]
Non-Textiles	105,122[627]	7,708[8]	17,744[42]	4,708[8]	122,866[669]	12,416[16]	135,282[685]
CLAY, STONE, LIME AND CEMENT	3,256[38]	129[1]	386[1]	32	3,642[39]	161[1]	3,803[40]
Brick, pipe and tile making	1,661[20]	119[1]	307	32	1,968[20]	151[1]	2,119[21]
Slate, stone and marble	171[2]	—	17[1]	—	188[3]	—	188[3]
Other clay, stone, lime and cement	1,424[16]	10	62	—	1,486[16]	10	1,496[16]
METALS	28,014[129]	593	3,766[9]	391	31,780[138]	984	32,764[138]
Iron smelting	2,178[32]	1	54[4]	—	2,232[36]	1	2,233[36]
Extracting and refining of other metals	835[5]	4	26	1	861[5]	5	866[5]
Conversion of iron into steel	3,510[34]	6	148[1]	—	3,658[35]	6	3,664[35]
Iron and steel rolling mills	7,849[25]	245	1,380	155	9,229[25]	400	9,629[25]
Rolling of other metals	418[2]	24	49	3	467[2]	27	494[2]
Metal tube making	2,006[3]	24	240	7	2,246[3]	31	2,277[3]
Wire drawing	597	19	72	13	669	32	701
Other conversion of metals	606[2]	3	76	3	682[2]	6	688[2]
Founding or casting of iron or steel	7,226[17]	64	1,239[2]	62	8,465[19]	126	8,591[19]
Mixing and casting of brass	514[3]	17	113	13	627[3]	30	657[3]
Founding of other metals	477[1]	16	60	11	537[1]	27	564[1]
Pattern making	230[1]	—	60	—	290[1]	—	290[1]
Electro-plating	49[1]	37	16	15	65[1]	52	117[1]
Metal dipping and burnishing	62	11	18	7	80	18	98
Corrugating, galvanising, tinning, enamelling and lacquering	1,414[3]	121	209[2]	99	1,623[5]	220	1,843[5]
Foundry requisites	43	1	6	2	49	3	52
ENGINEERING WORKS (OTHER THAN MACHINE MAKING) MACHINE AND OTHER TOOLS	14,217[62]	666	3,447[5]	360[1]	17,664[67]	1,026[1]	18,690[68]
Marine engineering	1,791[13]	1	455	1	2,246[13]	2	2,248[13]
Locomotive building and repairing	3,299[7]	6	496	1	3,795[7]	7	3,802[7]
Boiler making, etc.	2,041[12]	3	387[1]	2	2,428[13]	5	2,433[13]
Constructional engineering	1,626[11]	4	383[2]	1	2,009[13]	5	2,014[12]
Hydraulic, ventilating and pneumatic engineering	360	7	133	4	493	11	504
Electrical engineering	2,835[12]	583	848[1]	301[1]	3,683[13]	884[1]	4,567[14]
Machine and other tool making	1,228[4]	51	473[1]	39	1,701[5]	90	1,791[5]
Other engine building; transmission machinery	1,037[3]	11	272	11	1,309[3]	22	1,331[3]

TABLE 10—*continued.*

All Reported Accidents, 1929: Industry, Age, Sex.

See Notes prefixed to Table.

Industry.	Adults.		Young Persons.		All Ages.		Total.
	Males.	Females.	Males.	Females.	Males.	Females.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Textiles—*continued.*							
MACHINERY, MACHINERY ACCESSORIES, LIFTING APPLIANCES, RAILWAY AND TRAMWAY PLANT (OTHER THAN LOCOMOTIVES), CONVEYANCES	16,413[45]	598	3,287[4]	266	19,700[49]	864	20,564[49]
Agricultural machinery ..	231	1	65	—	296	1	297
Textile machinery and accessories	961[6]	19	281[1]	19	1,242[7]	38	1,280[7]
General engineering; making and repairing machinery ..	2,879[5]	38	824	24	3,703[5]	62	3,765[5]
Motor repairing, etc.. ..	851[6]	8	185	1	1,036[6]	9	1,045[6]
Jobbing engineering .; ..	150[1]	3	34	1	184[1]	4	188[1]
Railway and tramway plant and vehicles	4,440[1 2]	11	527[1]	12	4,967[13]	23	4,990[13]
Motor vehicles (other than steam) and accessories ..	4,790[5]	375	960[1]	134	5,750[6]	509	6,259[6]
Cycles (other than motor cycles) and accessories	121	66	55	45	176	111	287
Carts, carriages and wagons (other than railway and tramway carriages and wagons, cycles and motor vehicles)	91[1]	5	29	8	120[1]	13	133[1]
Other miscellaneous machines	781[6]	32	208[1]	12	989[7]	44	1,033[7]
Ordnance and munitions of war	1,118[3]	40	119	10	1,237[3]	50	1,287[3]
LIGHT METAL TRADES ..	1,628[8]	732[1]	648[1]	652[1]	2,276[9]	1,384[2]	3,660[11]
Cutlery and similar appliances	101	42	37	62	138	104	242
Gold, silver, etc., domestic ware	50[1]	23	17	16	67[1]	39	106[1]
Whitesmiths and tinsmiths ..	433[2]	110	201	86	634[2]	196	830[2]
Metal piercing, stamping and spinning	318[2]	304	100[1]	282[1]	418[3]	586[1]	1,004[4]
Other light metal trades ..	726[3]	253[1]	293	206	1,019[3]	459[1]	1,478[4]
INDUSTRIAL APPLIANCES	942[5]	257	361[1]	239[1]	1,303[6]	496[1]	1,799[7]
Safes, locks and latches making	97[3]	23	31	33	128[3]	56	184[3]
Chain and anchor making ..	118[1]	13	9	11	127[1]	24	151[1]
Nail, bolt, nut, screw and rivet making	278	150	168[1]	102[1]	446[1]	252[1]	698[2]
Other industrial appliances ..	449[1]	71	153	93	602[1]	164	766[1]
MISCELLANEOUS METAL TRADES	1,508[8]	82	374	76	1,882[8]	158	2,040[8]
Brass finishing	173[1]	27	101	37	274[1]	64	338[1]
Blacksmiths and farriers ..	405[1]	—	80	5	485[1]	5	490[1]
Other miscellaneous metal trades	930[6]	55	193	34	1,123[6]	89	1,212[6]
SHIPBUILDING	9,619[86]	6	1,524[9]	1	11,143[95]	7	11,150[95]
AIRCRAFT	383[1]	16	65	1	448[1]	17	465[1]
GENERAL WOODWORK ..	4,055[21]	104[1]	859[2]	72	4,914[23]	176[1]	5,090[24]
Saw mills	1,712[16]	10	289[1]	10	2,001[17]	20	2,021[17]
Joinery, carpentry and general woodworking	1,289[5]	5	266[1]	3	1,555[6]	8	1,563[6]
Wood turning	103[1]	10[1]	52	14	155[1]	24[1]	179[2]
Box and packing case making	262[1]	22	79	21	341[1]	43	384[1]
Brush making	48	27	14	7	62	34	96
Other wood working	238[1]	6	77	6	315[1]	12	327[1]
Other builders' materials ..	403[4]	24	82	11	485[4]	35	520[4]

TABLE 10—*continued.*

All Reported Accidents, 1929; Industry, Age, Sex.

See Notes prefixed to Table.

Industry.	Adults.		Young Persons.		All Ages.		Total.
	Males.	Females.	Males.	Females.	Males.	Females.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Textiles—*continued.*							
FURNITURE, CABINET MAKING AND UPHOLSTERY, ETC.	1,297[10]	114	394[1]	81	1,691[11]	195	1,886[11]
Cabinet making	585[5]	41	193	19	778[5]	60	838[5]
Chair making	107	3	29	2	136	5	141
Upholstery	36	8	30	17	66	25	91
Other furniture, etc., making and domestic utensils ..	569[5]	62	142[1]	43	711[6]	105	816[6]
MANUFACTURE AND DECORATION OF POTTERY	469[3]	140	84[1]	93	553[4]	233	786[6]
Manufacture and decoration of pottery	201[1]	47	25	32	226[1]	79	305[1]
Earthenware	268[3]	93	59[1]	61	327[3]	154	481[3]
GLASS MAKING	1,175[1]	126	214[1]	56	1,389[2]	182	1,571[2]
CHEMICALS, ETC.	4,500[46]	128	247[1]	59	4,747[47]	187	4,934[47]
Artificial manure	1,122[15]	6	50	2	1,172[15]	8	1,180[15]
Drugs and pharmaceutical preparations	110[1]	32	20	30	130[1]	62	192[1]
Coal tar and coal tar products	1,187[11]	1	43	1	1,230[11]	2	1,232[11]
Other chemicals, animal charcoal and glue	1,861[17]	67	105[1]	20	1,966[18]	87	2,053[18]
Paints, colours and varnish ..	220[3]	22	29	6	249[3]	28	277[3]
LEATHER TANNING AND CURRYING. IMITATION LEATHER, ARTICLES MADE FROM LEATHER, HARNESS SADDLERY AND HARNESS FURNITURE	538[5]	53	123	54	661[5]	107	768[5]
Sorting of hides, fellmongery, tanning and currying ..	425[4]	15	77	10	502[4]	25	527[4]
Other leather working ..	113[1]	38	46	44	159[1]	82	241[1]
TEXTILE PRINTING, BLEACHING AND DYEING	1,585[10]	308[1]	237[1]	185	1,822[11]	493[1]	2,315[12]
Textile printing, bleaching and dyeing	1,190[7]	92	163	47	1,353[7]	139	1,492[7]
Cloth finishing, raising and embossing	120	8	16	2	136	10	146
Lapping, making up and packing	33	13	7[1]	1	40[1]	14	54[1]
Job dyeing	19	7	3	7	22	14	36
Other finishing, cleaning and dyeing	83[1]	13	14	11	97[1]	24	121[1]
Laundries	140[2]	175[1]	34	117	174[2]	292[1]	466[2]
WEARING APPAREL AND ARTICLES FOR PERSONAL USE	946[2]	689[1]	244	432[1]	1,190[3]	1,121[2]	2,311[5]
Tailoring	130[1]	305	15	188	145[1]	493	638[1]
Dress and mantle making ..	17	51[1]	2	43	19	94[1]	113[1]
Millinery, hats and caps ..	62	52	16	25	78	77	155
Underclothing	27	83	4	63	31	146	177
Boots, shoes, slippers and clogs	668[2]	119	187	56[1]	855[3]	175[1]	1,030[3]
Other wearing apparel, etc. ..	42	79	20	57	62	136	198
RUBBER TRADES	1,316[8]	160	97[1]	55[1]	1,413[9]	215[1]	1,628[10]

TABLE 10—*continued.*

All Reported Accidents, 1929; Industry, Age, Sex.

See Notes prefixed to Table.

Industry.	Adults.		Young Persons.		All Ages.		Total.
	Males.	Females.	Males.	Females.	Males.	Females.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Textiles—*contd.*							
PAPER, PRINTING AND STATIONERY	3,218[16]	631[3]	522[2]	499[1]	3,740[18]	1,130[4]	4,870[22]
Paper, cardboard and millboard making	1,796[11]	138[2]	200	92[1]	1,996[11]	230[3]	2,226[14]
Letterpress printing	964[3]	142	204[1]	116	1,168[4]	258	1,426[4]
Lithographic printing ..	92	26	22	21	114	47	161
Bookbinding	51	45	13	34	64	79	143
Cardboard and paper boxes ..	72	157	28[1]	135	100[1]	292	392[1]
Other printing, engraving, photography, stationery, etc.	243[2]	123[1]	55	101	298[2]	224[1]	522[3]
FOOD	3,324[29]	1,180	315	664	3,639[29]	1,844	5,483[29]
Flour milling	348[2]	12	11	4	359[2]	16	375[2]
Other milling, etc.	142[2]	15	8	4	150[2]	19	169[2]
Bakeries	625[7]	196	86	114	711[7]	310	1,021[7]
Sugar confectionery, groceries, etc	949[6]	501	98	326	1,047[6]	827	1,874[6]
Sausages and cooked meats..	111[4]	28	38	15	149[4]	43	192[4]
Other foods	1,149[8]	428	74	201	1,223[8]	629	1,852[8]
DRINK	1,694[18]	674	222[1]	233[1]	1,916[19]	907[1]	2,823[20]
Alcoholic	1,342[15]	468	181[1]	140[1]	1,523[16]	608[1]	2,131[17]
Non-alcoholic	101[2]	86	22	30	123[2]	116	239[2]
Tobacco and matches ..	251[1]	120	19	63	270[1]	183	453[1]
OILCAKE, OIL REFINING AND EXTRACTING ..	812[11]	15	37	5	849[11]	20	869[11]
SOAP, STARCH AND CANDLES	365[1]	73	33	53	398[1]	126	524[1]
Soap, starch and candles ..	336[1]	70	20	50	356[1]	120	476[1]
Firewood cutting	29	3	13	3	42	6	48
SCIENTIFIC INSTRUMENTS	109[1]	21	46	17	155[1]	38	193[1]
CLOCKS, WATCHES AND JEWELLERY	85	45	27	38	112	83	195
Clocks, watches and jewellery	22	18	9	19	31	37	68
Ivory, bone and celluloid articles	63	27	18	19	81	46	127
ARTICLES FOR SPORTS AND PASTIMES, TOYS ..	413	85	94	45	507	130	637
Articles for sports and pastimes, toys	63	24	28	22	91	46	137
Musical instruments	350	61	66	23	416	84	500
GAS WORKS	2,118[30]	3	58[1]	—	2,176[31]	3	2,179[31]
ELECTRICITY GENERATING STATIONS	972[21]	3	12	—	984[21]	3	987[21]
OTHER MISCELLANEOUS TRADES	151[1]	77	21	49[1]	172[1]	126[1]	298[1]
Places under ss. 104-106 ..	**11,717[234]**	**226[1]**	**176[7]**	**36**	**11,893[241]**	**262[1]**	**12,155[242]**
Docks, Sec. 104	7,315[90]	1	39	—	7,354[90]	1	7,355[90]
Buildings, Sec. 105	3,794[126]	208[1]	108[7]	30	3,902[133]	238[1]	4,140[133]
Warehouse, Sec. 104, and Railways, Sec. 106	608[18]	17	29	6	637[19]	23	660[19]
Total ..	**123,061[804]**	**12,536[14]**	**19,308[56]**	**6,364[8]**	**142,369[860]**	**18,900[22]**	**161,269[882]**

TABLE 11.—All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents;

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not).		Other.		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways (Locomotives and Rolling Stock).	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity.	Explosions.	Fires (not Dangerous Occurrences).
	Steam, Gas and other Engines.	Electric Motors (not electric shock).	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Textiles	18	4	32[2]	340[5]	133[5]	9	—	—	16	28	44	3,966[10]	10	24	10[1]	27	11
Cotton	12	2	13[2]	227[2]	79[4]	4	—	—	6	8	10	2,282[2]	4	12	4	12	4
Wool, worsted, shoddy	4	—	6	65[3]	46	4	—	—	4	10	15	883[5]	—	9	2[1]	3	4
Flax, hemp and jute	2	1	2	20	3	1	—	—	2	6	11	409[1]	1	1	—	6	—
Silk and artificial silk	—	1	5	10	2[1]	—	—	—	3	1	—	123	5	2	1	4	1
Lace	—	—	—	5	—	—	—	—	—	—	2	30	—	—	—	—	—
Hosiery	—	—	5	7	2	—	—	—	1	1	2	137	—	—	2	1	1
Other textiles	—	—	1	6	1	—	—	—	—	2	4	102[2]	—	—	1	1	1
Non-Textiles	112[4]	14[1]	175[21]	879[15]	1,995[51]	2,945[5]	559	563	2,379[4]	3,260[10]	464[4]	12,410[40]	1,044[17]	1,067[9]	4,02[24]	1016[24]	250[4]
CLAY, STONE, LIME AND CEMENT	8[1]	—	13[2]	40[3]	48[2]	4	—	—	1	14	2	261[6]	107[5]	64	8	28[2]	11
Brick, pipe and tile making	4[1]	—	8[1]	22[2]	14[1]	2	—	—	—	4	1	187[3]	47[2]	47	4	9[1]	4
Slate, stone and marble	—	—	1	3	12	—	—	—	—	4	—	11[2]	2[1]	1	—	—	1
Other clay, stone, lime and cement	4	—	4[1]	15[1]	22[2]	2	—	—	1	6	1	63[1]	58[3]	16	4	19[1]	6
METALS	23	1	19[1]	78[1]	725[21]	240	17	22	127	144[1]	3	2,269[3]	414[20]	89[1]	64[8]	278[6]	37[1]
Iron smelting	3	—	—	2	42[3]	3	1	—	4	2	—	25[1]	166[8]	3[1]	5	44[3]	1
Extracting and refining of other metals	—	—	—	3	6[1]	1	1	—	1	1	—	15	9	4	3	20[1]	2
Conversion of iron into steel	1	—	3	2	176[6]	11	—	1	12	3	—	193[1]	108[6]	7	16[2]	45[2]	5
Iron and steel rolling mills	15	—	4[1]	13[1]	179[6]	11	2	—	18	5	—	792[4]	75[4]	12	13[1]	55	7
Rolling of other metals	—	—	2	2	2	1	—	—	4	—	2	87	1	.5	1	2	—
Metal tube making	—	—	—	18	65	101	1	3	22	—	—	226	6	18	4[2]	9	5
Wire drawing	1	—	2	4	3	2	—	—	2	1	—	138	1	3	2	5	1
Other conversion of metals	—	—	2	2	13	5	—	1	4	1	—	137[1]	—	4	—	18	—
Founding or casting of iron or steel	2	1	2	14	209[4]	38	5	4	45	18	—	378	39[1]	27	15[2]	41	12[1]
Mixing and casting of brass	—	—	1	7	6	51	4	2	8	—	—	66[1]	—	—	1	5	1
Founding of other metals	—	—	—	—	—	12	1	1	3	2	—	36	1[1]	—	1	18	—
Pattern making	—	—	1	2	1	3	2	—	1	109[1]	—	3	—	1	—	1	1
Electro-plating	—	—	—	1	—	1	—	3	—	—	—	33	1	—	1[1]	2	—
Metal dipping and burnishing	—	—	—	4	—	—	—	—	—	1	—	63	—	—	1	1	—
Corrugating, galvanising, tinning, enamelling and lacquering	1	—	2	4	19[1]	—	—	7	2	1	1	75[1]	7	5	1	12	2
Foundry requisites	—	—	—	—	4	—	—	—	1	—	—	2	—	—	—	—	—
ENGINEERING WORKS (OTHER THAN MACHINE MAKING) MACHINE AND OTHER TOOLS	11	1	12[3]	133[3]	379[14]	912[1]	178	81	739[3]	93	4	1,541[4]	67[4]	69[1]	97[5]	68[3]	35[1]

the small figures at the right are those of fatal accidents only.

Other.										Total.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other.		Men.	Women and Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.								(a)	(b)					
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)		(31)	(32)	(33)	(34)	(35)
6	311[1]	26[1]	36	605	908[3]	1,925[15]	2,682[3]	1,380[3]	1,281[5]	13,832[55]	218[1]	586[2]	231	2,519[6]	2	6	47
4	156	14	8	354	429[2]	1,076[4]	2,229[3]	788[2]	706[2]	8,443[24]	128	473[1]	107	1,774[4]	1	3	27
1	56[1]	4	8	114	248	473[2]	270	273	256[1]	2,758[13]	66[1]	90[1]	53	394	–	3	10
—	15	4[1]	6	47	93	91[2]	46	66	180[1]	1,013[5]	6	15	14	147[1]	–	—	2
1	64	3	2	43	97	160[1]	81	137	70[1]	816[3]	6	3	42	87	1	—	—
—	4	—	—	2	2	18[1]	7	4	11	85[1]	4	—	4	4	–	—	1
—	10	—	3	26	14[1]	70	28	53	36	399[1]	5	3	9	69	–	—	4
—	6	1	9	19	25	37	21	59[1]	22	318[3]	3	2	2	44[1]	–	—	3
203[15]	8255[23]	1013[12]	1778[1]	14792[17]	16081[61]	15191[133]	8220[11]	30912[28]	9303[25]	135282[335]	297[2]	224[1]	6372	14449[41]	159	1586	322
2	94[2]	27[1]	53	298	669[4]	519[3]	248	997[1]	287[1]	3,803[10]	12	11	139	326[1]	–	4	3
1	50[1]	6	45	130	321[1]	298[6]	152	617[1]	146[1]	2,119[11]	8	10	51	198[1]	–	1	1
—	—	8	1	26	34	17	8	47	12	188[3]	—	—	11	13	–	2	—
1	44[1]	13[1]	7	142	314[3]	204[2]	88	333	129	1,496[16]	4	1	77	115	–	1	2
52[5]	4052[14]	232	86	3,039[3]	4,051[15]	3,110[23]	1,981[2]	9,411[4]	2,200[3]	32,764[135]	19	11[1]	1617[1]	2,854[6]	15	1367	18
13[3]	355[5]	16	3	219[1]	370[2]	263[6]	105	448[1]	140[1]	2,233[16]	—	—	86	94	1	15	2
8	153	6	1	112[1]	117[1]	101[1]	40	191	71	866[5]	—	—	37	70	–	3	—
15	302[1]	32	6	414	499[4]	502[11]	194	852[1]	265[1]	3,664[35]	3	—	155	175[3]	4	703	—
21	359	33	14	889[1]	1,043[2]	1,136[2]	785	3,423[1]	714	9,629[25]	6	4	209	816	3	383	2
—	27[1]	2	4	22	86	42	24[1]	145	33	494[2]	2	1	15	39	–	—	—
4	113	17	4	178	323	188[1]	96	734	142	2,277[3]	1	—	113	220	–	29	2
—	28	1	2	27	72	52	37	274	43	701	1	—	34	140	1	—	2
—	50	16	2	95	95[1]	43	26	143	31	688[2]	—	—	24	54	–	102	—
8[1]	2040[4]	91	23	831	1,114[5]	493[1]	443	2,184	514	8,591[19]	4	2	754	800	6	116	6
—	102	4	8	68	72	50	33[1]	127	41[1]	657[3]	1	1	43	84[1]	–	—	—
—	126	2	6	41	66	39	22	161	26	564[1]	—	—	32	66	–	—	—
—	6	1	1	68	28	17	14	25	5	290[1]	—	—	10	13	–	—	1
—	13	—	1	4	5	12	2	27	11	117[1]	—	—	2	29	–	—	—
—	6	1	—	1	1	3	3	8	5	98	—	—	17	10	–	—	1
2	341[2]	10	8	66	154	159	152	657[1]	155	1,843[5]	1	3[1]	84[1]	235[2]	–	16	2
—	1	—	3	4	6	10	5	12	4	52	—	—	2	9	–	—	—
4[1]	600	166	222	2,625[1]	2,629[8]	1,515[10]	1,169[1]	4,200[4]	1,140[2]	18,690[68]	26	31	1192[1]	1,881[4]	59	64	14

TABLE 11. All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents;

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not).		Other.		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, Mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways (Locomotives and Rolling Stock).	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity.	Explosions.	Fires (not Dangerous Occurrences).
	Steam, Gas and other Engines.	Electric Motors (not electric shock)	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Non-Textiles—*contd.*																	
Marine engineering..	3	—	2[1]	18[1]	43[5]	145	12	—	115	8	—	129	7[1]	9	13	5	4
Locomotive building and repairing ..	—	—	—	12	55[1]	130	9	3	107	8	—	206	32	5	6	13	3
Boiler making, etc...	—	—	—	6	83[2]	26	3	1	61[2]	3	—	166[1]	2	11[1]	8[1]	13[2]	4
Constructional engineering	—	—	1	7	109[5]	34	4	3	68	5	—	151[1]	19[2]	9	6[1]	7	2
Hydraulic, ventilating and pneumatic engineering ..	—	—	—	10	8	54	6	—	26	6	—	43	1	1	2	1	1
Electrical engineering	1	1	7[1]	32[1]	48[1]	239	79	59	200	43	4	449[1]	5[1]	25	54[3]	16[1]	13[1]
Machine and other tool making ..	—	—	2[1]	29[1]	20	150	37	14	107	9	—	269[1]	1	6	6	7	7
Other engine building; transmission machinery ..	7	—	—	19	13	134[1]	28	1	55	11	—	128	—	3	2	6	1
MACHINERY, MACHINERY ACCESSORIES, LIFTING APPLIANCES, RAILWAY AND TRAMWAY PLANT (OTHER THAN LOCOMOTIVES), CONVEYANCES ..	11[1]	3	18	173[1]	169[6]	1130	275	142	821[3]	370	6	1,506[1]	75[1]	378[2]	52[3]	120[2]	37
Agricultural machinery	1	—	1	4	1	12	1	—	16	10	—	28	—	2	1	1	1
Textile machinery and accessories ..	—	—	2	30	13[2]	114	21	6	60	62	3	201	1	5	—	1	—
General engineering; making and repairing machinery ..	1	2	7	41	52[1]	304	51	9	207	32	1	345[1]	8	18	17	18	5
Motor repairing, etc.	1	—	2	5	1	21	1	—	10	5	—	37	—	158[1]	—	22[1]	8
Jobbing engineering	3[1]	—	1	1	2	14	1	—	9	2	—	22	2	1	1	1	—
Railway and tramway plant and vehicles	—	—	1	11	66[1]	85	8	6	95[1]	82	2	265	52[2]	40[1]	9[1]	17[1]	9
Motor vehicles (other than steam) and accessories ..	4	—	2	47[1]	14[1]	416	145	86	320	136	—	425	2	142	16	31[1]	10
Cycles (other than motor cycles) and accessories ..	1	—	—	7	—	21	9	11	18	—	—	30	—	—	—	—	2
Carts, carriages and wagons (other than railway and tramway carriages and wagons, cycles and motor vehicles) ..	—	—	1	—	—	1	1	4	4	13	—	11	—	3	—	1	—
Other miscellaneous machines	—	1	1	13	10[1]	67	29	18	65[2]	20	—	71	3	4	4[1]	5	—
Ordnance and munitions of war ..	—	—	—	14	10	75	8	2	17	8	—	71	7[1]	5	4[1]	23	2
LIGHT METAL TRADES ..	2	—	4	37	11[1]	149	22	200	94	9	1	559[1]	3	9	1	18[1]	7[1]

1929; Industry, Causation—*continued.*

the small figures at the right are those of fatal accidents only.

Other.										Total.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances.	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other.		Men.	Women & Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.								(30)						
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(a)	(b)	(31)	(32)	(33)	(34)	(35)
1	54	25	9	380	336[3]	229[1]	122	455[1]	124	2,248[13]	6	5	155	153	3	1	1
—	82	36	6	814	536[2]	328[3]	256[1]	912	243	3,802[7]	3	10	315	238	4	5	—
—	76	31	7	434[1]	406[2]	194	166	604	128[1]	2,433[12]	1	—	158	195[1]	2	5	—
1[1]	45	21	6	246	347[1]	153[2]	124	563	83	2,014[13]	3	3	78	173	1	4	—
—	17	8	6	52	78	34	24	95	31	504	1	—	38	54	1	—	—
2	252	22	162	357	523	394[2]	296	959[1]	325	4,567[14]	8	9	240[1]	622[1]	18	16	6
—	50	9	15	191	205	109	79	340[1]	129[1]	1,791[5]	3	1	134	260	20	2	6
—	24	14	11	151	198	74[1]	102	272[1]	77	1,331[3]	1	3	74	186[2]	10	31	1
5	481[3]	173[2]	216	2,789[3]	2,750	1,727[6]	1,149[2]	4,336[4]	1,652[5]	20,564[45]	35	17	1,218	2,722[3]	32	103	15
—	10	7	2	28	42	26	13	74	16	297	—	—	22	40	1	1	—
—	25[1]	11	5	99[1]	135	82[3]	102	184	118	1,280[7]	7	5	81	193[1]	1	—	2
—	98	56[1]	22	519	608	259[2]	178	672	235	3,765[5]	5	4	252	424	12	41	1
2	41	15	6	159[1]	128	97[1]	44	166[1]	116[1]	1,045[8]	—	—	73	149[1]	—	1	5
—	5	—	3	23	31	8	7	37	14	188[1]	—	—	14	13	—	—	1
1	116	47	15	941	763	537	310[1]	1,169[1]	343[3]	4,990[13]	4	2	281	449[2]	6	42	1
—	129[2]	19	118	727[1]	659	456	350	1,371	634	6,259[6]	9	5	327	1,163[1]	6	2	2
—	9	1	17	17	20	21	11	75	17	287	—	1	21	66	—	3	—
—	4	—	7	18	9	12	10[1]	29	5	133[1]	—	—	6	22	1	—	1
—	15	9[1]	8	116	166	68	61	232[1]	47[1]	1,033[7]	9	—	46	133[3]	3	5	—
2	29	8	13	142	189	161	63	327[1]	107	1,287[3]	1	—	95	70	2	8	2
—	127[1]	13	415	224	270	220[1]	197	856[4]	212	3,660[11]	5	11	174	596[1]	10	3	13

TABLE 11. All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents;

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not).		Other		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways (Locomotives and Rolling Stock).	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity.	Explosions.	Fires (not Dangerous Occurrences)
	Steam, Gas and other Engines	Electric Motors (not electric shock).	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Non-Textiles—*contd.*																	
Cutlery and similar appliances ..	—	—	1	4	—	—	1	5	1	1	—	136	—	—	—	—	—
Gold, silver, etc., domestic ware ..	—	—	—	3	1	2	—	6	—	3	—	28[1]	—	—	—	—	2
Whitesmiths and tinsmiths	—	—	2	4	3[1]	18	—	32	12	1	1	87	2	3	1	9[1]	1
Metal piercing, stamping and spinning..	—	—	—	12	1	33	5	107	22	—	—	134[1]	—	1	—	1	1
Other light metal trades	2	—	1	14	6	96	16	50	59	4	—	174	1	5	—	8	3[1]
INDUSTRIAL APPLIANCES ..	—	—	1	33[1]	9	97[1]	9	26	78	5	—	211	3	10	3	7[1]	4
Safes, locks, and latches making ..	—	—	1	1	2	6	2	3	13	1	—	20	1	3	—	3[1]	—
Chain and anchor making	—	—	—	2	2	4	—	2	2	—	—	13	—	1	—	—	—
Nail, bolt, nut, screw and rivet making	—	—	—	19[1]	1	75[1]	6	15	51	1	—	74	2	5	2	1	1
Other industrial appliances	—	—	—	11	4	12	1	6	12	3	—	104	—	1	1	3	3
MISCELLANEOUS METAL TRADES	—	1	1	27	23[1]	196[1]	24	29	53	4	1	291[1]	2	4	2[1]	18	8
Brass finishing ..	—	—	—	12	2	103[1]	7	2	19	1	—	38	—	—	—	—	—
Blacksmiths and farriers	—	—	—	—	4	2	—	2	5	1	—	79[1]	—	—	—	2	4
Other miscellaneous metal trades ..	—	1	1	15	17[1]	91	17	25	29	2	1	174	2	4	2[1]	16	4
SHIPBUILDING ..	2	1	1	8	232[4]	46[1]	—	1	311[1]	58	—	607[1]	22[1]	25	45[2]	26	27
AIRCRAFT ..	—	—	—	6	—	31[1]	7	4	18	9	—	38	—	4	1	3	—
GENERAL WOODWORK	5	1[1]	10	46[2]	39[1]	16	6	9	34	1870[6]	2	194	23[1]	42[1]	2	23	3
Saw mills	1	—	4	16	30[1]	1	—	—	2	861[4]	—	33	13[1]	20	1	6	—
Joinery, carpentry and general woodworking	2	—	2	11[1]	5	3	—	—	7	710[2]	—	36	2	9	—	8	1
Wood turning ..	1	—	—	5	—	1	2	—	—	97[1]	—	16	—	—	—	1	—
Box and packing case making	—	—	1	2	1	1	—	—	1	122[1]	1	25	2	3	—	2	—
Brush making ..	—	—	—	1	—	1	—	—	1	25	—	14	—	1	—	1	—
Other woodworking..	1	—	2	5	2	—	—	—	1	50	—	10	5	1	—	2	—
Other builders' materials	—	1[1]	1	6[1]	1	9	4	9	22	5	1	60	1	8[1]	1	3	2
FURNITURE, CABINET MAKING AND UPHOLSTERY, ETC. ..	1	—	5[2]	18	13[1]	7	—	9	8	501[1]	6	128[1]	1[1]	4	2[1]	6[1]	3
Cabinet making ..	—	—	1	9	5[1]	1	—	1	2	303	—	24	1[1]	2	1[1]	2	3
Chair making ..	—	—	—	2	—	—	—	—	—	73	—	9	—	—	—	—	—
Upholstery	—	—	—	—	3	1	—	—	—	5	—	13	—	—	—	—	—
Other furniture etc. making and domestic utensils ..	1	—	4[1]	7	5	5	—	8	6	120[1]	6	82[1]	—	2	1	4[1]	—

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1929 ; Industry, Causation—*continued.*

the small figures at the right are those of fatal accidents only.

Other.										Totals.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances.	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other		Men.	Women and Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.														
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30) (a)	(30) (b)	(31)	(32)	(33)	(34)	(35)
—	7	—	5	10	9	13	4	31	14	242	—	1	18	52	9	—	7
—	8	—	4	9	4	15	3	12	6	106[1]	—	—	2	12	–	—	2
—	34	1	61	72	69	50	69	256	42	830[2]	2	—	39	119	–	—	1
—	31	5	161	38	76	43[1]	59	228[2]	46	1,004[4]	2	5	29	178[1]	–	—	2
—	47[1]	7	184	95	112	99	62	329[2]	104	1,478[4]	1	5	86	235	1	3	1
—	83	15	114	166[1]	143	108[2]	76[1]	470	128	1,799[7]	1	5	80	346[1]	4	5	1
—	5	1	24	20	10	11[1]	8[1]	38	11	184[3]	1	—	9	29	–	1	—
—	11	5	7	33[1]	19	8	3	30	9	151[1]	—	1	9	34[1]	–	—	—
—	48	3	5	54	45	38	34	160	58	698[2]	—	4	27	136	–	1	—
—	19	6	78	59	69	51[1]	31	242	50	766[1]	—	—	35	147	4	3	1
—	117	11[1]	45	286	202[1]	127	66	366[1]	136[1]	2,040[3]	2	4	117	287	7	1	2
—	7	1	8	30	12	19	5	47	25	338[1]	1	—	20	50	–	—	1
—	50	3	5	122	46	26	21	83	35	490[1]	—	—	40	73	–	—	—
—	60	7[1]	32	134	144[1]	82	40	236[1]	76[1]	1,212[6]	1	4	57	164	7	1	1
10[1]	519[1]	115[2]	16[1]	2,041[5]	1,582[10]	1,882[10]	852[2]	2,158[3]	563	11,150[35]	1	—	670	777[2]	–	8	1
—	5	—	18	56	50	47	37	91	40	465[1]	1	1	30	79	–	—	—
1	71	41[2]	27	483[1]	492[6]	441[4]	201[2]	806[2]	202[1]	5,090[24]	11	12	122	449[2]	1	6	47
—	5	26[2]	2	87	257[6]	214[2]	56	308[1]	78	2,021[17]	1	2	39	134[1]	–	5	17
—	17	9[1]	11	241[1]	98	102[2]	57[1]	185[1]	47	1,563[9]	1	3	31	118[1]	–	—	17
—	4	1	—	9	6	8	4	20	4[1]	179[2]	2	—	2	12	–	—	2
1	3	—	3	26	34	35	33	69	19	384[1]	1	2	6	49	–	1	2
—	8	—	2	8	3	8	7	12	4	96	—	2	2	14	–	—	3
—	12	1	4	52	39	25	15	83[1]	17	327[1]	4	3	10	49	–	—	3
—	22	4	5	60	55	49	29[1]	129	33	520[4]	2	—	32	73	1	—	3
1	33	7	23	285	125[1]	180[2]	69	306	145	1,886[11]	3	1	57	268	1	—	32
—	6	4	4	154	40[1]	63[1]	28	139	45	838[5]	1	1	26	129	–	—	20
—	1	1	—	22	1	6	4	13	9	141	—	—	7	11	–	—	3
—	—	—	4	21	5	13	5	13	8	91	—	—	6	21	–	—	5
1	26	2	15	88	79	98[1]	32	141	83	816[6]	2	—	18	107	1	—	4

TABLE 11. All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents;

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not.		Other.		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, Mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways (Locomotives and Rolling Stock).	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity.	Explosions.	Fires (not Dangerous Occurrences).
	Steam, Gas and other Engines	Electric Motors (not electric shock).	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Non-Textiles—*contd.*																	
MANUFACTURE AND DECORATION OF POTTERY	—	—	1[1]	4	3	—	—	—	2	1	1	37	4	8	2	—	—
Manufacture and decoration of pottery	—	—	—	3	1	—	—	—	—	1	1	20	3	6	—	—	—
Earthenware ..	—	—	1[1]	1	2	—	—	—	2	—	—	17	1	2	2	—	—
GLASS MAKING ..	—	1	1	4	16[1]	1	—	—	3	8	1	65	29[1]	20	1	8	—
CHEMICALS, ETC.	6	2	14[2]	29	48	21	—	1	18	13	7	183[2]	172[4]	68	14[2]	87[2]	21
Artificial manure ..	2	—	1	10	11	9	—	—	6	—	—	41[1]	39[2]	26	9[1]	8	—
Drugs and pharmaceutical preparations	1	—	—	—	2	—	—	1	—	—	2	20	2	2	—	3	—
Coal tar and coal tar products	1	1	5[1]	4	7	3	—	—	2	4	—	36	50[1]	9	2	26	10
Other chemicals, animal charcoal and glue	2	1	5[1]	13	26	8	—	—	10	6	—	70[1]	80	29	3[1]	42[2]	7
Paints, colours and varnish	—	—	3[1]	2	2	1	—	—	—	3	5	16	1	2	—	8	4
LEATHER TANNING AND CURRYING. IMITATION LEATHER, ARTICLES MADE FROM LEATHER, HARNESS SADDLERY AND HARNESS FURNITURE	1	—	3	7[1]	4	—	—	2	—	4	23	182	—	8	2[1]	1	—
Sorting of hides, fellmongery, tanning and currying ..	1	—	2	6[1]	3	—	—	—	—	—	17	110	—	8	1	—	—
Other leather working	—	—	1	1	1	—	—	2	—	4	6	72	—	—	1[1]	1	—
TEXTILE PRINTING, BLEACHING AND DYEING..	7	—	15[2]	28	28[1]	8	1	—	5	4	133[2]	371[1]	—	37	6	27	1
Textile printing, bleaching and dyeing	1	—	6[1]	16	17[1]	8	1	—	4	2	82[2]	177	—	22	3	11	—
Cloth finishing, raising and embossing	—	—	—	5	1	—	—	—	—	—	11	30	—	—	—	—	—
Lapping, making up and packing ..	—	—	—	—	7	—	—	—	—	—	—	6	—	—	—	1	—
Job dyeing	—	—	—	—	1	—	—	—	—	—	1	6	—	—	—	1	—
Other finishing, cleaning and dyeing ..	1	—	1	3	—	—	—	—	—	2	3	14	—	1	1	1	1
Laundries	5	—	8[2]	4	2	—	—	—	1	—	36	138[1]	—	14	2	13	—

1929 ; Industry, Causation—*continued.*

the small figures at the right are those of fatal accidents only.

Other.										Totals.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances.	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other		Men.	Women and Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.														
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30) (a)	(30) (b)	(31)	(32)	(33)	(34)	(35)
—	31	1	42	43	68	165[1]	66	192[2]	115	786[4]	2	—	16	106	–	—	5
—	14	—	30	13	23	55	27	75[1]	33	305[1]	—	—	4	39	–	—	—
—	17	1	12	30	45	110[1]	39	117[1]	82	481[3]	2	—	12	67	–	—	5
5	108	4	1	87	167	201	159	579	102	1,571[8]	1	1	58	129	2	—	2
76[4]	595[3]	63	21	438[1]	558[4]	820[16]	334	974[3]	351[1]	4,934[47]	11	5	291	371	4	11	15
44[1]	93[2]	15	4	112[1]	161	182[3]	110	245	52[1]	1,180[15]	1	—	51	70	–	1	—
—	24	—	7	10	17	36[1]	7	42	16	192[1]	1	3	3	22	–	—	2
14[1]	161[2]	29	2	123	141[2]	234[4]	64	193	111	1,232[11]	1	—	58	71	4	7	1
16[1]	302[2]	18	3	176	203[2]	319[6]	133	430[2]	151	2,053[18]	3	—	172	180	–	3	3
2[1]	15	1	5	17	36	49	20	64	21	277[2]	5	2	7	28	–	—	9
1	31	3	30	78	42	127[2]	38	130[1]	51	768[5]	4	2	19	90	1	—	6
—	22	1	2	53	34	107[2]	28	99[1]	33	527[4]	2	—	10	62	1	—	3
1	9	2	28	25	8	20	10	31	18	241[1]	2	2	9	28	–	—	3
3	253	11	20	88	160[2]	420[1]	167[1]	349	173[1]	2,315[12]	26	12	60	204[2]	–	—	16
2	167	10	5	68	124[2]	280	125[1]	258	103	1,492[7]	17	5	49	133[1]	–	—	4
1	11	—	—	4	14	23	7	27	12	146	2	—	2	11	–	—	2
—	—	—	2	1	1	8	6	19	3[1]	54[1]	1	—	—	7[1]	–	—	3
—	4	—	—	3	—	7	3	4	6	36	—	—	1	5	–	—	—
—	21	1	1	4	6	27[1]	8	12	13	121[1]	1	—	3	18	–	—	4
—	50	—	12	8	15	75	18	29	36	466[3]	5	7	5	30	–	—	3

TABLE 11. All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not).		Other.		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways. (Locomotives and Rolling Stock).	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity	Explosions.	Fires (not Dangerous Occurrences).
	Steam, Gas and other Engines	Electric Motors (not electric shock).	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Non-Textiles—*contd.*																	
WEARING APPAREL AND ARTICLES FOR PERSONAL USE	1	1	3	39	14	1	—	2	1	17	11	894	—	10	1	7	8
Tailoring	—	—	2	6	3	—	—	—	—	—	—	153	—	2	—	2	3
Dress and mantle making	—	—	—	3	—	—	—	—	—	1	—	26	—	1	—	—	—
Millinery, hats and caps	1	—	—	5	1	—	—	—	—	—	6	25	—	2	—	3	—
Underclothing ..	—	—	—	3	3	—	—	1	—	—	2	69	—	1	1	1	—
Boots, shoes, slippers and clogs	—	1	1	18	3	—	—	—	1	12	3	545	—	4	—	1	5
Other wearing apparel, etc. ..	—	—	—	4	4	1	—	1	—	4	—	76	—	—	—	—	—
RUBBER TRADES	—	—	2	8[1]	8	6	1	2	3	4	38	225[2]	1	12	5	6	6[1]
PAPER, PRINTING AND STATIONERY ..	3	—	15	50[1]	71[1]	12	4	8	12	29	161	1,386[3]	15[2]	28[1]	6	30[2]	2
Paper, cardboard and millboard making	3	—	7	33[1]	47[1]	4	1	1	3	13	121	327[2]	15[2]	20	2	19[2]	—
Letterpress printing	—	—	4	5	13	2	—	1	7	6	27	534[1]	—	3	2	4	—
Lithographic printing	—	—	—	4	—	—	—	1	—	—	2	61	—	—	1	2	1
Bookbinding ..	—	—	2	—	—	—	—	—	—	1	4	75	—	—	—	—	—
Cardboard and paper boxes	—	—	1	4	2	1	1	1	—	3	1	229	—	3	1	1	—
Other printing, engraving, photography, stationery, etc.	—	—	1	4	9	5	2	4	2	6	6	160	—	2[1]	—	4	1
FOOD	11	—	17[2]	61	70[1]	3	1	4	5	12	52[2]	743[1]	20	55[2]	8[2]	41	8
Flour milling ..	2	—	3	29	12	1	—	—	—	4	5	53	5	5[1]	—	3	1
Other milling, etc. ..	3	—	2[1]	9	7	—	—	—	—	1	1	20	—	3	1	1	1
Bakeries	3	—	1	10	10[1]	—	—	—	—	—	24[2]	223	—	4[1]	—	19	2
Sugar confectionery, groceries, etc. ..	—	—	2	7	23	1	—	—	3	4	16	256	4	19	4	9	1
Sausages and cooked meats	—	—	—	—	1	—	—	—	—	—	1	37	—	2	1[1]	—	1
Other foods ..	3	—	9[1]	6	17	1	1	4	2	3	5	154[1]	11	22	2[1]	9	2
DRINK	3[1]	—	8[2]	9	26[1]	2	—	—	1	4	3	318	11	56	4[2]	79[1]	7
Alcoholic	2	—	7[2]	8	18[1]	2	—	—	—	3	1	189	10	49	2[1]	47[1]	3
Non-alcoholic ..	1[1]	—	1	—	1	—	—	—	—	1	1	39	1	3	—	29	—
Tobacco and matches	—	—	—	1	7	—	—	—	1	—	1	90	—	4	2	3	4
OILCAKE, OIL REFINING AND EXTRACTING ..	2	—	4	6	12[1]	2	—	—	2	—	1	71[2]	10	11[1]	3[1]	12	3
SOAP, STARCH AND CANDLES	—	—	1	5	3	3	—	1	1	22	2	41	12	9	1	3	2

1929 ; Industry, Causation—*continued.*

the small figures at the right are those of fatal accidents only.

Other.										Total.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances.	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other		Men.	Women and Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.								(a)	(b)					
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)		(30)	(31)	(32)	(33)	(34)	(35)
1	55	2	52	417	60	262[3]	94[1]	226	132[1]	2,311[5]	5	7	54	563[3]	1	—	35
—	15	—	9	227	13	90[1]	30	50	33	638[1]	—	—	6	270	–	—	7
—	8	—	5	16	8	27	3	7	8[1]	113[1]	—	—	1	23	–	—	3
1	9	—	3	23	6	29	7	23	11	155	—	2	—	45	–	—	3
—	4	—	11	11	2	30	10	19	9	177	2	—	3	31	–	—	3
—	17	2	11	125	28	60[2]	40[1]	108	45	1,030[3]	2	4	40	155[1]	1	—	12
—	2	—	13	15	3	26	4	19	26	198	1	1	4	39	–	—	7
1	70[2]	8[1]	25	163	237	138[1]	106	430[1]	123[1]	1,628[10]	4	1	43	168[2]	4	—	4
3	138	33[1]	139	175	455[1]	726[8]	301	755[1]	313[1]	4,870[12]	35[1]	46	65	373	1	—	28
2	67	24	25	113	279[1]	414[4]	174	389[1]	123	2,226[14]	12	8	33	162	–	—	8
—	36	6[1]	62	30	116	183[1]	62	218	105[1]	1,426[4]	17[1]	14	21	105	1	—	10
—	2	—	4	4	12	23	12	26	6	161	2	6	1	13	–	—	1
—	2	2	13	6	—	14	6	11	7	143	1	3	1	15	–	—	1
—	10	—	16	4	16	34[1]	14	34	16	392[1]	1	11	2	32	–	—	1
1	21	1	19	18	32	58[2]	33	77	56	522[3]	2	4	7	46	–	—	7
4[2]	396[2]	32	79	357[1]	507[1]	864[7]	327[1]	1,344[4]	462[1]	5,483[39]	62	29	65	893[4]	5	3	31
1	2	1	2	14	42	81[1]	21	58	30	375[2]	15	—	5	25	1	2	2
—	4	3	1	14	11[1]	33	7	35	12	169[2]	2	—	1	12	1	—	8
—	55	7	27	41	104	145[1]	67[1]	199[1]	80	1,021[7]	22	6	8	129[1]	2	1	12
—	181[1]	6	26	86	171	290[3]	123	466[1]	176[1]	1,874[6]	13	16	30	290[2]	1	—	4
3[2]	17	—	6	40[1]	6	22	8	34	13	192[4]	2	2	2	37	–	—	—
—	137[1]	15	17	162	173	293[2]	101	552[2]	151	1,852[8]	8	5	19	400[1]	–	—	5
2	89[1]	11	27	89[1]	255[2]	525[3]	182	837[2]	275[2]	2,823[20]	6	9	58	364[3]	–	1	6
2	73[1]	8	19	65	195[2]	430[5]	131	652[1]	215[2]	2,131[17]	—	2	37	266[1]	–	1	2
—	6	—	5	5[1]	15	21	8	85	17	239[2]	1	—	6	34[1]	–	—	2
—	10	3	3	19	45	74	43	100[1]	43	453[1]	5	7	15	64[1]	–	—	2
2	36	7	6	64	104	183[3]	56	202[1]	70	869[11]	7	1	25	104	–	—	6
3	17	3	26	54	37	90[1]	39	123	26	524[1]	3	1	16	53[1]	–	—	—

TABLE 11. All Reported Accidents,

The principal numbers are the totals of fatal and non-fatal accidents;

INDUSTRY.	Machinery moved by Mechanical Power.												Transport (whether moved by Power or not).		Other.		
	Prime Movers.		Transmission Machinery.		Lifting Machinery.	Machine Tools for Metal Working.				Woodworking Machinery.	Rollers of Calenders, mixers, etc., not for Metal or Woodworking ("Nip" accidents).	Other.	Railways. (Locomotives and Rolling Stock.	Other Vehicles (excluding Hand Trucks, Bogies, etc.).	Electricity.	Explosions.	Fires (not Dangerous Occurrences).
	Steam, Gas and other Engines	Electric Motors (not electric shock).	Shafting.	Belts, Ropes, Pulleys and Gearing.		Lathes.	Milling Machines.	Power Presses (other than Punches).	Other.								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Non-Textiles—*contd.*																	
Soap, starch and candles	—	—	—	5	3	3	—	1	1	2	2	39	12	9	1	3	2
Firewood cutting ..	—	—	1	—	—	—	—	—	—	20	—	2	—	—	—	—	—
SCIENTIFIC INSTRUMENTS ..	—	—	1	—	—	28	6	8	10	5	—	22[1]	—	—	—	1	1
CLOCKS, WATCHES AND JEWELLERY	—	—	—	2	1	8	1	1	5	3	1	72	1	—	—	4	1
Clocks, watches and jewellery ..	—	—	—	1	1	5	1	1	2	1	—	10	1	—	—	2	1
Ivory, bone and celluloid articles ..	—	—	—	1	—	3	—	—	3	2	1	62	—	—	—	2	—
ARTICLES FOR SPORTS AND PASTIMES, TOYS	—	—	—	8	4	17	7	9	15	48	3	66	—	2	2	5	—
Articles for sports and pastimes, toys ..	—	—	—	4	1	4	—	3	2	17	1	22	—	—	1	2	—
Musical instruments	—	—	—	4	3	13	7	6	13	31	2	44	—	2	1	3	—
GAS WORKS ..	14[1]	—	2	10[2]	27[2]	4	—	—	5	2	—	63[3]	40[2]	32	6	90[1]	10
ELECTRICITY GENERATING STATIONS ..	1	2	3[1]	5	7[1]	1	—	—	6	4	—	26	7	12	64[7]	18[1]	7
OTHER MISCELLANEOUS TRADES.. ..	—	—	1	5	5	—	—	2	1	3	2	40	5[1]	1	—	2	1
Places under ss 104–106	**8**	—	**4[1]**	**14[1]**	**1,404[12]**	—	—	**1**	—	**12**	**3**	**75**	**153[6]**	**121[2]**	**8**	**28[1]**	**5**
Docks, sec. 104 ..	2	—	1	4	1256[11]	—	—	1	—	3	—	29	94[5]	73[1]	3	14[1]	3
Buildings, sec. 105 ..	4	—	3[1]	7[1]	103[18]	—	—	—	—	9	3	41	5	33[1]	5	10	2
Warehouses, sec. 104, and Railways, sec. 106	2	—	—	3	45[4]	—	—	—	—	—	—	5	54[3]	15	—	4	—
Total ..	**138[4]**	**18[1]**	**211[14]**	**1,233[13]**	**3,532[118]**	**2,954[5]**	**559**	**564**	**2,395[6]**	**3,300[10]**	**511[4]**	**16,451[30]**	**1,207[15]**	**1,212[11]**	**420[13]**	**1,071[15]**	**268[4]**

* 72 cases under III and 300 cases under IV of the Dangerous

1929 ; Industry, Causation—*continued.*

the small figures at the right are those of fatal accidents only.

Other.										Totals.	Cleaning of Machinery in Motion (included elsewhere in Table).		Eye Injuries (included elsewhere in Table).	Sepsis (included elsewhere in Table).	Dangerous Occurrences.		
Gassing.	Molten Metal; other Hot or Corrosive Substances.	Machinery not moved by Mechanical Power.		Use of Hand Tools.	Struck by Falling Body.	Persons Falling.	Stepping on or Striking against Objects (not included in other Columns).	Handling Goods or Articles in manufacturing or carrying processes (not included in other Columns).	Other		Men.	Women and Young Persons.			Bursting of Revolving Vessel, etc.	Breaking of Lifting Appliance.	Explosion or Fire.
		Lifting Machinery.	Other.														
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(a)	(b) (30)	(31)	(32)	(33)	(34)	(35)
2	17	3	26	42	36	86[1]	39	116	26	476[1]	3	1	14	53[1]	–	—	—
1	—	—	—	12	1	4	—	7	—	48	—	—	2	—	–	—	3
—	11	—	8	12	13	14	9	35	9	193[1]	1	—	10	25[1]	–	—	1
—	3	—	32	10	10	12	5	15	8	195	1	—	4	21	–	—	3
—	3	—	16	5	3	3	1	9	2	68	—	—	2	12	–	—	2
—	—	—	16	5	7	9	4	6	6	127	1	—	2	9	–	—	1
—	15	1	22	50	57	65	34	147	60	637	3	4	19	113	1	—	6
—	1	—	9	17	7	13	3	21	9	137	1	3	5	23	–	—	2
—	14	1	13	33	50.	52	31	126	51	500	2	1	14	90	1	—	4
24[2]	166[1]	22[1]	5	256	241[3]	417[9]	177[1]	346	220[3]	2,179[31]	7[1]	—	103	175[2]	1	10	3
3	53	11	3	93	121[2]	230[7]	69	152	89[1]	987[21]	2	—	36	74	1	—	3
—	6	1	5	26	26	56[1]	12	79	19	298[2]	1	2	14	38	–	—	3
3	88	111[3]	14	618[3]	2,181[21]	2,658[134]	795[4]	3,161[4]	690[6]	12,155[242]	1	—	199	618[4]	2	100	3
3	20	49[1]	6	308[2]	1,412[9]	1,192[22]	322[2]	2,214[4]	346[2]	7,355[90]	—	—	65	246[3]	1	95	1
—	65	55[4]	6	291[1]	663[11]	1,327[94]	433[2]	760	315[3]	4,140[133]	1	—	123	321[1]	1	3	—
—	3	7	2	19	106[1]	139[8]	40	187	29[1]	660[18]	—	—	11	51	–	2	2
112[13]	8,654[34]	1,150[18]	1,828[1]	16,015[20]	19,170[31]	19,774[332]	11,697[21]	35,453[43]	11,274[30]	161,269[982]	516[3]	810[3]	6,802[2]	17,586[31]	154	1,692	372*

Occurrences Notification Order, dated 9th November, 1928.

TABLE 11A. Persons Employed in Factories, 1928.

The figures in the following statement were obtained by means of an analysis of the Workmen's Compensation Act Returns for 1928 combined with an Order under Section 130 of the Factory and Workshop Act, 1901, and of the Returns to the Registrar of Friendly Societies in connection with schemes certified under Section 31 of the Workmen's Compensation Act, 1925. They do not include a certain number of factory workers who, being in the employment of the Crown, are dealt with under a certified scheme for government workers, and no allowance has been made for a small proportion of the total number of factory workers in respect of whom the employers failed to make Returns before the date upon which the tabulation was closed down.

For the purpose of tabulation, a broad classification of the workers in accordance with the main industry of the factory has been adopted throughout.

Industry.	Number.							Percentages.			
	Males.			Females.				Sex.		Age.	
	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Total.	Male.	Female.	Under 18 Years of Age.	18 Years of Age and Upwards.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Textiles	**51,363**	**318,091**	**369,454**	**126,929**	**530,709**	**657,638**	**1,027,092**	**36·0**	**64·0**	**17·4**	**82·6**
Cotton	26,322	164,442	190,764	54,894	275,320	330,214	520,978	36·6	63·4	15·6	84·4
Wool, worsted and shoddy	13,967	83,238	97,205	28,334	120,972	149,306	246,511	39·4	60·6	17·2	82·8
Flax, hemp and jute	4,424	15,350	19,774	8,999	30,960	39,959	59,733	33·1	66·9	22·5	77·5
Silk and artificial silk	1,668	23,088	24,756	9,913	22,961	32,874	57,630	43·0	57·0	20·1	79·9
Lace	685	4,672	5,357	1,273	4,971	6,244	11,601	46·2	53·8	16·9	83·1
Hosiery	2,991	17,985	20,976	18,222	61,877	80,099	101,075	20·8	79·2	21·0	79·0
Other textiles	1,306	9,316	10,622	5,294	13,648	18,942	29,564	35·9	64·1	22·3	77·7
Non-Textiles	**363,395**	**2,582,151**	**2,945,546**	**317,174**	**860,774**	**1,177,948**	**4,123,494**	**71·4**	**28·6**	**16·5**	**83·5**
CLAY, STONE, LIME AND CEMENT	11,485	87,731	99,216	872	5,309	6,181	105,397	94·1	5·9	11·7	88·3
Brick, pipe and tile making	8,139	51,365	59,504	697	4,457	5,154	64,658	92·0	8·0	13·7	86·3
Slate, stone and marble	1,390	10,696	12,086	29	177	206	12,292	98·3	1·7	11·5	88·5
Other clay, stone, lime and cement	1,956	25,670	27,626	146	675	821	28,447	97·1	2·9	7·4	92·6
METALS	39,383	348,054	387,937	7,671	20,523	28,194	416,131	93·2	6·8	11·4	88·6
Iron smelting	2,170	33,051	35,221	22	236	258	35,479	99·3	0·7	6·2	93·8
Extracting and refining of other metals	590	9,926	10,516	29	292	321	10,837	97·0	3·0	5·7	94·3
Conversion of iron into steel	2,656	41,363	44,019	205	797	1,002	45,021	97·8	2·2	6·4	93·6
Iron and steel rolling mills	7,160	72,774	79,934	392	3,049	3,441	83,375	95·9	4·1	9·1	90·9
Rolling of other metals	1,053	8,887	9,940	275	900	1,175	11,115	89·4	10·6	11·9	88·1
Metal tube making	2,513	24,753	27,266	207	662	869	28,135	96·9	3·1	9·7	90·3
Wire drawing	1,009	9,225	10,234	518	967	1,485	11,719	87·3	12·7	13·0	87·0
Other conversion of metals	205	1,240	1,445	4	35	39	1,484	97·4	2·6	14·1	85·9
Founding or casting of iron or steel	15,592	104,631	120,223	1,864	4,132	5,996	126,219	95·2	4·8	13·8	86·2
Mixing and casting of brass	3,915	20,852	24,767	1,594	3,925	5,519	30,286	81·8	13·2	18·2	81·8
Founding of other metals	656	5,775	6,431	88	244	332	6,763	95·1	4·9	11·0	89·0
Pattern making	359	1,747	2,106	21	54	75	2,181	96·6	3·4	17·4	82·6
Electro-plating	634	2,917	3,551	910	2,015	2,925	6,476	54·8	45·2	23·8	76·2
Metal dipping and burnishing	102	318	420	103	317	420	840	50·0	50·0	24·4	75·6
Corrugating, galvanising, tinning, enamelling and lacquering	1,112	9,204	10,316	1,312	2,622	3,934	14,250	72·4	27·6	17·0	83·0
Foundry requisites	157	1,391	1,548	127	276	403	1,951	79·3	20·7	14·6	85·4
ENGINEERING WORKS (OTHER THAN MACHINE MAKING) MACHINE AND OTHER TOOLS	43,700	251,580	295,280	14,567	39,343	53,910	349,190	84·6	15·4	16·7	83·3

TABLE 11A. Persons Employed in Factories, 1928—*continued.*

Industry.	Number.							Percentages.			
	Males.			Females.				Sex.		Age.	
	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Total.	Male.	Female.	Under 18 Years of Age.	18 Years of Age and Upwards.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-Textiles—*contd.*											
Marine engineering	2,767	17,264	20,031	84	305	389	20,420	98·1	1·9	14·0	86·0
Locomotive building and repairing	4,552	42,783	47,335	46	250	296	47,631	99·4	0·6	9·7	90·3
Boiler making, etc.	3,615	26,799	30,414	54	176	230	30,644	99·2	0·8	12·0	88·0
Constructional engineering	3,284	16,715	19,999	177	322	499	20,498	97·6	2·4	16·9	83·1
Hydraulic, ventilating and pneumatic engineering	1,392	8,602	9,994	119	276	395	10,389	96·2	3·8	14·5	85·5
Electrical engineering	18,522	86,864	105,386	12,518	33,780	46,298	151,684	69·5	30·5	20·5	79·5
Machine and other tool making	7,188	32,784	39,972	1,129	3,127	4,256	44,228	90·4	9·6	18·8	81·2
Other engine building; transmission machinery	2,380	19,769	22,149	440	1,107	1,547	23,696	93·5	6·5	11·9	88·1
MACHINERY, MACHINERY ACCESSORIES, LIFTING APPLIANCES, RAILWAY AND TRAMWAY PLANT (OTHER THAN LOCOMOTIVES), CONVEYANCES	64,555	454,280	518,835	9,438	29,757	39,195	558,030	93·0	7·0	13·3	86·7
Agricultural machinery	1,009	7,320	8,329	58	88	146	8,475	98·3	1·7	12·6	87·4
Textile machinery and accessories	5,909	42,858	48,767	897	2,923	3,820	52,587	92·7	7·3	12·9	87·1
General engineering; making and repairing machinery	13,465	86,344	99,809	831	2,397	3,228	103,037	96·9	3·1	13·9	86·1
Motor repairing, etc.	9,165	44,000	53,165	378	1,931	2,309	55,474	95·8	4·2	17·2	82·8
Jobbing engineering	853	3,956	4,809	39	97	136	4,945	97·2	2·8	18·0	82·0
Railway and tramway plant and vehicles	6,537	78,284	84,821	202	1,091	1,293	86,114	98·5	1·5	7·8	92·2
Motor vehicles (other than steam) and accessories	16,760	124,028	140,788	2,738	9,278	12,016	152,804	92·1	7·9	12·8	87·2
Cycles (other than motor cycles) and accessories	2,365	9,266	11,631	1,455	4,225	5,680	17,311	67·2	32·8	22·1	77·9
Carts, carriages and wagons (other than railway and tramway carriages and wagons, cycles and motor vehicles)	2,411	13,501	15,912	493	1,192	1,685	17,597	90·4	9·6	16·5	83·5
Other miscellaneous machines	5,035	37,638	42,673	1,591	4,444	6,035	48,708	87·6	12·4	13·6	86·4
Ordnance and munitions of war	1,046	7,085	8,131	756	2,091	2,847	10,978	74·1	25·9	16·4	83·6
LIGHT METAL TRADES	11,135	58,020	69,155	18,010	36,427	54,437	123,592	56·0	44·0	23·6	76·4
Cutlery and similar appliances	1,214	6,073	7,287	1,824	4,439	6,263	13,550	53·8	46·2	22·4	77·6
Gold, silver, etc., domestic ware	460	3,804	4,264	900	2,980	3,880	8,144	52·4	47·6	16·7	83·3
Whitesmiths and tinsmiths	2,910	13,293	16,203	1,933	4,971	6,904	23,107	70·1	29·9	21·0	79·0
Metal piercing, stamping and spinning	2,216	10,800	13,016	8,024	12,089	20,113	33,129	39·3	60·7	30·9	69·1
Other light metal trades	4,335	24,050	28,385	5,329	11,948	17,277	45,662	62·2	37·8	21·2	78·8
INDUSTRIAL APPLIANCES	5,495	26,373	31,868	6,180	13,855	20,035	51,903	61·4	38·6	22·5	77·5
Safes, locks, and latches making	781	3,963	4,744	805	1,634	2,439	7,183	66·0	34·0	22·1	77·9
Chain and anchor making	273	3,428	3,701	405	794	1,199	4,900	75·5	24·5	13·8	86·2
Nail, bolt, nut, screw and rivet making	2,631	11,267	13,898	3,175	8,068	11,243	25,141	55·3	44·7	23·1	76·9
Other industrial appliances	1,810	7,715	9,525	1,795	3,359	5,154	14,679	64·9	35·1	24·6	75·4
MISCELLANEOUS METAL TRADES	4,470	28,551	33,021	1,382	4,270	5,652	38,673	85·4	14·6	15·1	84·9
Brass finishing	602	2,600	3,202	445	1,345	1,790	4,992	64·1	35·9	21·0	79·0
Blacksmiths and farriers	692	4,514	5,206	24	55	79	5,285	98·5	1·5	13·5	86·5
Other miscellaneous metal trades	3,176	21,437	24,613	913	2,870	3,783	28,396	86·7	13·3	14·4	85·6
SHIPBUILDING	16,383	117,263	133,646	322	1,684	2,006	135,652	98·5	1·5	12·3	87·7
AIRCRAFT	1,854	12,297	14,151	140	833	973	15,124	93·6	6·4	13·2	86·8

TABLE 11A. Persons Employed in Factories, 1928—*continued.*

Industry.	Number.							Percentages.			
	Males.			Females.				Sex.		Age.	
	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Total.	Male.	Female.	Under 18 Years of Age.	18 Years of Age and Upwards.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-Textiles—*contd.*											
GENERAL WOODWORK ..	24,209	124,791	149,000	3,935	10,910	14,845	163,845	90·9	9·1	17·2	82·8
Saw mills	5,847	32,174	38,021	255	895	1,150	39,171	97·1	2·9	15·6	84·4
Joinery, carpentry and general woodworking	10,225	47,940	58,165	463	1,338	1,801	59,966	97·0	3·0	17·8	82·2
Wood turning	574	2,594	3,168	371	1,029	1,400	4,568	69·4	30·6	20·7	79·3
Box and packing case making	2,609	8,584	11,193	1,425	2,774	4,199	15,392	72·7	27·3	26·2	73·8
Brush making	621	4,850	5,471	994	3,496	4,490	9,961	54·9	45·1	16·2	83·8
Other wood working ..	1,056	5,459	6,515	143	529	672	7,187	90·6	9·4	16·7	83·3
Other builders' materials ..	3,277	23,190	26,467	284	849	1,133	27,600	95·9	4·1	12·9	87·1
FURNITURE, CABINET MAKING AND UPHOLSTERY, ETC.	15,869	77,459	93,328	7,524	18,415	25,939	119,267	78·3	21·7	19·6	80·4
Cabinet making	8,488	31,733	40,221	2,107	5,028	7,135	47,356	84·9	15·1	22·4	77·6
Chair making	1,213	6,398	7,611	356	708	1,064	8,675	87·7	12·3	18·1	81·9
Upholstery	1,203	3,858	5,061	663	2,071	2,734	7,795	64·9	35·1	23·9	76·1
Other furniture etc. making and domestic utensils ..	4,965	35,470	40,435	4,398	10,608	15,006	55,441	72·9	27·1	16·9	83·1
MANUFACTURE AND DECORATION OF POTTERY	4,338	28,157	32,495	9,169	27,322	36,491	68,986	47·1	52·9	19·6	80·4
Manufacture and decoration of pottery	2,038	15,085	17,123	3,323	10,582	13,905	31,028	55·2	44·8	17·3	82·7
Earthenware	2,300	13,072	15,372	5,846	16,740	22,586	37,958	40·5	59·5	21·5	78·5
GLASS MAKING	4,253	25,704	29,957	1,651	4,253	5,904	35,861	83·5	16·5	16·5	83·5
CHEMICALS, ETC.	7,061	85,694	92,755	6,485	15,653	22,138	114,893	80·7	19·3	11·8	88·2
Artificial manure	272	6,829	7,101	82	395	477	7,578	93·7	6·3	4·7	95·3
Drugs and pharmaceutical preparations	848	8,247	9,095	3,748	8,661	12,409	21,504	42·3	57·7	21·4	78·6
Coal tar and coal tar products	817	15,875	16,692	25	154	179	16,871	98·9	1·1	5·0	95·0
Other chemicals, animal charcoal and glue	3,893	43,305	47,198	1,799	4,433	6,232	53,430	88·3	11·7	10·7	89·3
Paints, colours and varnish ..	1,231	11,438	12,669	831	2,010	2,841	15,510	81·7	18·3	13·3	86·7
LEATHER TANNING AND CURRYING. IMITATION LEATHER, ARTICLES MADE FROM LEATHER, HARNESS SADDLERY AND HARNESS FURNITURE	4,451	32,569	37,020	5,103	11,123	16,226	53,246	69·5	30·5	17·9	82·1
Sorting of hides, fellmongery, tanning and currying ..	2,720	23,991	26,711	1,180	3,523	4,703	31,414	85·0	15·0	12·4	87·6
Other leather working ..	1,731	8,578	10,309	3,923	7,600	11,523	21,832	47·2	52·8	25·9	74·1
TEXTILE PRINTING, BLEACHING AND DYEING	11,936	90,310	102,246	34,709	99,059	133,768	236,014	43·3	56·7	19·8	80·2
Textile printing, bleaching and dyeing	6,800	58,675	65,475	5,047	16,281	21,328	86,803	75·4	24·6	13·6	86·4
Cloth finishing, raising and embossing	791	6,104	6,895	588	1,792	2,380	9,275	74·3	25·7	14·9	85·1
Lapping, making up and packing	719	6,638	7,357	808	2,706	3,514	10,871	67·7	32·3	14·0	86·0
Job dyeing	251	2,233	2,484	1,640	4,385	6,025	8,509	29·2	70·8	22·2	77·8
Other finishing, cleaning and dyeing	1,209	4,915	6,124	2,907	7,224	10,131	16,255	37·7	62·3	25·3	74·7
Laundries	2,166	11,745	13,911	23,719	66,671	90,390	104,301	13·3	86·7	24·8	75·2
WEARING APPAREL AND ARTICLES FOR PERSONAL USE	20,794	123,710	144,504	76,011	237,033	313,044	457,548	31·6	68·4	21·2	78·8

TABLE 11A. Persons Employed in Factories, 1928—*continued.*

Industry.	Number.							Percentages.			
	Males.			Females.				Sex.		Age.	
	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Under 18 Years of Age.	18 Years of Age and Upwards.	Total.	Total.	Male.	Female.	Under 18 Years of Age.	18 Years of Age and Upwards
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-Textiles—*contd.*											
Tailoring	4,124	27,267	31,391	24,963	79,811	104,774	136,165	23·1	76·9	21·4	78·6
Dress and mantle making	503	3,632	4,135	10,251	37,254	47,505	51,640	8·0	92·0	20·8	79·2
Millinery, hats and caps	1,716	10,046	11,762	5,017	20,832	25,849	37,611	31·3	68·7	17·9	82·1
Underclothing	694	4,286	4,980	14,125	38,282	52,407	57,387	8·7	91·3	25·8	74·2
Boots, shoes, slippers and clogs	12,061	70,401	82,462	11,425	38,178	49,603	132,065	62·4	37·6	17·8	82·2
Other wearing apparel, etc.	1,696	8,078	9,774	10,230	22,676	32,906	42,680	22·9	77·1	27·9	72·1
RUBBER TRADES	2,064	21,488	23,552	3,807	11,632	15,439	38,991	60·4	39·6	15·1	84·9
PAPER, PRINTING AND STATIONERY	27,192	177,907	205,099	39,603	91,210	130,813	335,912	61·1	38·9	19·9	80·1
Paper, cardboard and millboard making	4,366	38,330	42,696	6,157	14,047	20,204	62,900	67·9	32·1	16·7	83·3
Letterpress printing	16,790	106,301	123,091	15,328	36,970	52,298	175,389	70·2	29·8	18·3	81·7
Lithographic printing	910	5,442	6,352	1,732	4,052	5,784	12,136	52·3	47·7	21·8	78·2
Bookbinding	916	4,934	5,850	2,085	5,901	7,986	13,836	42·3	57·7	21·7	78·3
Cardboard and paper boxes	809	3,863	4,672	6,272	13,547	19,819	24,491	19·1	80·9	28·9	71·1
Other printing, engraving, photography, stationery, etc.	3,401	19,037	22,438	8,029	16,693	24,722	47,160	47·6	52·4	24·2	75·8
FOOD	18,630	157,616	176,246	41,643	99,069	140,712	316,958	55·6	44·4	19·0	81·0
Flour milling	829	16,817	17,646	563	1,732	2,295	19,941	88·5	11·5	7·0	93·0
Other milling, etc.	875	11,216	12,091	1,151	3,496	4,647	16,738	72·2	27·8	12·1	87·9
Bakeries	8,896	56,949	65,845	13,524	30,093	43,617	109,462	60·2	39·8	20·5	79·5
Sugar confectionery groceries, etc.	2,414	23,571	25,985	18,293	36,175	54,468	80,453	32·3	67·7	25·7	74·3
Sausages and cooked meats	2,520	10,887	13,407	786	2,506	3,292	16,699	80·3	19·7	19·8	80·2
Other foods	3,096	38,176	41,272	7,326	25,067	32,393	73,665	56·0	44·0	14·1	85·9
DRINK	7,092	59,465	66,557	12,290	37,989	50,279	116,836	57·0	43·0	16·6	83·4
Alcoholic	5,361	44,369	49,730	2,027	12,314	14,341	64,071	77·6	22·4	11·5	88·5
Non-alcoholic	880	4,734	5,614	846	4,512	5,358	10,972	51·2	48·8	15·7	84·3
Tobacco and matches	851	10,362	11,213	9,417	21,163	30,580	41,793	26·8	73·2	24·6	75·4
OILCAKE, OIL REFINING AND EXTRACTING	1,282	23,564	24,846	319	2,258	2,577	27,423	90·6	9·4	5·8	94·2
SOAP, STARCH AND CANDLES	1,756	14,972	16,728	3,999	8,767	12,766	29,494	56·7	43·3	19·5	80·5
Soap, starch and candles	1,361	13,307	14,668	3,841	8,214	12,055	26,723	54·9	45·1	19·5	80·5
Firewood cutting	395	1,665	2,060	158	553	711	2,771	74·3	25·7	20·0	80·0
SCIENTIFIC INSTRUMENTS	2,801	11,709	14,510	2,114	5,080	7,194	21,704	66·9	33·1	22·6	77·4
CLOCKS, WATCHES AND JEWELLERY	1,724	11,292	13,016	3,333	8,820	12,153	25,169	51·7	48·3	20·1	79·9
Clocks, watches and jewellery	1,046	7,869	8,915	1,787	4,536	6,323	15,238	58·5	41·5	18·6	81·4
Ivory, bone and celluloid articles	678	3,423	4,101	1,546	4,284	5,830	9,931	41·3	58·7	22·4	77·6
ARTICLES FOR SPORTS AND PASTIMES, TOYS	4,449	22,230	26,679	4,085	9,359	13,444	40,123	66·5	33·5	21·3	78·7
Articles for sports and pastimes, toys	1,621	5,499	7,120	2,809	4,470	7,279	14,399	49·4	50·6	30·8	69·2
Musical instruments	2,828	16,731	19,559	1,276	4,889	6,165	25,724	76·0	24·0	16·0	84·0
GAS WORKS	1,383	56,986	58,369	23	581	604	58,973	99·0	1·0	2·4	97·6
ELECTRICITY GENERATING STATIONS	1,130	32,669	33,799	201	2,364	2,565	36,364	92·9	7·1	3·7	96·3
OTHER MISCELLANEOUS TRADES	2,021	19,710	21,731	2,588	7,876	10,464	32,195	67·5	32·5	14·3	85·7
ALL FACTORY INDUSTRIES	414,758	2,900,242	3,315,000	444,103	1,391,483	1,835,586	5,150,586	64·4	35·6	16·7	83·3

TABLE 12.—Hoist Accidents, 1929; Causation, Age, Sex.

(Also included in Tables 10 and 11.)

The principal numbers are those of accidents fatal and non-fatal; the small figures at the right are those of fatal accidents only.

Causation.	Adults. (Over 18).		Young Persons. (14-18).		Total.
	Males.	Females.	Males.	Females.	
(1)	(2)	(3)	(4)	(5)	(6)
A. Falls:					
1. Falls down hoist well when—					
(a) Entirely unfenced	11^{1}	—	—	1	12^{1}
(b) Fenced—single bar	—	—	—	—	—
Doors left open—					
(c) Creeping cage	3^{1}	—	1	—	4^{1}
(d) Cage moved by someone else	4	—	—	—	4
(e) Other than (c) or (d)	—	3	1	2	6
(f) Injured person opened doors	9^{1}	1	2	—	12^{1}
(g) Auto. gates propped open or out of order	4	—	2	—	6
(h) Hoist creeping upset load when unloading	—	—	—	—	—
2. Fall of cage through—					
(a) Breaking of suspension rope	15^{4}	—	—	—	15^{4}
(b) Leaking or failure of hydraulic valve	—	—	—	—	—
(c) Other causes	16^{3}	—	—	2	18^{3}
3. Falls of persons or articles —					
(a) Getting in or out of cage in motion	4	1	1	1	7
(b) Other falls of persons out of cage	7^{2}	1	—	—	8^{2}
(c) Bodies falling out of cage and striking persons outside	2	—	—	—	2
(d) Articles falling on persons in cage through open top	5^{1}	—	—	—	5^{1}
(e) Article in cage falling on person in it	1	—	2	—	3
B. Crushes:					
1. Between cage and fencing of well	14^{1}	2	11^{1}	—	27^{2}
2. Between cage and structure of well—					
(a) Cage ascending—tops of doorways or floors of rooms	37	4	39	5	85
(b) Cage descending—between cage and floor of room	37^{2}	—	15^{3}	8	60^{4}
(c) Projections in well	16^{2}	—	20	3	39^{2}
(d) No projections in well	10	1	3	1	15
(e) Cage and top of well	4^{1}	—	—	—	4^{1}
(f) Cage and bottom of well	9^{5}	—	1	—	10^{5}
3. Crushed between truck and inside of cage	5	—	1	1	7
C. Miscellaneous:					
1. Injured by—					
(a) Automatic gates	10	2	2	2	16
(b) Counterweight	13^{4}	—	1	—	14^{4}
(c) Gear of hoist (starting of suspension ropes, etc.)	18	—	4	—	22
2. Continuous hoists	2	—	—	—	2
3. Other causes	17	3	5	2	27
D. Repairing, Cleaning or Oiling, included in above	28^{3}	1	1	—	30^{3}
Total	273^{18}	18	111^{3}	28	$*430^{21}$

* Including 14 cases at hoists not moved by mechanical power.

TABLE 13.

Particulars from Reports for the year 1928 from Medical Officers of Health under Section 132, Factory and Workshop Act, 1901.

1,616 reports were due from England and 1,578 were received. For Wales the corresponding figures are 191 and 184 and for Scotland 307 and 301.

A.—Inspections (including those by Sanitary Inspectors).

Premises.	England.*			Wales*			Scotland.			Great Britain.		
	Inspections.	Written Notices.	Occupiers Prosecuted.	Inspections.	Written Notices.	Occupiers Prosecuted.	Inspections.	Written Notices.	Occupiers Prosecuted.	Inspections.	Written Notices.	Occupiers Prosecuted.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Factories (including factory laundries).	63,619	4,670	6	5,714	325	—	6,319	612	1	75,652	5,607	7
Workshops (including workshop laundries).	196,559	11,962	19	17,251	660	—	36,299	1,314	—	250,109	13,936	19
Workplaces (other than outworkers' premises).	52,753	2,211	2	1,987	156	—	8,766	320	—	63,506	2,687	2
Total	312,931	18,843	27	24,952	1,141	—	51,384	2,246	1	389,267	22,230	28

B.—Defects found.

Particulars.	England*				Wales*				Scotland.				Great Britain.			
	Defects.			Offences followed by Prosecutions.	Defects.			Offences followed by Prosecutions.	Defects.			Offences followed by Prosecutions.	Defects.			Offences followed by Prosecutions.
	Found.	Remedied. **	Referred to Factory Inspector.		Found.	Remedied. **	Referred to Factory Inspector.		Found.	Remedied. **	Referred to Factory Inspector.		Found.	Remedied. **	Referred to Factory Inspector.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Nuisances under the Public Health Acts:—†																
Want of cleanliness ..	14,160	14,088	25	6	1,244	1,228	11	—	1,902	1,888	—	—	17,306	17,204	36	6
Want of ventilation ..	810	789	5	—	45	45	—	—	57	56	—	—	912	890	5	—
Overcrowding ..	160	158	—	—	5	6	—	—	4	4	—	—	169	168	—	—
Want of drainage of floors ..	308	293	—	1	24	24	—	—	17	14	—	—	349	331	—	1
Other nuisances	10,282	10,007	10	32	399	394	1	—	612	597	1	—	11,293	10,998	12	32
Sanitary accommodation:—																
insufficient..	1,214	1,069	58	1	46	38	—	—	58	52	2	—	1,318	1,159	60	1
unsuitable or defective..	7,209	7,073	15	9	195	200	2	—	204	203	—	—	7,608	7,476	17	9
not separate for sexes..	620	574	3	—	7	6	1	—	7	7	—	—	634	587	4	—
Offences under the Factory and Workshops Acts:—																
Illegal occupation of underground bakehouse (s.101).	73	68	—	—	—	—	—	—	5	5	—	—	78	73	—	—
Other offences.‡	1,159	1,072	133	2	5	5	—	—	19	14	1	1	1,183	1,091	134	3
Total ..	35,995	35,191	249	51	1,970	1,946	15	—	2,885	2,840	4	1	40,850	39,977	268	52

* Monmouthshire is included in Wales.

† Including those specified in sections 2, 3, 7 and 8 of the Factory and Workshop Act, 1901, as remediable under the Public Health Acts.

‡ Excluding offences relating to outwork and offences under the Sections mentioned in the Schedules to the Ministry of Health (Factories and Workshops Transfer of Powers) Order, 1921, and the Scottish Board of Health (Factories and Workshops Transfer of Powers) Order, 1921.

** A few cases are included in this column which relate to defects found in the previous year.

TABLE 13—*continued.*

Particulars from Reports for the year 1928 from Medical Officers of Health under Section 132, Factory and Workshop Act, 1901.

C.—Outwork in Unwholesome Premises, Section 108.

NATURE OF WORK. (1)	Great Britain. Instances. (2)	Notices served. (3)	Prosecutions. (4)
Wearing Apparel—			
Making, etc.	1,128	627	12
Cleaning and washing	25	12	—
Household linen	—	—	—
Lace, lace curtains and nets	7	—	—
Curtains and furniture hangings	12	16	—
Furniture and upholstery	15	2	—
Electro-plate	—	—	—
File making	—	—	—
Brass and brass articles	—	—	—
Fur pulling	8	7	—
Cables and chains	4	3	—
Anchors and Grapnels	—	—	—
Cart Gear	—	—	—
Locks, latches and keys	5	5	—
Umbrellas, etc.	25	23	—
Artificial flowers	24	13	—
Nets, other than wire nets	—	—	—
Tents	—	—	—
Sacks	—	—	—
Racquet and tennis balls	6	6	—
Paper, etc., boxes, paper bags	148	150	4
Brush Making	32	19	—
Pea picking	—	—	—
Feather sorting	—	—	—
Carding, etc., of buttons, etc.	8	2	—
Stuffed toys	6	4	—
Basket making	—	—	—
Chocolates and sweetmeats	4	—	—
Cosaques, Christmas crackers, Christmas stockings, etc.	5	6	—
Textile weaving	—	—	—
Total	1,462	895	16

TABLE 14.—Administration of the Factory Acts, 1919–1929.

Subject. (1)	1929, excluding Ireland. (2)	1924, excluding Ireland. (3)	1919, including Ireland. (4)
Authorised Staff (Inspectors and Assistants)	206	205	222
Expenditure* (excluding Central Office Clerks and Pensions).	£159,722	£151,190	£127,961
Registered Factories and Workshops. — Factories	152,453	142,494	135,454
Registered Factories and Workshops. — Workshops (including Men's) ..	108,323	133,729	165,484
Registered Factories and Workshops. — Total†	260,776	276,223	300,938
Docks, etc. (Registered Occupiers)..	3,284	3,428	3,879
Warehouses	4,924	4,806	4,606
Humid textile factories under s. 96..	421	346	313
Works or Departments under Regulations or Special Rules.	222,577	136,485	84,240
Textile Works under Particulars Section. — Factories	4,597	7,250	8,376
Textile Works under Particulars Section. — Workshops	1,263	1,940	2,411
Effective visits to — Factories	187,506	184,155	147,379
Effective visits to — Workshops	82,105	118,357	145,601
Effective visits to — Other places under the Act	21,389	17,040	8,924
Effective visits to — Places not under the Act	24,957	23,397	20,335
Effective visits before or after legal hours.	10,754	11,379	20,804
Works visited more than once during the year. — Factories.. Textile ..	2,077	2,421	‡
Works visited more than once during the year. — Factories.. Non-Textile..	24,375	24,266	‡
Works visited more than once during the year. — Workshops (including Men's)	6,467	9,373	‡
Works visited more than once during the year. — Docks, etc.	449	514	‡
Works visited more than once during the year. — Warehouses..	123	123	‡
Works visited more than once during the year. — Institution (under s. 5, 1907) .. Factories..	10	16	‡
Works visited more than once during the year. — Institution (under s. 5, 1907) .. Workshops	5	7	‡
Prosecutions (Cases)	2,119	1,456	1,127
Certifying Surgeons	1,752	1,774	2,342
Medical Examinations. — For employment of Young Persons (14–16)	344,336	363,142	344,940
Medical Examinations. — For employment at night: Boys over 16	883	1,155	‡
Medical Examinations. — Under Regulations, Special Rules, etc.§	297,711	284,267	233,216
Accidents reported — Fatal	982	956	1,385
Accidents reported — Non-fatal	160,287**	168,767**	40,056†† / 84,582‡‡
Dangerous Occurrences (s. 5, 1906)..	2,218	1,938	1,631
Poisoning reported by — Occupiers	460	544	225
Poisoning reported by — Certifying Surgeons ..	593	711	279
Poisoning reported by — Practitioners	313	330	140
Notices to District Councils. — Representations (ss. 5, 14[5] and 97 to 100) ..	5,810	7,600	11,277
Notices to District Councils. — Occupation of Workshops..	6,940	9,183	12,502
Contravention Notices (to occupiers)	210,338	213,970	134,422

* 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); 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.

‡ Figures not tabulated. ** On basis of three days of incapacitation.

†† On basis of one day of incapacitation. ‡‡ On basis of one week of incapacitation.

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