Health of the munition worker / handbook prepared by the Health of munition workers committee.

MINISTRY OF MUNITIONS

HEALTH OF MUNITION WORKERS COMMITTEE

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OF THE
MUNITION WORKER

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MINISTRY OF MUNITIONS

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HANDBOOK PREPARED BY THE

HEALTH OF MUNITION WORKERS COMMITTEE

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CONTENTS.

APPENDICES.

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INDEX.

HEALTH OF MUNITION WORKERS COMMITTEE.

Terms of Reference.

The Committee were appointed by the Minister of Munitions, with the concurrence of the Home Secretary, "to consider and advise on questions of industrial fatigue, hours of labour, and other matters affecting the personal health and physical efficiency of workers in munitions factories and workshops."

Members of the Committee.

Sir George Newman, M.D. (Chairman); Chief Medical Officer, Board of Education; Member of Central Control Board (Liquor Traffic) and Chairman of Canteen Committee; Emeritus Lecturer on Public Health, St. Bartholomew's Hospital.

Sir Thomas Barlow, Bart., K.C.V.O., M.D., F.R.S., Physician-Extraordinary to H.M. the King.

Gerald Bellhouse, H.M. Deputy Chief Inspector of Factories, Home Office.

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J. R. Clynes, M.P., Parliamentary Secretary to Ministry of Food.

E. L. Collis, M.B., H.M. Medical Inspector of Factories, Home Office; Chief Director of Health and Welfare, Ministry of Munitions.

W. M. Fletcher, M.D., F.R.S.; Secretary of Medical Research Committee; Fellow of Trinity College, Cambridge.

Leonard E. Hill, M.B., F.R.S., Director, Department of Applied Physiology and Hygiene, Medical Research Committee; Professor of Physiology, London Hospital Medical School.

SAMUEL OSBORN, J.P., Managing Director, Clyde Steel Works, Sheffield.

Miss R. E. SQUIRE, H.M. Deputy Principal Lady Inspector of Factories, Home Office.

Mrs. H. J. TENNANT, C.H., Chief Adviser (Women's Welfare) in Labour Regulation Department, Ministry of Munitions.

E. H. PELHAM (Secretary),
Assistant Secretary, Board of Education.

The following Memoranda have now been prepared by the Committee :—

No. 1.—Sunday Labour. (Cd. 8132.)

No. 2.—Welfare Supervision. (Cd. 8151.)

No. 3.—Industrial Canteens. (Cd. 8133.)

No. 4.—Employment of Women. (Cd. 8185.)

No. 5.—Hours of Work. (Cd. 8186.)

No. 6.—Canteen Construction and Equipment. (Appendix to No. 3.) (Cd. 8199.)

No. 7.—Industrial Fatigue and its Causes. (Cd. 8213.)

No. 8.—Special Industrial Diseases. (Cd. 8214.)

No. 9.—Ventilation and Lighting of Munition Factories and Workshops. (Cd. 8215.)

No. 10.—Sickness and Injury. (Cd. 8216.)

No. 11.—Investigation of Workers' Food and Suggestions as to Dietary. (Second Appendix to No. 3.) (Cd. 8370.)

No. 12.—Statistical Information concerning Output in relation to Hours of Work. (Cd. 8344.)

No. 13.—Juvenile Employment. (Cd. 8362.)

No. 14.—Washing Facilities and Baths. (Cd. 8387.)

No. 15.—The Effect of Industrial Conditions upon Eyesight. (Cd. 8409.)

No. 16.—Medical Certificates for Munition Workers. (Cd. 8522.)

No. 17.—Health and Welfare of Munition Workers outside the Factory.

No. 18.—Further Statistical Information concerning Output in relation to Hours of Work, with special reference to the Influence of Sunday Labour. (Cd. 8628.)

No. 19.—Investigation of Workers' Food and Suggestions as to Dietary. (Second Appendix to No. 3. Revised edition.) (Cd. 8798.)

No. 20.—Weekly Hours of Employment (Supplementary to Memorandum No. 5). (Cd. 8801.)

Interim Report.—Industrial Efficiency and Fatigue. (Cd. 8511.)

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MINISTRY OF MUNITIONS.

HEALTH OF MUNITION WORKERS COMMITTEE.

To the Right Hon. WINSTON S. CHURCHILL, M.P.,
Minister of Munitions.

Sir,

In accordance with your instructions the Health of Munition Workers Committee have prepared the following statement in the form of a Handbook for Directors, Managers, Foremen and others in authority in Munition Works of all kinds.

The Committee were appointed in September 1915 by Mr. Lloyd George, then Minister of Munitions, for the purpose of advising the Ministry on questions affecting the health and well-being of workers in munition factories. At an early stage of their inquiries the Committee decided to issue from time to time Memoranda dealing with the various problems which fell within their terms of reference. By this means they were enabled to deal promptly with particular questions as they arose instead of deferring any pronouncement until the whole of the field had been surveyed. This method of procedure had also the advantage of making the Committee's recommendations on any particular subject more readily and immediately accessible. Twenty Memoranda and an Interim Report have now been prepared by the Committee, dealing with the principal matters which need to be taken into account if the health and physical efficiency of the worker are to be maintained. They are concerned not only with the environment of the worker but with his personal health and betterment. The Memoranda have been widely circulated, and though primarily concerned with the health and welfare of workers in munition factories they cannot fail to contribute to the solution of similar problems in other industries.

The purpose of the present Handbook is to state in brief, categorical and somewhat dogmatic form the principal steps which must be taken to maintain the health and efficiency of the worker. It will be obvious that some of the suggestions contained in the following pages affect industrial conditions principally during the war emergency, and are of a temporary nature only. Any lengthy explanations or arguments have been avoided. For further information in regard to any particular point the reader may properly be referred to the Memoranda and Interim Report issued by the Committee, and to other literature to which reference is made in the Handbook.

I have the honour to be, Sir,

Your obedient Servant,

GEORGE NEWMAN, M.D.,
Chairman.

E. H. PELHAM,
Secretary.

London, October, 1917.

THE HEALTH OF THE MUNITION WORKER.

Chapter I.

INTRODUCTION.

General Principles.

The war, with all the novel and strange conditions which it has created, has served to give a new perspective to many Industrial problems and to none more than that of improving and maintaining the Health of the Worker.

Without health there is no energy, without energy there is no output. More important than output is the vigour, strength, and vitality of the nation. Man is greater than the machine he works. Nor is health only a physical condition. It is also mental and moral. Discontent, apathy, monotony, boredom, and lack of interest in life may be just as detrimental as physical ailment and may equally involve irreparable loss in individual fitness, well-being, and efficiency.

In this matter the interests of the Employer and the Workman are identical. Without health the worker cannot earn a decent livelihood for himself and his family or produce output for the employer and the nation.

The **Conditions of Health** are two :

(*a*) **Favourable conditions for the body itself.**—Food, air, exercise, cleanliness, warmth, and an appropriate alternation between rest and work.

(*b*) **A satisfactory environment.**—A sanitary factory, suitable hours of labour, good housing accommodation, avoidance of injury or poisoning from industrial processes.

The responsibility of the Employer is, therefore, concerned partly with the workman himself and partly with the conditions and circumstances under which he works. For example, **the factory must be clean and wholesome.** It must be properly heated and ventilated. There must be suitable and sufficient sanitary accommodation. Dangerous machinery must be safeguarded and injurious processes specially provided against. Circumstances also necessitate in many factories the establishment of a canteen, the provision of seats, suitable clothing, lavatories, rest-rooms and first-aid appliances. Owing to the factory employment of many workers for the first time and of increased numbers of women, often at a distance from home, arrangements must be made for individual supervision and the maintenance of their health. Boys also call for special vigilance and attention.

Over and above all this it is now recognised that the wise employer considers the personal well-being of his workpeople. He can no longer look upon his employees as merely "hands," merely instruments to yield him produce, whom he can afford to ignore or neglect. **Neglect spells disaster.** Nor, on the other hand, is the matter fully met by various forms of "scientific management." What is required is a sound, humane and sympathetic understanding of the application of the physiological laws which universally govern the health and physical efficiency of the human individual. For instance, the feeding of the industrial worker and the necessity of sufficient rest were in former times largely ignored. The employer assumed that such matters lay outside his purview, forgetting that the underfed or unrested workman is a wasteful worker, unable when at work to yield his value in wages, and too often on the sick list. **The necessary dietary for a worker** must contain a sufficient proportion and quantity of nutritive food, suitably mixed, properly cooked, easily digestible, appetising and obtainable at a reasonable cost. It is of the first importance to the employer, as well as to the employee, that the worker should get such a dietary. The same applies to rest. The human body can only work if **rest** is

alternated with work. There is a natural rhythm between activity and rest, and if this principle be ignored, and work continue for too long hours or with insufficient rest pauses, **output declines, and the worker degenerates.** There is wide adaptability of the animal mechanism in response to training, custom, or use, but the fundamental principle remains. Maximum output is not obtainable without proper and sufficient periods of rest.

The **essential personal conditions of health** may be summarised thus :—

(*a*) **Food**—sufficient in quantity, suitable in character ; appropriate times of consumption.

(*b*) **Fresh, cool, clean and moving air**—in bedroom, living-room, and workrooms.

(*c*) **Exercise.**—Routine work may exercise and indeed exhaust portions of the body, but vigorous general exercise is necessary to counteract cramped positions and to stimulate the circulation, respiration and physiological functions of the body. Field sports, dancing, swimming and gymnastics are all desirable.

(*d*) **Cleanliness** prevents many minor diseases, ailments and infections.

(*e*) **Warmth of the body** is also essential to health. In addition to warm clothing, strong, weather-proof, low-heeled boots are desirable to prevent chill and flat foot.

(*f*) **Rest** and work must alternate.

(*g*) Lastly, there are **regular habits of body.** The undue retention of waste undigested products in the alimentary canal leads to absorption of poisons which tend to cause general ill-health, anæmia, indigestion and debility. Such conditions may readily lead to fatigue and to incapacity for work. All persons should therefore acquire a regular daily habit in this matter, and sanitary accommodation should be such in every factory as to facilitate such a habit.

Chapter II.

RELATION OF FATIGUE TO INDUSTRY.*

Definition and Causation of Fatigue.

Fatigue is the sum of the results of activity which show themselves in a diminished capacity for doing work.

In ordinary language fatigue is generally associated with familiar bodily sensations, and these sensations are often taken to be its measure. It is of vital importance for the proper study of industrial fatigue, however, to recognise not only that bodily sensations are a fallacious guide to the true state of fatigue which may be present, and a wholly inadequate measure of it, but also that **fatigue in its true meaning advances progressively,** and is measurable at any stage by a diminished capacity for work, before its signs appear plainly, or at all, in sensation.

In the animal body the performance of work depends on the activities of parts which are best considered under three groups—

First, the complex nervous mechanisms of the **brain and spinal cord,** which are concerned in the initiation and distribution of impulses to action ;

Second, the **nerves,** which conduct the impulses to muscles ; and

Third, the **muscles** themselves, which by contracting finally perform external work.

Fatigue has been separately studied in all these parts. In its essential features the fatigue of all alike has been found, when it occurs, to depend not upon the simple using up—" exhaustion "—of the substances supplying

* See also the Committee's Interim Report on " Industrial Efficiency and Fatigue " ; " The Principles of Scientific Management," by Frederick W. Taylor ; " Fatigue and Efficiency," by Josephine Goldmark.

the chemical energy which is liberated during work, but upon the accumulation within the living elements of the products of the chemical changes involved. Fatigue of the animal machine, that is to say, is not to be compared with the failure of fuel as in a steam-engine, or with the running-down of a clock-weight, but rather with the **clogging of the wheels** in the human mechanism by dirt.

In the tired man the symptoms of fatigue are referred to the muscles ; they ache, or they may appear to " give way under him," but in reality the most severe bodily activity fails to produce any close approach to complete fatigue of the muscles. The fatigue is **fatigue of the nervous system,** though in sensation its effects may be referred to the muscles themselves. A hunted animal may be driven to intense muscular fatigue, but in this extreme case the blood becomes charged with chemical products of activity, for the elimination of which no opportunity is given, and the muscles, with every other organ of the body, become poisoned. Even in laborious work it is doubtful whether a man by voluntary effort can cause his muscles to approach advanced fatigue. It is well known that a man apparently " run to a standstill " in a race may upon some new excitement run freshly again, under augmented stimulus from the nervous system.

Note.—A. The problem of scientific industrial management, dealing as it must with the human machine, is fundamentally a problem in industrial fatigue.

B. The problem of industrial fatigue is primarily and almost wholly a problem of fatigue in the nervous system and of its direct and indirect effects.

C. The subjective sensations of fatigue are not a measure, or even an early sign, of it. Real or objective fatigue is shown, and is measurable, by the diminished capacity for performing the act that caused it.

Signs and Symptoms of Fatigue.

The signs and symptoms of fatigue will depend upon the nature of the particular work done, whether it be

general bodily work of this or that kind, carried out in fixed routine, or whether it involve mental activity of a simple or of a more complicated kind. The fatigue may spring from

(i) The **maintained use of intelligence** and observation with varying degrees of the muscular effort necessary in every kind of work.

(ii) The **maintenance of steady attention** upon one skilled task, or of distributed attention as when several machines are to be tended or other manipulations performed.

(iii) The **continued use of special senses** and sense-organs, whether by touch or sight. It will be affected greatly according to whether the worker has opportunity for obeying his "natural rhythms," or whether unnatural rhythm is imposed upon him by the pace of the machine with which he works or by that of his fellow-workmen.

Monotonous work—and much industrial work is monotonous—offers some special problems. Uniformly repeated acts tend to become in a sense "automatic," and the nerve centres concerned become less liable to fatigue—the time ratio of necessary rest to action is diminished. But when monotonous series are repeated fatigue may appear in what may be called the psychical field, and a sense of "monotony" may diminish the capacity for work. Conversely, "interest" may improve the working capacity even for a uniform monotonous activity, and the interest may spring from emotional states, or, as some think, from states of anticipatory pleasure before meal-time and rest ("end-spurt"), or, again, from a sense of patriotism eager to forward the munitions output.

For practical purposes in industrial management **two chief characters of nervous fatigue** may be observed.

First, during the continued performance of work the objective results of nervous fatigue precede in their onset the subjective symptoms

of fatigue. Without obvious sign and without his knowing it himself, a man's capacity for work may diminish owing to his unrecognised fatigue. His time beyond a certain point then begins to be uneconomically spent, and **it is for scientific management to determine this point,** and to determine further the arrangement of periods of rest in relation to spells of work that will give the best development over the day and the year of the worker's capacity.

Second, the results of fatigue which advances beyond physiological limits ("over-strain") not only reduce capacity at the moment, but do damage of a more permanent kind which will affect capacity for periods far beyond the next normal period of rest. It will plainly be uneconomical to allow this damage to be done.

For these reasons, chief among others, it is important to detect **latent fatigue,** and since sensations of fatigue are unpunctual and untrustworthy, means must be sought of observing the onset of fatigue objectively.

What are the Tests of Industrial Fatigue?

Diminished Output.

The true sign of fatigue is diminished capacity, and it follows from what has been said that measurement of output in work will give the most direct test of fatigue.

The output must be measured under the ordinary conditions of the work, and, in cases where from the nature of the work the output is not automatically measured, it must be tested by methods which do not allow the workers to be conscious at particular times of the test being made. In this way the errors due to special effort from interest or emulation will be eliminated. The results of work expressed in output must be corrected by allowance for all variable factors save that of the workers' changing capacity; changes in supply of steam or electric power and of raw material, for instance, must be determined for the correction and interpretation of the actual output returns. The output must be estimated for successive short periods (*e.g.*, each hour) of the day's work, so that the phenomena of "beginning-spurt" and "end-spurt," and other variations complicating the

course of fatigue as such, may be traced and taken into account. Isolated tests of output taken sporadically will be meaningless. The records must also extend over longer periods to show the onset of fatigue over the whole day and over the whole week, and under particular seasonal or other conditions, in order to detect and measure the results of accumulating fatigue.

Measurements of output must obviously be recorded at so much for each individual or for each unit group. The size of total output will be meaningless of course without reference to the numbers engaged. But it will also be important for proper management to take account of the output of particular individuals. This in many factory processes is easily possible, and when it has been done the results have shown surprising variations of individual output which are independent of personal willingness and industry, and have generally been quite unsuspected by the workers and their supervisors before the test was made. Information so gained is valuable in two respects. Good individual output is often the result of escape from fatigue by conscious or unconscious adoption of particular habits of manipulation or of rhythm. Its discovery allows the propagation of good method among the other workers. In the second place, these tests of individual capacity (or its loss by fatigue) give an opportunity for a rearrangement of workers and their assignment to particular processes of work. Astonishing results, bringing advantage both to employers and employed, have been gained in other countries by the careful selection of individuals for particular tasks, based not upon the impressions of foremen but upon the results of experiment.

In the present time of crisis **patriotic incentive** has done much to abolish customary reduction of effort among munition workers, but it is of great importance to note that a special and strenuous voluntary effort in labour, if it be maintained under a badly arranged time-table of work and rest, does not necessarily bring increased output over a long period, however praiseworthy the intention of effort may be.

Accidents and Spoiled Work.

An important and early sign of fatigue in the nervous centres is a want of co-ordination and **failure in the power of concentration.** This may not be subjectively realised, but may be shown objectively in an increased frequency of trifling accidents. The accidents are due to momentary loss of attention, and may result in personal damage to the worker, trifling or serious, breakages of tools or

materials, or the spoiling of work. In well-managed factories the incidence of accidents of this kind is recorded for unit periods throughout the day, and these records may provide a good secondary index to fatigue, but only in so far as they are corrected by reference to the rate of work being done and other variables.

Associated Fatigue and Laboratory Tests.

The primary sign of fatigue in a given function is diminished capacity. The man is listless, fagged or even exhausted on his particular job. But there is evidence to show that accumulated fatigue in connection with a given act may affect adversely the condition of other parts of the nervous system not immediately employed, and thus may occur forms of associated fatigue, *e.g.*, diminishing quickness of response, blunting of the senses of hearing or sight, lowering of other nervous functions. The appearance of associated fatigue will need for its detection and study the application of special tests.

Sickness, Lost Time, and "Staleness."

Lastly, the accumulated results of fatigue are damaging to general health, and they will be reflected in the sickness returns and in the returns of lost time.

At the present time in very many munition factories the complaint is made by workers, and not least by the most intelligent and willing of them, that they are feeling "**fed up**," or "fair whacked," to use local phrases, and the evidence shows that this state of "staleness" is becoming increasingly common and obvious. By experienced managers and medical officers this condition of staleness is attributed almost wholly to persistent **long hours or the deprivation of weekly rest.** It has grave accompaniments, which paradoxically appear not only in a state of lethargy and indifference, but also in a craving for change and excitement. No doubt the restlessness of the condition must often predispose also to indulgence in the alleviations given by alcohol. At all points the state is apt to set up a vicious circle in which the very need for change and rest prevents the proper use of such chances of rest as are given.

Proper attention earlier in the war to the need for weekly rest would have prevented a large part of the diminished capacity of this kind that has been allowed to appear, and would have averted much costly and wasteful expenditure upon imperfect work. But stress must be laid here on a further point. For the avoidance of staleness in conditions of strenuous labour it is not enough to treat workmen in the bulk and to regulate daily and weekly rests upon a physiological basis devised for the average. If that be done, widespread evils like those too commonly present now may be avoided, but good management will **consider always the individual workman** as well. In very many cases, perhaps in almost all, in which staleness is well marked or has even advanced to definite sickness, a single "day off," given occasionally at the right time, would have avoided much wasteful reduction of capacity and in the worst cases the total loss of many days of work.

The Study of Industrial Fatigue.

In the rapid enlargement and organisation of munition factories in this country there has been, and is, the most urgent need for the application of the results of experience scientifically acquired. Upon a sudden national emergency the accumulation of fatigue and its results in workers might well be temporarily disregarded, but now, though the special need persists, **the race is a long one,** and a failure to conserve the maximum efficiency of the workers must be disadvantageous. Misguided efforts to stimulate workers to feverish activity in the supposed interests of the country are likely to be as damaging to the desired result as the cheers of partisans would be if they encouraged a long-distance runner to a futile sprint early in his race.

Even during the urgent claims of a war the problem must always be to obtain the maximum output from the individual worker which is compatible with the maintenance of his health. In war time the workmen will be willing, as they are showing in many directions, to forego comfort and to work nearer the margin of accumulating fatigue than in time of peace, but the country cannot

afford the extravagance of paying for work done during incapacity from fatigue just because so many hours are spent upon it, or the further extravagance of urging armies of workmen towards relative incapacity by neglect of physiological law.

There are many isolated instances in which the onset of industrial fatigue has been avoided by intelligent observation of the output and of the returns of sickness and of lost time, and by prompt initiative in **adapting the hours of work to physiological need ;** but these instances are exceptional. Taking the country as a whole, it would seem that the munition workers in general have been allowed to reach a state of reduced efficiency and lowered health which might have been avoided without reduction of output by attention to the details of daily and weekly rests. The signs of fatigue are even more noticeable in the case of the managers and foremen, and their practical results are probably more serious than in the case of the workmen.

The national experience in modern industry is longer than that of any other people. It has shown clearly enough that false ideas of economic gain, blind to physiological law, must lead, as they led through the 19th century, to vast national loss and suffering. It is certain that unless industrial life is to be guided in the future by the application of physiological science to the details of its management, it cannot hope to maintain its position hereafter among some of its foreign rivals, who already in that respect have gained a present advantage.

Chapter III.

HOURS OF LABOUR.*

Legal Restrictions on Hours of Labour.

The Factory and Workshop Act, 1901, imposes certain restrictions on the hours of employment of protected persons, that is of women and young persons (*i.e.* boys and girls between 13 and 18 years of age who are legally exempt from attendance at school). The following are the principal provisions bearing on employment in non-textile factories :—

(*a*) The hours of employment of protected persons on the first five days of the week are not to exceed a fixed daily period of 12 (including 1½ hours for meals), and on Saturday 8 hours (including ½ hour for meals). The period of work may commence at 6 a.m., 7 a.m. or 8 a.m. That is to say, **the maximum weekly hours of employment, exclusive of meal times, are 60.** (Section 26 (i), (ii), (iii).)

(*b*) **Sunday labour is forbidden.** (Section 34.)

(*c*) Protected persons may not be employed continuously for more than 5 hours without an interval of at least ½ hour for a meal. (Section 26 (iv).)

(*d*) Women may be employed in certain industries for two hours overtime in addition to the ordinary hours on any day except Saturday, provided that an additional ½ hour is allowed for meals after 5 p.m. ; that no woman is so

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* See Committee's Memoranda No. 1 (Sunday Labour), No. 4 (Employment of Women), No. 5 (Hours of Work), No. 13 (Juvenile Employment), No. 20 (Weekly Hours of Employment).

employed for more than three days in any one week, and that the number of days in the year on which any woman is employed on overtime shall not exceed thirty. (Section 49.) No similar exception is allowed for young persons.

(*e*) **Night work is not allowed for women and girls, but is allowed for boys over 14 if employed in blast furnaces and iron mills.** (Section 54.)

No restrictions are placed upon the hours of employment of men.

Section 150 of the Act provides that :—

"In cases of any public emergency the Secretary of State may, by Order to the extent and during the period named by him, exempt from this Act any factory or workshop belonging to the Crown, or any factory or workshop in respect of work which is being done on behalf of the Crown under a contract specified in the Order."*

Under this provision Orders have been made by the Home Office allowing relaxations of the limitations set out above. These Orders are of two kinds—(*a*) **General Orders** setting out the conditions under which women and young persons may ordinarily be employed in munition works (the last General Order was issued in September 1916) ; (*b*) **Special Orders** authorising variations of the General Order in particular cases.

Under Section 6 (i) of the Munitions of War (Amendment) Act, 1916 :—

"The Minister of Munitions shall have power by Order to give directions . . . (subject, so far

* By Regulations made under the Defence of the Realm Act, and dated June 10th, 1915, and October 3rd, 1916, the power of the Secretary of State is extended to any factory or workshop in which he is satisfied that by reason of the loss of men through enlistment or transference to Government Service, or of any other circumstances arising out of the present war, exemption is necessary to secure the carrying on of work and that it can be granted without detriment to the national interests.

as the matter is one which is dealt with by the Factory and Workshops Acts 1901 to 1911, to the concurrence of the Secretary of State) as to hours of labour or conditions of employment of the female workers so employed."

No Order has as yet been issued under this section, hours of employment continuing to be dealt with under the Factory Acts. A committee, including representatives of the Ministry of Munitions, of the Home Office, and of other Departments concerned, has been established at the Ministry to consider special applications for permission to work on Sundays or for exceptional hours.

Weekly Hours of Employment.

Two years ago an attempt to restrict hours of employment on munitions of war was difficult because, firstly, there was an almost complete absence of any scientific data as to the relation of hours of employment to output; secondly, while the hours worked were frequently agreed to be excessive, opinion differed widely as to the limits which should be imposed; thirdly, any proposal which was likely to involve even a temporary loss of output would have been doomed to failure. It was evident in fact that any reduction of hours then proposed had to be gradual. Under these circumstances the recommendations put forward by the Committee in their Memorandum No. 5 were provisional, and were based upon what appeared immediately practicable rather than upon what was ultimately desirable or might be defensible upon a physiological basis. Further, they confined themselves to suggesting maximum limits, and did not endeavour to suggest the modifications necessary to meet varying industrial conditions.

The limits of the weekly hours of employment then provisionally suggested were :—

(*a*) For men, that the average weekly hours of employment should not exceed 65–67 (exclusive of meal times), *i.e.* a 13–14 hours working day.

(*b*) That boys under 18 should be allowed to work the same hours as men, provided that :—

(i) The hours of boys under 16 should be limited to 60 so far as possible ;

(ii) Substantial relief at the week ends should be insisted on ;

(iii) Night work should be limited as far as possible to boys over 16.

(*c*) That for women and girls employment should be restricted within the normal legal limit of 60, *i.e.* a 12-hour working day, though within these limits moderate daily overtime might be allowed, and that the employment of girls under 18 at night should be limited as far as possible.

These recommendations were received with sympathy by employers and employed alike, and active and continuous efforts have been made by the Departments concerned to secure their general adoption. The time, however, has now come when these suggested limits should be reviewed in the light of, firstly, the **experience gained** and the evidence collected during the past two years ; secondly, the **strain involved** by three years of war conditions, a strain which is likely still to continue for a considerable period ; and, thirdly, the **rapid increase in the number of women workers** and in the variety of processes on which they are employed.

The results of the investigations set out below are important, because the selection of factories for investigation has been based solely on the likelihood of reliable data being forthcoming. In none of the operations studied was there any change in the nature of the operation or the type of machinery during the period under review. The data also was chosen so as to eliminate any possible disturbance due to increasing skill. There is no reason to suppose that the data are vitiated by any artificial restriction of output.

As a result of investigations, covering a period of over a year, the following four sets of data have been collected by Dr. Vernon* :—

(*a*) *Women turning aluminium fuse bodies.*

	Average weekly hours.		Relative hourly output.	Relative total output.
	Nominal.	Actual.		
First period –	74·8	66·2	100	100
Second period	61·5	54·8	134	111
Third period–	54·8	45·6	158	109

During the first period there was Sunday labour (eight hours) on five Sundays out of six ; during the second period on three out of eight, the nominal hours in these three weeks being 66·5 instead of 58·5. During the third period the time-keeping was bad ; with good time-keeping a nominal 50-hour week ought to yield the same actual hours of work (namely 45·6), in other words, for women engaged in moderately heavy lathe work a 50-hour week yields as good an output as a 66-hour week, and a considerably better one than a 75-hour week.

(*b*) *Women milling a screw thread.*

	Average weekly hours.		Relative hourly output.	Relative total output.
	Nominal.	Actual.		
First period –	71·8	64·9	100	100
Second period	64·6	54·8	121	102
Third period–	57·3	48·1	133	99

A reduction of hours did not lead to an improvement of total output, similar to that in the fuse body turning

* See Memoranda 12 and 18, which contain reports by Dr. Vernon on "Output in relation to Hours of Work."

operation, because for four-fifths of the total time required to mill the screw thread on the fuse body the operative had no opportunity of quickening her working speed since she had merely to stand idly watching her machine, whereas the lathe worker had to apply seven different cutting and boring tools in succession to each fuse body and could quicken up her speed of work at almost every stage.

(*c*) *Men engaged in heavy work.*

	Average weekly hours.		Relative hourly output.	Relative total output.
	Nominal.	Actual.		
First period –	66·7	58·2	100	100
Second period	62·8	50·5	122	106
Third period–	56·5	51·2	139	122

During the third period the nominal weekly hours were substantially less than during the second period, but owing to the cessation of Sunday labour the time-keeping was so much improved that the actual hours of work were greater than during the previous period.

(*d*) *Boys boring top caps.*

	Average weekly hours.		Relative hourly output.	Relative total output.
	Nominal.	Actual.		
First period –	78·5	72·5	100	100
Second period	61·5	54·7	117	88
Third period–	60·5	54·5	129	97

Increase of output in this process, which is largely automatic, could only be attained by a more continuous feeding of the machines throughout working hours.

The above data show that **a reduction in the weekly hours of actual work, varying from 7 to 20, in no case**

resulted in more than an insignificant diminution of total output, while on the average it produced a distinct increase. The classification of the operations according to the possibility they offer for the speeding up of production demonstrates anew that the alterations of hours may have very different effects in different operations. The exact measure of such alterations cannot be predicted ; it can only be ascertained by observation and experiment. It appears, however, that **for processes similar to those examined the weekly hours can advantageously be reduced to a total of from 50 to 55 hours, and even lower limits might give an equally good output.**

Two further points of importance emerge from consideration of these data. First, the **rate of production changed gradually** and frequently did not reach an equilibrium value for four months. This gradual change negatives the view that the effect upon output of the change of hours was a mere consequence of the desire to earn the same weekly wages as before the hours were shortened. The explanation lies rather in the worker finding unconsciously and gradually, by experience, that he can work more strenuously and quickly for a short hour week than for a long hour week. Secondly, **by economising time a considerable increase in the average hourly output is possible, quite apart from any increased rapidity of working.**

The broad fact emerges that **substantial reductions of hours can be effected without any reduction of output.** Whereas at the beginning of the war there was a general belief that longer hours produced larger output, it is now widely recognised that **a 13 or 14 hours' day for men and a 12 hours' day for women, excepting for quite brief periods, are not profitable from any point of view.** Few, probably, would now be disposed to dispute the statement made by the Rt. Hon. George Barnes, M.P., in his summary of the recent reports of the Commissions on Industrial Unrest,* that :—

* These reports (eight in number) have been published and can be purchased through the usual channels.

> "There is a general consensus of opinion that Sunday and overtime labour should be reduced to a minimum, that holidays should not be curtailed, and that hours of work should not be such as to exclude opportunities for recreation and amusement."

It must be obvious that any reduction of hours which can be accomplished without loss of output is profitable not only to the employer, in that it reduces running expenses, but to the worker, since even if his or her daily measure of work involves the same amount of fatigue a longer period is left for recovery and for the enjoyment of adequate sleep and recreation.

It must be recognised that the conditions are not the same now as they were in the early days of the war; not only have large numbers of the youngest and strongest workers been withdrawn for military service, but those who remain are suffering from the strain inseparable from a continuous period of long hours of employment. To this must be added the strain caused by family and other anxieties arising out of the war. While much has been done to improve conditions of employment they are still in many cases far from ideal, notably as regards housing and transit. Further, large numbers of women are now employed on heavy work and on skilled operations involving constant thought and attention, which were considered two years ago to be quite beyond their capacity. It may be true that no serious breakdown of health has as yet been observed, but it cannot be assumed that this condition will continue indefinitely. The effects of the strain may even now be more serious than appears on the surface, for, while it is possible to judge roughly the general condition of those at work, little information is available concerning the large number of workers who are continually giving up their job, often because it is too arduous. This is an important point which is liable to be overlooked, because the supply of labour has hitherto been adequate to meet the loss. The conditions of irritability and nervous exhaustion, mentioned in the reports of the Commissions on Industrial Unrest, represent well-known symptoms of fatigue. It must be remembered that the effects of fatigue are accumulative.

To sum up ; the maximum limits of weekly employment provisionally suggested are now too high except for quite short periods, or perhaps in cases where the work is light and the conditions of employment exceptionally good. In the great majority of cases the hours of work should be restricted within lower limits than those provisionally suggested in Memorandum No. 5, and **the time is ripe for a further substantial reduction in the hours of work.** It is impossible to lay down a single rule as to the best hours for all cases ; the best scheme can only be determined after a careful consideration of a number of different factors, *e.g.* :—

(*a*) The strain involved in the work ; its character and mental strain.

(*b*) The extent to which the pace of the work is governed by the machine.

(*c*) The factory environment, temperature, ventilation, etc.

(*d*) The individual physical capacity of the workers, age, sex, and experience.

(*e*) The organisation of the factory (including welfare supervision).

(*f*) The sufficiency and suitability of the workers' food, canteen accommodation, etc.

(*g*) The arrangement of the hours of work (spells, breaks and pauses).

(*h*) Conditions outside the factory, *e.g.*, housing and transit.

In arranging the hours of work for a factory, allowance should be made so far as discipline and organisation permit for the fact that the best hours of employment will not be the same for all processes, even in the same factory. If due regard is had to the factors just named reductions can be made, with benefit to health and without injury to output.

Shifts and Daily Hours of Employment.

If weekly hours of employment are limited, as suggested in the last section, it necessarily follows that average

daily hours of employment will also be confined within moderate limits. The special questions which arise in regard to them can therefore be dealt with briefly.

The daily employment of workers is organised either in single shifts or in double shifts, or in three shifts.

From the point of view of output single shifts are open to objection owing to the large number of hours out of the 24 during which the machinery lies idle. In the earliest stages of the War, when it was frequently found impossible to organise a second shift owing to the dearth of workers, and especially of skilled operatives, an endeavour was made to secure larger output by prolonging the hours of employment, men, and even women, being employed over long periods for 14 or even 15 hours a day. For reasons already explained it is now generally recognised that these long hours are unprofitable, and that much shorter hours can be worked without any loss of output.

Many munition employers, as a result of recent experience, now take the view that for women and young persons a 12-hour day is too long, and hours are now frequently limited to a 10-hour or even a shorter day, longer hours being only worked occasionally to meet special emergencies.

Double shifts are the form of employment now most commonly adopted. Though for reasons to be stated in a later section, night work is in itself open to serious objections as a permanent part of the industrial organisation of the country—at any rate, so far as women are concerned—it must for the present be regarded as inevitable, at any rate, for adult workers, since it enables the machinery to be employed for the greater part of the 24 hours; and so long as the hours of work are not unduly long, and due attention is paid to the environment of the worker, it is undoubtedly productive of increased output.

For men the two shifts are most commonly each of 12 hours' duration, though occasionally to meet local conditions the night shift is of 13 hours, as compared to

11 hours of the day shift. Such an arrangement can hardly be economical, in view of the greater strain involved by night work, and the arrangement should certainly be avoided wherever possible. Where the nature of the work does not render it essential that the end of one shift should coincide with the commencement of the next, **it is unquestionably found advantageous to leave an interval between the two shifts.** The shorter hours thus rendered possible are advantageous from the point of view of both the health of the workers and of output. Apart from this, opportunity is afforded for cleaning and ventilating the shops—a matter of much importance.

The three-shift system, especially for women, has much to commend it where it can be organised. It imposes little or no strain upon the workers, while the periods for which the machinery stands idle are much reduced. For men the adoption of the system is generally impracticable, owing to the dearth of an adequate supply of labour. These difficulties do not arise to the same extent in the case of women, and there is no doubt that the three-shift system for women yields the best results where it can be arranged for. The strain of night work, indeed, the strain of work generally, is sensibly diminished. Greater vigour of work is maintained throughout the shift; less time is lost by unpunctuality or illness. In the 8-hour shift each hour has a sustained value in contrast to the diminishing value of the later hours in a longer shift. The night shift, which is the most trying, recurs every third, instead of every other, week.

On the other hand there are **certain difficulties of organisation** which have to be surmounted. Thus

(*a*) Male tool-setters have ordinarily to be employed on two 12-hour shifts. Difficulties consequently arise in combining the hours of men and women workers, notably as regards meal hours.

(*b*) The break for meals being limited to half an hour may afford an inadequate time for refreshment, especially at night.

(*c*) Time may be lost at the change of shifts.

(*d*) Workers may object through fear that shorter hours will mean smaller wages.

(*e*) The benefit of shorter hours of employment in the factory may be lost through misuse of leisure time, or by its devotion to household duties. Difficulties are also sometimes experienced in the home and in lodgings through meals being required at times inconvenient for other workers.

Experience shows that these difficulties, though substantial in particular cases, are seldom insurmountable; and there are numerous instances throughout the country where the three-shift system has been successfully organised.

Breaks, Spells and Pauses.

Breaks.—The ordinary daily hours of work are organised under the "two-break" system or the "one-break" system. Under the former work normally commences at 6 a.m., and the ordinary breaks are half-an-hour for breakfast and one hour for dinner. Under the "one-break" system work commences after breakfast, at 7 or 8 a.m., and there is only a single break of one hour for dinner. A break for tea is, however, sometimes provided where it is necessitated by the hours of working. This break is generally of half-an-hour's duration, but is sometimes reduced to 15 or 20 minutes in order to permit the workers to return home earlier. In the case of women and young persons this limitation of the interval for tea is only allowed by special war emergency Order of the Home Office, and where adequate provision is made for the workers to obtain tea in the works and for tea to be actually ready for them as soon as they stop work.

Enquiry suggests that work before breakfast is a mistake* :—

(*a*) A large number of "quarters" are lost before breakfast. To some extent this loss is unavoidable and due to the workers being fagged,

* See the Committee's Interim Report on "Efficiency and Fatigue," pages 56–67.

to minor ailments (colds and rheumatism), or to transit difficulties ; but much of the loss is avoidable—the shortness of the spell before breakfast increases the temptation to miss it.

(*b*) The amount of time lost before breakfast often causes serious disorganisation.

(*c*) Only a minority of workers can put in their best work before having a proper meal in the morning.

(*d*) There is the breakfast interruption of work.

Even where the discontinuance of work before breakfast involves a small reduction in the number of weekly hours the loss has generally been more than compensated for by the reduction in the amount of time lost.

Apart from a conservative feeling against any change, objection has been made to the adoption of the " one-break " system on the ground that :—

(*a*) Where a reduction of hours is involved a loss of wages is feared.

(*b*) Domestic inconvenience may be caused through the worker requiring his breakfast before he leaves home.

(*c*) A later start may involve a later hour of finishing work.

(*d*) The workers do not in fact always get a good breakfast before they start.

These objections, however, are surmountable. Where work commences before 8 a.m. it is generally desirable that a short break for refreshment should be provided in the middle of the morning, and the Home Office General Order of September 1916 requires, in the case of women and young persons, that : " When work commences before 8 a.m., and no interval is allowed for breakfast, an opportunity shall be given to the workers to take refreshment during the morning."

Spells and Pauses.—Under present circumstances many women and young persons cannot profitably be employed for the full spell of five hours on continuous work allowed by the Factory Act, and even where the spell is somewhat

less than five hours employers frequently allow short intervals for refreshment in the afternoon, and frequently in the morning also. These pauses not only provide an opportunity for refreshment, but a period of rest and recovery from fatigue and a break in the monotony of the work.

Holidays.

The long continuance of the War has made it more than ever important that periodic holidays, preferably of several days' duration, should be provided, and more than one of the recent Commissions on Industrial Unrest emphasised the point. As a trades-unionist puts it :—

> "If once in every two or three months a man could have two or three days off it would prove the finest medicine, much better than a bonus as extra pay."

Holidays are at least equally important for the management and foremen, who cannot take odd days off like the ordinary worker. They also afford a much needed opportunity for carrying out repairs to plant and machinery.

Chapter IV.

SUNDAY LABOUR AND NIGHT WORK.

Sunday Labour.

In the earlier stages of the War men were widely employed on Sunday in the hope of thereby increasing output. Sunday labour was also sanctioned by the Home Office for women and young persons in a certain number of cases, generally subject to specified restrictions (*e.g.*, employment not to be on consecutive Sundays, or only to be in cases of emergency). Though Sunday labour for men is now greatly restricted in amount and has been practically abolished for women and young persons, it is desirable shortly to set out the causes which have led to its discontinuance.

Sunday labour is unpopular. The seventh day as a period of rest is good for body and mind. Employers dislike Sunday labour because supervision is difficult, and because it imposes a severe strain on foremen. It is expensive because of the higher rates of pay necessary. These rates of pay at first made Sunday labour attractive to many workers, but its popularity has now largely disappeared. Several of the recent Commissions on Industrial Unrest recommended the stoppage of such Sunday work as still continues. Sunday labour in fact is only defensible if it can be shown to be productive of greater output over a longer or shorter period.

But **Sunday labour is uneconomical.** The evidence is conclusive that by depriving the worker of his weekly rest he is afforded no sufficient opportunity for recovering from fatigue. Relief is required from monotony of work as well as from physical strain. Though attendance on Sunday is generally good, it is not always accompanied by satisfactory individual output. Time gained on Sunday is largely lost by bad time-keeping on other days of the week. It is almost a common-place that seven days' labour only produces six days' output.

> On the question of Sunday work by exhausted men, one foreman said he did not believe in "a holiday on double pay." Another remarked that Sunday work gave "six days' output for seven days' work on eight days' pay."

Scientific investigations confirm general opinion. One example will suffice :—

> The hours of a body of 56 men sizing fuse bodies were reduced by between 5 and 6 hours, owing to stoppage of Sunday labour. The time-keeping, however, was so much improved that the actual number of hours worked were practically the same as before. The withdrawal of Sunday labour thus caused the men to work more regular hours ; moreover, during those hours they increased their ordinary output some 16 per cent. above its previous level.

Even two years ago, when opinion on most problems about hours of labour varied widely, there was practical unanimity that if maximum output was to be secured and maintained for any length of time a weekly period of rest must be allowed. On economical and social grounds alike this weekly period of rest is best provided on Sunday ; and **Sunday labour should be confined to :—**

(a) **Sudden emergencies, including the occasional making up of arrears in particular sections ;**

(b) **repairs, tending furnaces, certain continuous processes, &c. (the men so employed being given a corresponding period of rest during another part of the week).**

The Minister, in December, 1915, issued a Circular in which the following opinions were expressed :—

> "The Minister is of opinion that it is necessary in the interests both of the workers and of production that a weekly rest period—preferably Sunday—should be secured to all workers.
>
> "This recommendation applies equally to all classes of labour, male and female, adult and juvenile, though there must be certain necessary exceptions in the case of labour such as that employed upon furnaces which could not be discontinued without grave dislocation. Even in these cases, though it may not be possible to arrange for a general rest on any particular day in the week, it would still be desirable so to arrange the work that all persons engaged upon the work had, if on different days, a regular period of rest."

In April, 1917, a further Circular was issued, in which it was stated that

> "The Minister, after further consultation with the various Departments concerned, is of opinion that it is advisable that Sunday labour, with the exception of shifts beginning on Sunday night or ending on Sunday morning, or of work in connection with the necessary repair of plant machinery, should be discontinued as far as possible from the beginning of May, and would be glad if you would make arrangements in your establishment to that end."

Night Work.*

There is no legal restriction upon night work for men. It is only legal for boys under 18 in certain specified continuous processes. The employment of women at night has been illegal in this country for more than 50 years, and its abolition was agreed to by 12 European countries at the International Conference held at Berne in 1906.

The **objections to night work** can be shortly summarised as follows :—

(*a*) It is uneconomical owing to the higher cost of wages, lighting and heating.

(*b*) Supervision at night is not always so good as by day.

(*c*) Inferior lighting may make work, and especially fine work, more difficult.

(*d*) The worker may be unable to obtain adequate sleep by day. This may be the result of the dislocation of ordinary habits of life, or of social causes, such as noises and disturbances, or the care of children. Further, workers are tempted to curtail their period of sleep by rising to join the family midday meal, or to obtain some recreation and amusement.

(*e*) Social intercourse, recreation and amusement are seriously interfered with. Continuance of education is impracticable.

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* See "Fatigue and Efficiency," Chapter X., by Josephine Goldmark (Survey Associates, Incorporated ; 1913).

(*f*) Finally, it is unnatural to turn the day into night, and to deprive the body of the beneficial effects of sunlight.

Though for reasons already explained night work must be regarded under existing conditions as inevitable for the great mass of workers, there is **not the same justification for the employment at night of growing girls and boys*** ; the Home Office and the Ministry of Munitions have now altogether prohibited the employment of girls under 16, and have largely curtailed the night employment of girls between 16 and 18 and of boys between 14 and 16.

A question of considerable importance in connection with the shift system is as to how long workers should remain on the night shift at any one time. A week is the commonest period. Sometimes, however, changes are made fortnightly or monthly, and in some instances there is no alternation at all, the workers remaining continuously on day or night work, except for occasional changes amongst individuals for the convenience of the persons concerned.

On purely physiological grounds infrequent changes are to be preferred. The question, however, is one that must be largely determined by the social conditions under which the worker lives. Regard must be had to the difficulty of obtaining uninterrupted sleep, family duties, the desire for social intercourse, and other similar considerations. The results of various investigations suggest that **continuous night work is productive of definitely less output than is the alternating system,**† and there is no evidence that the output of the continuous day shift balances this inferiority.

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* See report of Departmental Committee on "Night Employment of Male Young Persons in Factories and Workshops." (Cd. 6503, 1912.)

† See study on "The Comparative Efficiency of Day and Night Work" in the Committee's Interim Report on "Industrial Efficiency and Fatigue." (Cd. 8511.)

Chapter V.

LOST TIME; INCENTIVE TO WORK.

Lost Time.*

Fatigue is not the only cause of Lost Time. Other causes are :—

Causes mainly Unavoidable.

(*a*) Necessity of employing persons of inferior physique or irregular habits.
(*b*) Lack of sufficient or suitable accommodation.
(*c*) Lack of transport facilities.
(*d*) Bad weather and dark streets.
(*e*) Lack of material coming from outside.
(*f*) Domestic duties of married women.
(*g*) Sickness and accident.

Causes mainly Avoidable.

(*a*) Drink.
(*b*) Indifference.
(*c*) Discontent with conditions of work.
(*d*) Morning "quarters."
(*e*) Overtime work.
(*f*) Faulty internal organisation, leaving employees without work.

Other causes, of less importance, might be added, and even those mentioned differ considerably both in influence and in generality. The first seven of them are for the most part beyond the control of both employer and employee; the remainder might to a great extent be remedied by the one or the other.

* For a fuller discussion of this subject see Professor Loveday's study of "The Causes and Conditions of Lost Time" in the Committee's Interim Report on "Industrial Efficiency and Fatigue."

Investigations show that **the proportion of lost time due to sickness and other unavoidable causes is as a rule greatly under-estimated** in factory records, and the proportion due to slackness consequently over-estimated.

The causes of lost time should be carefully ascertained, and remedies sought. Excessive overtime and Sunday work have a prejudicial effect upon health. Apart from this some employees may miss normal hours in order to make necessary the better paid overtime. Variations in the sickness rate may be due to long hours or a bad environment in the factory, to changes in climatic conditions, to holidays, urgency or slackness of work. An early start before breakfast is another frequent cause of lost time. The restrictions of the Liquor Control Board have removed or reduced much of the lost time due to excessive drinking.

Incentive to Work.

Closely connected with the question of lost time is that of incentive to work. Patriotism has already been mentioned. Others are a good factory environment, an attractive canteen system, social amenities of the factory, the instruction of the new worker, sufficient and suitable rest pauses, and wages. This last is perhaps the most potent influence affecting output and the natural inclination to work. In determining upon a satisfactory wage system* certain considerations must be borne in mind :—

(i) A healthy environment in the factory and in the home is the first necessity in order to obtain a healthy population of wage earners to whom a wage scheme may appeal as an incentive to work.

(ii) Under conditions of repetition work, especially if it be monotonous, piece rates may be expected to give a greater output than time wages.

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* For a fuller discussion of this subject see the study on "Incentives to Work, with special reference to Wages," in the Committee's Interim Report on "Industrial Efficiency and Fatigue."

(iii) The rise and fall of wages (paid on a well-planned piece rate) earned by individual workers is a valuable indication of health and efficiency.

(iv) A wage scheme fails as an incentive if its operation cannot easily be understood by the wage earners, or, if understood, appears to them inequitable.

(v) A wage scheme which is badly adjusted may lead directly to limitation of output.

(vi) A scale of wages which renders it possible for the wage earners to obtain too easily all the money which their social aspirations demand fails to provide an adequate incentive.

(vii) Hours of labour, which give but little chance of spending the wages earned, diminish the incentive to earn more money.

(viii) Workers, especially those newly introduced to industrial life, require protection against their own eagerness.

Chapter VI.

A HEALTHY FACTORY ENVIRONMENT.

The Factory and Workshops Act, 1901, Section 1 (i) provides as follows for every factory, except a domestic factory :—

(*a*) It must be kept in a cleanly state ;

(*b*) It must be kept free from any effluvia arising from any drain, water-closet, privy, urinal, or other nuisance ;

(*c*) It must not be so overcrowded while work is carried on therein as to be dangerous or injurious to the health of the persons employed therein ;

(*d*) It must be ventilated in such a manner as to render harmless, so far as is practicable, all the gases, vapours, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on therein, that may be injurious to health.

In subsequent Sections these various requirements are elaborated.

Cleanliness of Factory.

The first provision of the Factory Act is that the workshop must be kept in " a cleanly state " [Section 1 (1a), (3)]. A high standard of cleanliness is essential not only for health, but because it has an **important bearing on the self-respect of the workers.** The difficulties are frequently considerable, and constant attention is necessary. Action should not be limited to removing dust and other refuse which actually obstructs or affects the efficiency of the machinery. If dust is allowed freely to accumulate its inevitable circulation in the air represents a material danger to health even where it is not derived from poisonous substances.

Flooring [Section 8 (1)] should be smooth, hard, durable, and impervious. While flooring of concrete or similar material may be best for the parts of a shop where the machinery is placed and for passage ways, it is not the material most suitable for workers to stand on. Wood is much less fatiguing to stand on for any continuous period. It is also warmer for the feet—a matter of no small importance in cold weather. Where the processes render a wet floor unavoidable, it is extremely desirable, however effective the drainage may be, to provide foot-boards.

General Ventilation and Heating.*

"In every room in any factory or workshop sufficient means of ventilation shall be provided and sufficient ventilation shall be maintained." (Factory Act, S. 7.)

"In every factory and workshop adequate measures must be taken for securing and maintaining a reasonable temperature in each room in which any person is employed, but the measures so taken must not interfere with the purity of the air of any room in which any person is employed." (S. 6 (1).)

The Factory and Workshop Act is concerned only with the minimum essential in ordinary times, but present conditions and circumstances render it necessary to consider the problem of ventilation from a somewhat different standpoint. At present the importance of proper and effective methods of ventilation is intensified by the increase in the number of workers (many of whom are new to industrial conditions), by the long hours of work, and by the continuous occupation of the shop by day and night. Frequently there is no interval in which natural ventilation can restore a vitiated atmosphere, and each shift succeeds to the bad conditions of ventilation left by its predecessor.

The objects of ventilation are to provide—

(*a*) **Air which is pure and clean** for the workers to breathe.

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* See First Report (Cd. 1302, 1902) and Second Report (Cd. 3552, 1907) of the Departmental Committee on "Ventilation of Factories and Workshops."

(*b*) **An atmosphere which is stimulating and refreshing.**

Air which is entirely pure from the chemical point of view may still be an atmosphere of a depressing character, detrimental to physical efficiency. It is not enough to aim only at clean air, or only at a stimulating atmosphere. Both objects must be constantly borne in mind.

Clean Air.

The impurities which are liable to be added to the air inside the workshop are—

(*a*) **Carbonic acid** given off in the breath of human beings, and by fires, gas lights, or any other form of open combustion. Carbonic acid in the percentage found in rooms and factories is harmless, but it affords a useful indication of the efficiency of ventilation. If it is efficient the percentage of carbonic acid will not measurably exceed that in the atmosphere. This is the ideal to be aimed at, rather than the practice hitherto followed of keeping the acid below 12 parts per 10,000 of air in daytime and below 20 parts at night.

(*b*) **Various ill-defined volatile substances** arising from human beings, from the skin and the alimentary canal, especially when personal cleanliness is defective. These substances are probably harmless in themselves, but they excite a feeling of discomfort or even of disgust.

(*c*) **Bacteria** arising from human beings form a more definite and more directly harmful sort of impurity. Colds, sore throats, influenza, and the like are largely spread from an infected individual to his neighbours by organisms which are carried in the air. Though these diseases may be regarded as trivial in character, there can be no doubt as to the amount of industrial inefficiency which they cause. Of diseases more serious as regards life as well as health, tuberculosis of the lungs is undoubtedly found disseminated in a like manner.

(*d*) Industrial processes may give rise to varied impurities such as **dust and fumes.** Some are simply unpleasant, others are directly harmful.

Stimulating Atmosphere.

At first sight a workshop may have so large a cubic capacity in relation to the number of workpeople and the kind of process in operation that it does not require ventilation. This is a false assumption. In large shops there may be a mass of stagnant atmosphere which is obviously depressing and relaxing, and fails entirely to provide the stimulating effect of **cool air in gentle motion** which is provocative of the best physical and mental exertion. This exhilarating influence of atmosphere depends essentially upon the cooling of the skin by moving air, and is closely connected with questions of temperature and heat. **Cool air is more stimulating than warm,** and more conducive to physical effort. Damp warm air is more relaxing than dry air at the same temperature. The desirable atmosphere is characterised by being

(*a*) Cool rather than hot ;
(*b*) Dry rather than damp ;
(*c*) Diverse in its temperature in different parts and at different times rather than uniform and monotonous ;
(*d*) Moving rather than stagnant.

The explanation of the familiar benefits of such an atmosphere appears to lie in the cooling and varying stimulation of the skin of the exposed parts of the body. The concentration of a current of air on too small a part of the body only causes what is commonly known as a draught ; thus a slightly open window may cause a draught, whereas a widely open window may not.

WAYS AND MEANS.

The ventilation and heating of every workshop provides a separate problem. There is no uniform or stereotyped method which will give satisfactory results everywhere. The essential requirement is **current** ventilation and **cross** ventilation. The means to be adopted

must be subject to local conditions in each case, and the general lines alone can be indicated here.

(*a*) **Cubic capacity.** This is the first essential. Though the minimum of 250 cubic feet per worker (400 during any period of overtime) prescribed by S. 3 (1) of the Factory Act is seldom infringed, the provision of adequate ventilation may be rendered difficult, owing to the close proximity of the workers to one another.

(*b*) **Definite openings communicating with the outside air should be provided in every workshop,** preferably opposite each other. The average machine shop and all similar one-storey shops may be provided with louvres along the length of the roof ridges, or better with narrow openings where the roof meets the wall. Such louvres should be permanently open and would generally ensure that the atmosphere will at least not be grossly bad.

(*c*) **Fixed openings should be supplemented** by the use of **doors** and **windows** (which will open) and **fans**. Fans are specially valuable to meet emergencies, and abnormal conditions, and provide for the thorough movement of the air.

(*d*) Local sources of impurity and heat production should be dealt with by the provision of **hoods, exhausts,** &c. Smoke and fumes from neighbouring chimneys may also have to be guarded against.

A close connection exists between **ventilation and temperature.** What is the best temperature depends on the character of the work and the habit of the worker. Sedentary workers require a temperature as high as 60° Fahrenheit, though it may be somewhat higher when the air is in motion.

Means of heating are usually restricted by practical considerations to some system of steam heating or hot-water pipes ; the ideal form is no doubt by radiant heat, as may be seen from the excellent and invigorating conditions which prevail in many smithies and forges. Gas-

heated radiators in which the burnt gas escapes into the shop are not permissible.

Some responsible person should be specially detailed to supervise the ventilation and heating. The most complete installation for ventilation and heating—that is, the **means**—may be rendered ineffective by injudicious management or failure in proper or continuous **maintenance.** Rapid changes of temperature at different times of the day, varying circumstances of use and occupation, all require appropriate treatment. Mismanagement may arise through neglect to observe the prevailing conditions and to put in operation the appropriate appliances for the supply of air and heat. While it is for the management to provide the means it is for the workers to aid in their use and application.

Local and Exhaust Ventilation.

In addition to the general provisions in regard to ventilation, the Factory and Workshop Act contains various special provisions in regard to the provision of local or exhaust ventilation in the case of dangerous or unhealthy industries (where grinding, glazing, or polishing on a wheel, or any process is carried on by which dust, or any gas, vapour, or other impurity, is generated and inhaled by the workers to an injurious extent). Under Section 79, Orders can be made dealing with individual industries.

Local or exhaust ventilation is normally required to remove from the atmosphere dust, heated fumes or volatile vapours. The essentials to such ventilation are :—

(*a*) A duct along which a flow of air is maintained in a definite direction.

(*b*) Suitable opening or openings in the duct through which the dangerous substances are withdrawn.

(*c*) Suitable openings for the admission of air into the workroom.

The duct along which a flow of air is maintained should be of sufficient length and size. It must not contain bends so sharp as to impede the flow of air. The opening or openings through which the air enters the duct must not be too small or they may become choked with dust. The openings should have hoods so arranged as to surround so far as possible the seat of origin of the substance to be removed.

In the case of dust from a revolving wheel, the hood and duct should be placed so as to intercept the dust which is thrown tangentially from the wheel and to catch dust which would otherwise fall to the ground ; the dust then comes under the influence

of the air current in the hood, and is drawn into the duct, while the air current itself is assisted by the air thrown off by the wheel. Where dust is created by manual labour the operative should stand or sit facing the opening of the hood so that the current of air draws the dust away from him.

In the case of heated fumes, the hood should be bell-mouthed and its lower end should envelop and extend below the place from which the fumes originate. The opening of the hood should be at such an angle as to prevent accumulation of dust, or in the case of heated fumes to prevent the expanding gases from rebounding and escaping like smoke from the badly constructed chimney. Volatile substances are difficult to localise. If, as is usually the case when noxious vapours have to be dealt with, the vapour is heavier than air, the openings to the duct must be at the ground level and as near as practicable to the place where the vapour is given off.

The removal of dust or volatile substances is generally best effected by a current of air produced by mechanical means. Generally speaking, where a keen draught as for the removal of dust is required, pressure fans should be employed since these fans, though requiring more power to drive them, can work against considerable pressure and smaller ducts may be used. Where on the other hand, large volumes of air are to be removed, volume fans can be more economically employed, but with such fans attention to the sectional area of the ducts is of great importance. The ducts must never be constricted at any point ; the total area of the opening must be greater than that of the fan, and all sharp bends in the duct must be avoided. Further, the delivery side of the fan must not be impeded or so placed as to be exposed to the action of wind.

Heated fumes can usually be removed without using mechanical power, provided that the duct is vertical and of ample diameter and height. Down draughts should be guarded against by the provision of wind cowls or by other means.

The distribution and size of openings for the admission of air to the workroom is a matter of essential importance. To obtain an interchange of air and so secure general ventilation, these openings should be placed as far as possible from the exhaust openings, preferably on the opposite side of the work-room, and to avoid draughts such openings should comprise an area three times that of the exhaust openings. Where volatile vapours are being dealt with, it is specially important that the openings should be ample and should be arranged high up in the workroom. The supply of in-coming air may in some cases be ensured by the use of a pressure fan driving in air through well-distributed openings.

Experience shows that installations which are in themselves satisfactory frequently fail to effect their purpose through in-sufficient attention to their care and maintenance. Hoods

become detached from ducts; holes are broken into the ducts, and ducts have been found blocked with every kind of debris. The whole installation may be impaired by a dust collecting apparatus with exits of inadequate area.

Lighting.*

The **essentials** of good lighting may be summarised as :—

(*a*) Adequacy ;

(*b*) A reasonable degree of constancy, and uniformity of illumination over the necessary area of work ;

(*c*) Placing or shading of lamps so that the light from them does not fall directly on the eyes of an operator when engaged on his work or when looking horizontally across the work-room ;

(*d*) The placing of lights so as to avoid the casting of exterior shadows on the work.

Natural Light.

Natural lighting is superior to artificial lighting on grounds of health as well as of economy. Where it can be provided **roof lighting is generally to be preferred to lateral lighting,** especially if it can be arranged that the light enters from the north. In a good system of roof lighting the illumination is uniform. In modern factories where lateral lighting is employed, a large part of the walls are devoted to windows, but it is evident that there is a limit to the width of the room beyond which the illumination falls below what is adequate. What this width is will depend partly upon the nature of the work to be done in the shop and partly on the extent to which light is impeded by outside obstacles, such as neighbouring buildings, or inside obstacles such as machinery.

The effect of **light coloured walls and white ceilings** on the general brightness of the rooms and in forming an effective background to dark objects should not be

* See Report of Departmental Committee on "Lighting in Factories and Workshops" (Cd. 8000, 1915).

overlooked. Sometimes the natural lighting may be improved by deflecting vertical light into the room by means of reflectors or prismatic glass, or by whitening the surface of an external wall or building which obstructs the light. The position of permanent working points should be so adjusted in relation to the windows, and to internal obstacles of whatever kind, as to secure so far as practicable adequate daylight for each.

The **necessity for regularly cleaning the windows** on the inner and outer surfaces cannot be too strongly insisted on. Not only do dirty windows seriously hinder daylight from entering the shop, but the daylight period of work is considerably shortened and needless expenditure on artificial lighting incurred in consequence.

Artificial Light.

Artificial lighting is of special importance at the present time when night work is done, and when women and boys are employed in large numbers. The first requisite for good lighting is adequacy, and the unit of illumination is the "foot-candle,"* that is, the illumination produced by a light of one standard candle at a point of a surface one foot from the source and so placed that the light strikes the surface at right angles. Thus, 1 candle 1 ft. from the surface is 1 foot-candle, 50 candles at a distance of 1 ft. is 50 foot-candles, and 50 candles at 10 ft. distance is 0·5 foot-candle.† Light should also be constant and uniform, without glare and without casting extraneous shadows on the point to be illuminated. Artificial lighting is usually obtained by use of coal gas, oils, or electric light. Cannel-coal gas is more illuminant than bituminous-coal gas. The chief results of the burning of coal gas are an increase in CO_2 and watery vapour, raising of temperature, with some production of sulphurous acid and other constituent

* On the continent of Europe the *meter-candle* is the unit (=about $\frac{1}{10}$ of a foot-candle.)

† Over the "working areas" of workrooms illumination at floor-level should be not less than 0·25 foot-candle; in all open places, roadways, yards or other approaches to workplaces, 0·05 (see Report of Departmental Committee on "Lighting in Factories and Workshops"—Cd. 8000, 1915.)

bodies. Each cubic foot of gas pollutes the atmosphere to the same degree as one adult person. The best form of gas illumination is now commonly obtained by the use of an incandescent-mantle burner properly ventilated. Oil-lamps give fair results, but raise the temperature and give off CO_2 and watery vapour. Electric light is the most hygienic form of illumination. No oxygen is used up, no CO_2 or moisture is produced.

The **results of inadequate illumination** are damage to eyesight and personal health, various forms of domestic insanitation, accidents in factories and workshops, often accompanied by diminution in output of work and lack of discipline. Bad lighting affects output unfavourably, not only by making good and rapid work more difficult but by causing headaches and other effects of eye strain. Attention should be paid to the lighting of passages, offices, and the immediate surroundings of the factory as well as to that of the factory itself.

Sanitary Accommodation.

The Factory Act and the Public Health Acts alike require that every factory and workshop must be provided with sufficient and suitable accommodation in the way of sanitary conveniences. A Special Order was issued by the Home Office in February 1903. This Order does not apply to London or to any districts in which the Public Health Acts Amendment Act, 1890, is in force, but it may be regarded as prescribing the minimum conditions which are generally considered as sufficient and suitable. The Order includes the following provisions :—

(*a*) Not less than one sanitary convenience shall be provided for every 25 females.

(*b*) Not less than one sanitary convenience shall be provided for every 25 men provided that—

(i) where the number of males exceeds 100 and sufficient urinal accommodation is also provided, it shall be sufficient if there is one sanitary convenience for every 25 males up to the first 100 and one for every 40 after ;

(ii) where the number of males exceeds 500, and proper supervision and control is exercised by a special officer, one convenience for every 60 men need only be provided in addition to sufficient urinal accommodation.

(*c*) The accommodation must be so arranged and maintained as to be conveniently accessible at all times to all persons employed.

(*d*) Every sanitary convenience must be kept in a cleanly state, sufficiently ventilated and lighted, and must not communicate with any workroom except through the open air or through an intervening ventilated space.

(*e*) Every sanitary convenience must be under cover and so partitioned off as to secure privacy, and if for the use of females must have proper doors and fastenings.

(*f*) Where persons of both sexes are employed, the accommodation for each sex shall be so placed that the interior shall not be visible, even when the door of a convenience is open, from any place, where persons of the other sex have to work or pass ; if the conveniences for one sex adjoin those for the other, the approaches must be separate.

In the case of some new factories, or in isolated situations, the most approved system of drainage and construction cannot be carried out, and recourse must be had to pail closets ; in such cases a higher standard of accommodation should be provided, unless proper arrangements can be made for daily scavenging (out of working hours).

Whatever the arrangement made it is of the utmost importance that **a high standard of cleanliness should be maintained.** It will generally be found desirable, if not essential, to appoint someone to be responsible for proper supervision and maintenance.

Chapter VII.

WASHING FACILITIES AND BATHS.*

Introductory.

Under the Factory Act and the Regulations of the Home Office and Ministry of Munitions the provision of washing accommodation is only compulsory where workers are engaged on processes in which poisonous materials such as lead or T.N.T. are manipulated. Though provision is most needed in such cases, or where heat, dust or dirt are present to an unusual degree, **washing is beneficial to the health and efficiency** of all workers. It also has a beneficial effect upon the self-respect of the worker, who is able to leave his employment clean and tidy. There is ample evidence as to **a growing desire on the part of the workers for a more extended provision.**

Experience shows that when opportunities for washing are provided they are generally used. There may be a short period of inertia at first, but workers have no innate desire to be otherwise than clean, and soon bring influence to bear upon any of their fellows who do not avail themselves of the facilities offered. The provision of **baths** is at present mainly confined to a few works where they are required by the Home Office Regulations, or where the processes involve strenuous work in a high temperature. Where men are employed under conditions of great heat, baths may prove an effective antidote to muscular rheumatism. While the general provision of baths cannot be regarded as a practicable proposal there is no doubt that extended provision is desirable. It is unnecessary to emphasise the **benefit and refreshment** derived therefrom.

Washing Facilities.

Lavatories.—Where washing accommodation has been provided, inspection has shown that sufficient attention is seldom paid to details of construction. Frequently the details seem to have been left to a building contractor with no special knowledge of the hard usage to which fittings are subjected under the conditions of industrial life; as a result lavatories, **though adequate when new, may**

* See Appendices A and B.

quickly fall into disrepair. Separate basins, originally provided with plugs attached by chains, are found with the chains broken, the plugs lost and the waste pipes stuffed up with rags. Walls against which basins are fixed, unless protected by an enamelled surface, soon become splashed with soap suds, and present an **uninviting aspect** which cannot be easily or quickly improved. Waste pipes are often too narrow for convenient cleansing, or contain sharp bends and angles, and consequently become blocked or broken.

Insufficient provision is often made for **draining the lavatory floor,** which possibly through bad construction becomes uneven and the site of pools of dirty water. The floor should be smooth, hard, impervious and properly sloped and graded. Nail brushes and soap, even though frequently renewed, disappear, and thus involve a constant source of annoyance and expense. These troubles may be largely overcome by adhering to certain principles in construction. The installation should be :—

(*a*) As **simple** as possible in construction and arrangement ;

(*b*) **Strong and durable,** able to withstand considerable wear and tear ;

(*c*) **Sufficient and suitable** in accommodation so that a large number can wash together or in a short time* ;

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* The standard adopted under Factory Regulations is as follows :—The washing conveniences should be under cover, and maintained in a cleanly state and in good repair. There should be either :—

(*a*) A trough with a smooth impervious surface (fitted with a waste pipe without plug), and of such length as to allow at least 2 feet for every five persons, and having a constant supply of water from taps or jets above the trough at intervals of not more than 2 feet ; or

(*b*) At least one lavatory basin for every five persons, fitted with a waste pipe and plug, or placed in a trough having a waste pipe, and having either a constant supply of hot and cold water or warm water laid on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on, and a supply of hot water always at hand when required for use by persons employed (see Figure 4)

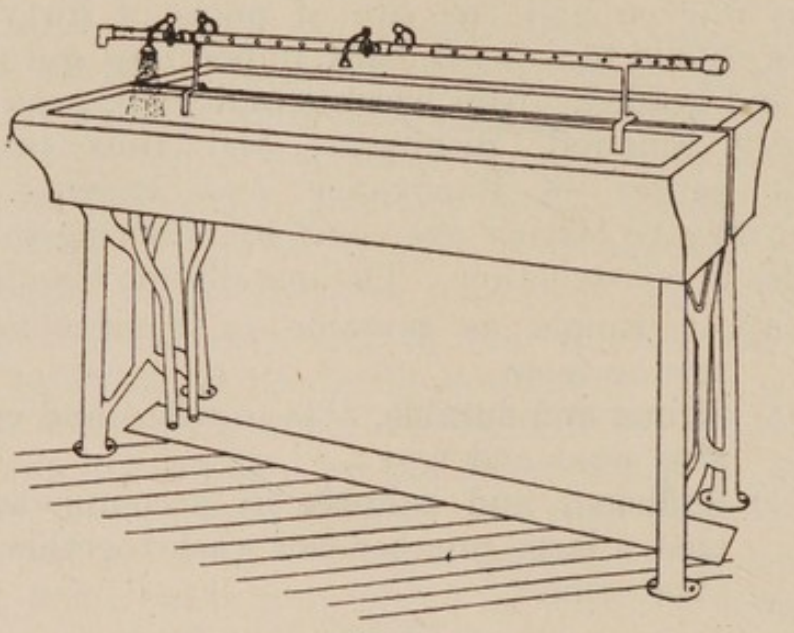
(*d*) **Economical in space ;**

(*e*) So constructed that it can be **easily cleaned,** and contain a minimum of removable or detachable articles ;

(*f*) Provided with an **ample supply of water** (hot and cold) ; and

(*g*) So situated in the factory as to be fairly **accessible** to all for whom it is provided.

Where difficulties arise in regard to the use of ordinary lavatory basins they may in certain cases be overcome by using such



* Figure 1.

a washing trough as that illustrated in Figure 1. Here the necessary plumbing is reduced to a minimum ; there is no plug ; washing is done under a spray of water ; the waste pipe opens directly over the drain ; and the drain itself is flush with the floor, which is sloped towards it. The trough stands in the centre of the room, free from the walls, and the wall space can be used for cloak room accommodation, whether hooks or lockers. A useful modification of the water supply is to have only two spray taps for occasional use, and a series of flush holes in both sides of the water pipe, the supply to which is controlled by a cock on the far side of the taps. This cock is turned on just before the operatives come to wash at the close of each spell of work. Arrangements can be made for controlling the tem-

* From a design by the Stourbridge Glazed Brick and Fire Clay Company, Ltd., Blowers Green, Dudley.

perature of the water. Where space is limited, say near the exit of a big engineering shop, a more compact installation may be used. This may take the form of a large circular basin with spray taps radiating from a central supply pipe coming down from above, and with an open pipe in the centre for carrying off the waste water to a drain in the floor, as shown in Figure 1. Wherever spray taps are used, advantage is gained by so arranging the height and position of the taps that a douche bath for the head, neck and arms can be taken if desired.

Nail brushes.—The difficulty occasioned by the disappearance of nail brushes may be overcome by having large brushes made and fixed in position so that they can drain into the trough. In use the hand is rubbed against such brushes instead of the usual reverse process. In a number of factories stout nail brushes are provided attached to the washing troughs by chains ; and on the whole this plan appears to work satisfactorily.

Soap.—Soap may be supplied economically in small boxes, about 4″ square, kept locked and fixed in convenient positions above the trough, say on or near the water pipe ; the soap of the consistency of butter, or jelly, is obtained by inserting a finger into a round hole in the bottom of the box. Each day the attendant fills up the box. Soap for use in this way can be obtained in powder form* which sets to a jelly on the addition of water ; by buying soap thus in powder form the cost of carriage is diminished. Alternatively, the soap may be served out as a powder placed in a flour dredger chained to the trough. One point, however, should be borne in mind, the natural oil of the skin and hair may be removed by the use of strong alkaline soaps ; if such soaps are used, as may be necessary to cleanse hands soiled with oil and grime in engineering works, then some ointment, glycerine or lanoline, should be employed after washing to restore the suppleness of the skin. Without this precaution the skin may become dry and cracked, and so be unable to resist bacterial infection when dermatitis results.

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* Such soap is prepared by Messrs. Lever Bros., Port Sunlight, Cheshire.

Towels.—The supply of clean, dry towels should be adequate ; for this purpose it is desirable that :—

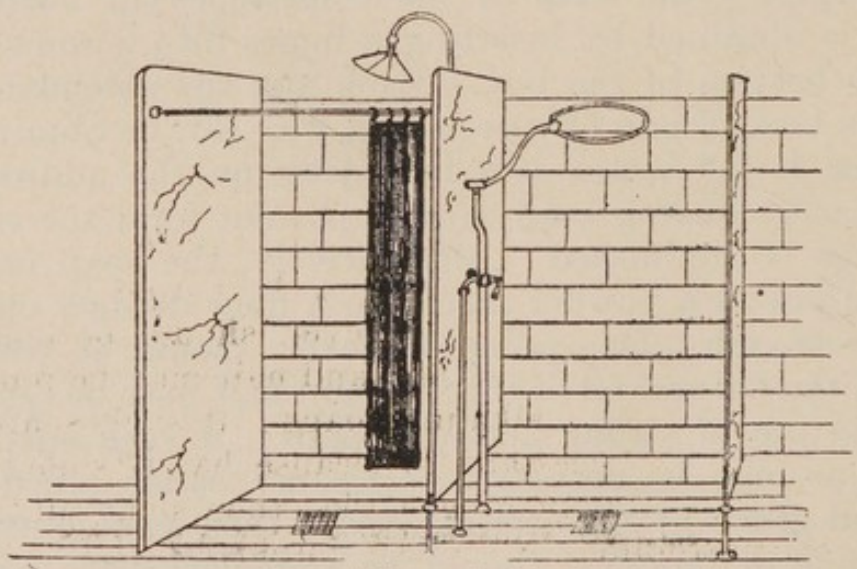
(*a*) A towel at least five square feet in area should be provided for each worker, and should be renewed or washed daily ; or

(*b*) One roller towel fastened in position, at least 15 square feet in area, should be provided for every three workers, and should be renewed or washed daily ; or should be provided for every nine workers and should be washed or renewed after every meal time and at the close of the days' work.*

The provision of separate towels is preferable and is made in National Filling Factories, partly because the danger of infection is minimised and partly because each worker thus obtains a dry towel.

†Bathing Facilities.

Baths.—For men, the simplest and at the same time the cheapest and most efficacious installation is that of **shower or douche baths.**



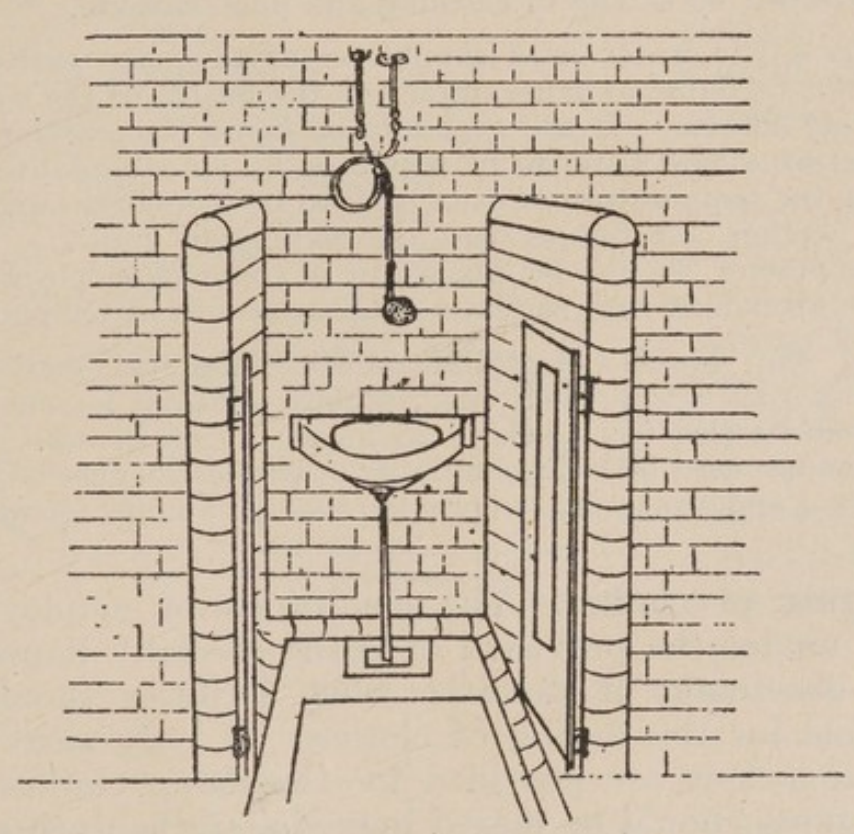
‡ Figure 2.

* These suggestions are identical with the requirements of the Home Office Order for the Manufacture and Decoration of Pottery.

† Reference may usefully be made to the Report of the Departmental Committee on Washing and Drying Accommodation at Mines. (Cd. 6724, 1913.)

‡ From a design by Messrs. Doulton & Co., Ltd., Lambeth, S.E.

The stimulating effect on the skin of the falling water is greater than is obtained by total immersion. Douche baths have been strongly recommended for use by coal miners, and have been installed with success in many factories. (*See* Figures 2 and 3.) For women, ordinary shower baths are less applicable, because of the difficulty of keeping the hair dry or of drying it after bathing; a horizontal spray fixed at the level of the shoulders, or obtained from a movable nozzle or ring on a flexible tube, overcomes this objection. (*See* Figures 2 and 3.) Such an arrangement may also be found preferable for men.



* Figure 3

Cubicles.—The cubicles in which the baths are placed should be arranged to secure privacy. In order to reduce the time which each worker spends in the cubicle it may be possible to arrange for the workers to dress and undress partly outside the cubicle, but at any rate in the case of women some provision

* From a photograph taken in a munition factory.

for dressing, including a seat and pegs, must be provided inside the cubicle. Where this is done the size of the cubicle should not be less than 3 feet wide by 4 feet deep. The walls should ordinarily not be less than 6 feet high. A space should be left between the floor and the walls of the cubicles sufficient to permit of drainage and cleaning. (*See* Figure 2.)

The building and fittings should be so constructed as to facilitate the maintenance of absolute cleanliness. Square corners, ledges, or rough inner surfaces should be avoided. Wood should be used only for seats, and for this purpose hard wood should be employed with spaces between the wood for ventilation. The walls and partitions (and this applies also to lavatories and sanitary conveniences) should always have smooth and curved surfaces which can be readily washed down and cannot be used for writing on. Enamel tiles and bricks or enamel metal sheets may be used for this purpose ; any initial cost thus incurred is soon recouped by saving in cleaning and lime-washing.

Water.—The water used should be of adequate purity and should not be liable to cause injury to the health of the workers or to yield effluvia. It will generally be found preferable for the temperature of the water to be regulated by an attendant rather than for the temperature of each bath to be regulated separately by the worker. A temperature of about 100° Fahr. is usual. A thermometer should be placed in a convenient position so that the attendant can readily correct variations of temperature.

Soap and Towels.—A simple and economical method of supplying soap is to provide small tablets sufficient for one bath. A convenient size for towels is 25 inches by 60 inches. When the baths are used by a large number of workers it may be found convenient and economical to provide a small laundry for washing them.

Drying of clothes.—The conditions of employment which render the provision of baths specially important often also make it desirable that facilities should be available for the drying of clothes. If only cloakroom pegs or lockers are provided for the damp clothes, hot water pipes should be placed immediately beneath them. A preferable plan where a large amount of clothing has to be dried is to suspend the clothes from the roof of the building by a chain or string securely fastened at the lower end. The heat of the building produced by the hot water pipes for the baths causes a good ventilation in the roof which satisfactorily dries the clothes and prevents any disagreeable odour. The interior of the building may with advantage be maintained at a level

temperature of about 70°F. This adds to the comfort of the workers and effectively dries the clothes. Ventilation can be obtained by the provision of ventilators in the roof or by the use of fans.

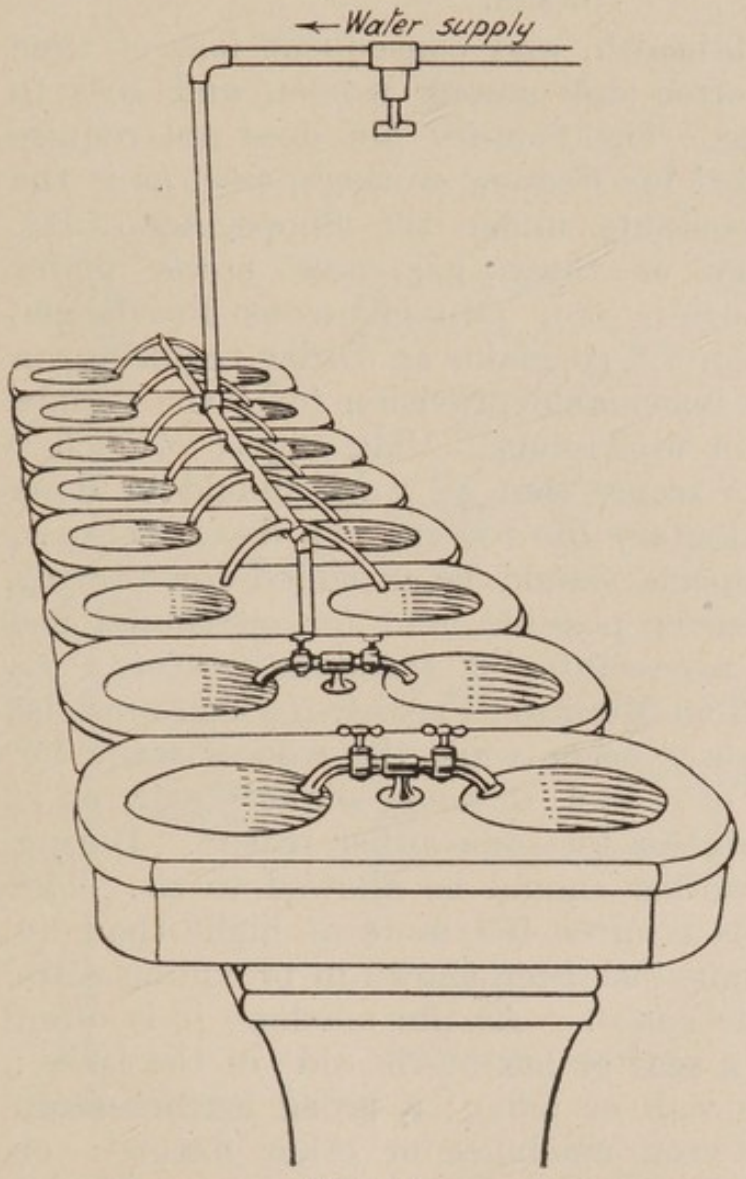


FIGURE 4.

Handbasins as used in a National Projectile Factory.

The maintenance of any installation provided is almost as important as its construction. This should be made the definite duty of an appointed officer, who should keep the lavatory clean, control the supply of nail brushes and soap, and arrange that dry clean towels are available. Such an officer may also usefully be employed in attending to the sanitary conveniences, and in supervising the cloak room. While the ultimate responsibility for upkeep must rest with the employer, it may be found, at any rate in the case of baths, that the workers can, with advantage, be encouraged to participate in the management by a special committee or otherwise. Since periodic baths are of special benefit to health and efficiency, it is desirable to allow workers **time for bathing within working hours.**

Chapter VIII.

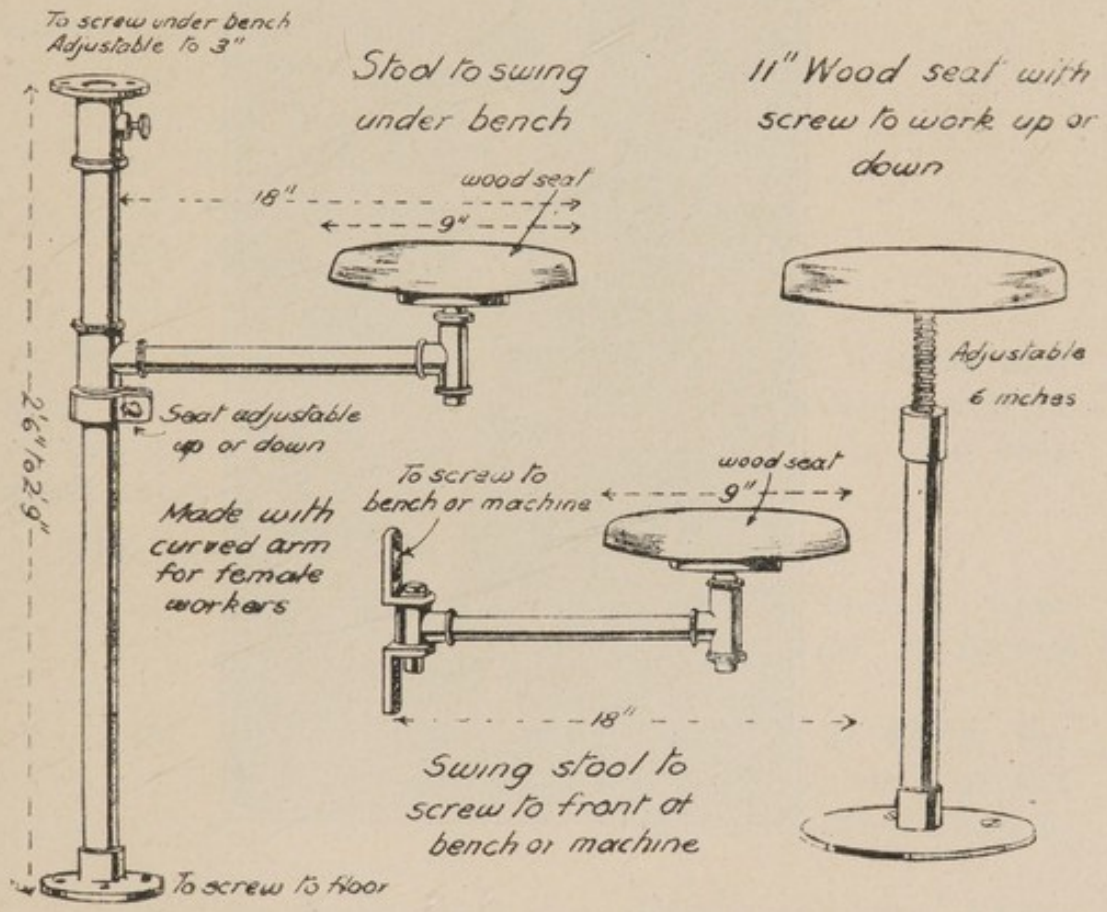
SEATS, CLOTHING, ETC.

Seats.

Fatigue and ill-health, and consequent loss of time and output, are often due among women and girls to prolonged standing. The Factory Act does not require seats to be provided for Factory workers, such as is the case for shop assistants under the Shops Act, 1912, but the Secretary of State has now power under the Police, Factories, etc. (Miscellaneous Provisions) Act of 1916, Section 7,* to make an Order requiring an occupier to make reasonable provision for "the supply and use of seats in workrooms." The object of such a provision is not to secure that all work should be done seated, since a sedentary life has its own disadvantages, but rather that means should be provided for varying the position, wherever possible, and for occasional use when the work necessitates a standing posture. In almost all the work in Munition Factories, which must be done standing, pauses occur while the worker waits for the readjustment of a tool, or some slight repair, or is held up for material or for some other reason. During such pauses the worker should be allowed to sit. The need for such seats is often felt more at night than by day. Much ingenuity has been shown in providing seats which occupy little space. At the machine it is often practicable to fix **a seat or bar** at the side of the lathe; **a flap seat** to the wall or pillar; **a broad leather strap** may be hung between machines or other fixture; or a suitable form of **high stool** provided for use while at work, with or without caster wheels (see illustrations).

The intervals between spells of work should be times of real rest and recuperation. This cannot be obtained on the wooden forms without backs in the canteen or messroom, which are too often the only seats provided. Forms with backs, or chairs, are generally much to be

* See Appendix A. An Order made under this section, dealing with the manufacture of tinplates, requires the provision in the messroom of "chairs or benches with back rests."



Types of Seats.

The accompanying engraving illustrates the costume which has been adopted for certain women workers engaged at drop stamps. The stamps in question are 7 cwt. and 15 cwt. sizes, made by B. & S. Massey, Ltd., and are used in forging the noses of 6 in. shells. The work performed by the women is that of the assistant, pulling the control handle and so on; the forger is a male worker. The costume, it is reported, appears to be a complete success. Five women are now using it, and a sixth, a crane driver in another department, has asked to be allowed to adopt it. It may therefore be taken that the costume is acceptable to the wearers.

preferred. In addition, comfortable chairs for women who may be overtired or faint should be provided, preferably in a rest room adjacent to the surgery. A brief rest under the supervision of the nurse frequently enables a woman or girl to return to work reinvigorated for the remainder of the spell.

Protective Clothing.

For women and girls protective clothing is essential where risk to health is involved from :—

(*a*) Dust, dirt or wet.
(*b*) Acid burns.
(*c*) Dangerous machinery.
(*d*) Work involving climbing.
(*e*) Exposure to excessive heat.
(*f*) Exposure to inclement weather.

Protective clothing is desirable for all women and girls. It adds to their smartness and neatness, and so to the general appearance of the factory. It also aids discipline and promotes *esprit de corps*.

There are four main types of costume* :—

(*a*) The **overall dress,** for general factory wear (see illustrations, Nos. 1, 2 and 3, facing page 66).
(*b*) The **trouser or knicker suit with tunic,** for outdoor work, climbing ladders, etc., or for very dirty work (see illustrations, Nos. 5 and 6, facing page 67).
(*c*) The **boiler suit,** for dangerous work where close-fitting clothes are essential for safety (see illustration, No. 4, facing page 67).

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* These types of costume are illustrated and described in the "Ministry of Munitions Journal" for May, 1917, pages 183 and 184, as well as in a special leaflet issued by the Ministry with the concurrence of the Home Office ; this leaflet contains particulars of various types of costumes, gloves, boots, &c., which can be purchased through the Explosives Supply Department, 37–41, Old Queen Street, Westminster, S.W. 1.

An illustrated memorandum on "Protective Clothing for Women and Girls" has just been issued by the Home Office, and may be purchased through the usual channels (see page 9).

(*d*) The **impervious apron and bib,** worn with either the overall dress or the trouser suit, for protection against wet, oil, acid, or the wear and tear of friction (see illustration facing page 65.)

With the costume a **cap** should be worn for protection against dust and dirt, for safeguarding the hair from dangerous machinery, and for keeping the head dry out of doors.

Accessories, such as **gloves, veils, clogs, or respirators,** are also necessary in the cases of certain processes, especially where there is a risk of fire or of poisoning from dust or fumes.

The proper selection of materials is highly important. Woollen materials are less inflammable and more durable than cotton, but for general use cotton materials such as drills, dungaree, or (when thin material is required) jean or linen are suitable. For resistance to moisture good waterproof cloth, oiled or American cloths, are obtainable. Aprons can be obtained of these materials, also of rubber or leather. Sound acid-resisting materials can be had for aprons, leggings and clogs, also oil-proof materials for protecting machinists from the lubricating oil which penetrates ordinary clothing. For outdoor wear in wet weather a mackintosh coat, trousers, and sou'wester hat, with leggings and strong boots are frequently provided. A corduroy suit is also suitable for all weathers, and is very durable. In some cases a mackintosh coat to wear over the cotton drill trouser suit may be enough.

In **explosive factories** (except National Factories) the clothing must be approved by the Chief Inspector of Explosives at the Home Office, who supplies particulars respecting materials and fire-proofing. The Ministry of Munitions give advice for other explosive and filling factories.

Protective clothing for men and boys is equally important, especially when they are engaged in processes involving exposure to dust, dirt or wet, acids or alkalis.


1


2


3


4


5


6

Protective clothing should be provided by the employer. The cost of caps and overalls (within a maximum limit of price), at the rate of two to each woman worker, may, with the Welfare and Health Section of the Ministry, be allowed as a working expense for the purposes of Part II of the Munitions of War Act, 1915, and the Rules thereunder. The employer should also be responsible for washing, mending and renewing the clothing.

Cloakrooms.*

Cloakrooms are necessary for health and comfort, especially of women and girls.

Cloakroom accommodation, in order to be satisfactory, should comply with the following **essentials :—**

(*a*) It should be close to the canteens, lavatories, and sanitary accommodation.

(*b*) It should provide a separate peg or locker for each worker, which should bear the workers' name or work number.

Hanging pegs should be not less than 18 inches apart, and may usefully be separated by a small partition. Lockers may be made of metal open-work in preference to wood, to allow free circulation of air.

(*c*) There should be ample space for changing clothes and boots.

(*d*) Provision should be made for drying wet outdoor clothes in bad weather, and working overalls in wet processes. Steam pipes placed under the hanging pegs have been found useful for this purpose.

(*e*) A high standard of cleanliness should be maintained.

(*f*) Cloakrooms should be thoroughly ventilated.

(*g*) Cloakrooms should be in charge of an attendant, and means taken to prevent petty pilfering or theft.

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* See "Welfare Work" by Miss E. Dorothea Proud, C.B.E. (G. Bell & Sons), 1916 (pages 114–119). See also Appendices A and B.

Weights.

Admittedly women and young persons are physically weaker than men. Apart from this they are more liable to strain from sudden muscular efforts. The Home Office "General Order" prescribes that a woman or young person shall not be allowed to lift, carry or move anything so heavy as to be likely to cause injury to them. The weight which can safely be lifted depends not only on the physique of the worker but on the position in which the weight lies, its shape, the manner of carrying it, and the place to which it has to be carried. Again, much depends on the acquisition of knack. Given, however, reasonable conditions and a good physique, women and girls over 18 have been found able to handle weights up to 50 lbs. in the ordinary course of work without difficulty. Such a weight would, of course, be too great for women of less than normal strength, or if the weight is of awkward bulk or has to be raised to a special height.

If weights are properly adjusted to physical capacity, experience suggests that a woman can frequently perform as much work as a man owing to her capacity for quicker movement and continuous work. In order **to prevent strain and to secure the best results** attention should be paid to the following amongst other points :—

(*a*) Adaptation of the size and shape of the burden.

(*b*) The provision of labour saving appliances, such as overhead cranes or inclined planes.

(*c*) The size and shape of boxes, trolleys, or other receptacles and vehicles.

(*d*) Long handles and other methods of reducing leverage.

(*e*) Methods of reducing the height through which weights have to be raised, *e.g.*, by the provision of benches for the temporary storing of shells by the machine.

(*f*) Instruction in the knack of lifting weights.

(*g*) Limitation of hours of employment.

Drinking Water.

Drinking water should always be available, and an Order* has recently been made under the Police, Factories, etc. (Miscellaneous Provisions) Act, 1916, Section 7,† under which, in all factories and workshops in which twenty-five or more persons are employed, provision shall be made at suitable points, conveniently accessible at all times to all persons employed, for :—

"(*a*) an adequate supply of wholesome drinking water from a public main or from some other source of supply approved in writing by the local authority of the district in which the factory or workshop is situated, which shall be either laid on or contained in a suitable vessel ;

(*b*) (except where the water is delivered in an upward jet from which the workers can conveniently drink) at least one suitable cup or drinking vessel at each point of supply, with facilities for rinsing it in drinking water.

Each drinking water supply shall be clearly marked 'Drinking Water.' All practicable steps shall be taken to preserve the water and vessels from contamination."

* Statutory Rules and Orders, 1917, No. 1068.

† See Appendix A (page 125).

Chapter IX.

THE INDUSTRIAL CANTEEN.

The Minister of Munitions has recommended the establishment of Canteens* in National and Controlled Munitions Establishments. Under the Police Factories (Miscellaneous Provisions) Act, 1916, S. 7, the Home Secretary is empowered to issue Orders requiring the occupier of a factory or workshop to make reasonable provision for preparing or heating or taking meals for workers employed therein.

The need for Canteen Provision.

Efficiency in the workman or the soldier depends most largely upon his physical fitness, which in its turn depends upon nutrition. If it be true that an army of soldiers fights on its stomach it is equally true that an army of workmen can only work effectively if well fed. The establishment of an effective and well-managed canteen is attended by **substantial advantages,** both to the employer and the worker. These benefits are direct and indirect, and may be summarised as follows :—

Direct Benefits.

(*a*) Improvement in the health, nutrition and physical condition of workers.
(*b*) Reduction in sickness.
(*c*) Less absence and broken time.
(*d*) Less tendency to alcoholism.
(*e*) Increased efficiency and output.

Indirect Benefits.

(*a*) Saving of time of worker.
(*b*) Salutary change from the workshop.
(*c*) Greater contentment.
(*d*) Better mid-day ventilation of the workshop.
(*e*) Increased facilities for recreation and games in spare time.

* For information as to the conditions under which capital expenditure on the provision of canteens can be regarded as an expense for the purposes of the Excess Profits Duty, see Appendix B.

The evidence of these results is substantial, indisputable and widespread. In the isolated cases where the canteen has failed it has been evident that its failure has been due to exceptional circumstances, misuse by the workers, or mismanagement. In almost all large works there is a body of men or women who in the interest of physical health and vigour are particularly in need of canteen provision at the factory. This group of ill-fed workers accounts in a large degree for such inefficiency as exists, and its energy and output is reduced in the absence of suitable feeding arrangements.

Accommodation Required.

The accommodation necessary may take one or other of three forms :—

(i) **Messroom,** with or without hot closet, hot plates, or hot water ;
(ii) **Buffet bar** (or trolleys) ;
(iii) **Canteen** or full restaurant with kitchen, providing hot and cold meals.

The messroom is the irreducible minimum, though it often fails to have a sufficiently good effect. The food is brought by the worker and is often insufficient, unappetising, and innutritious. The buffet is useful as supplementing "carried food," and for refreshment at night or in short breaks of work. The full-meal canteen is the really useful and practical method of providing meals for workpeople.

The amount or degree of canteen accommodation necessary depends

(*a*) On the situation of the factory and the opportunity for all or any of the workers to go home for meals ;
(*b*) On the proximity of outside restaurants ;
(*c*) On the hours of work (day or night) and the meal intervals ;
(*d*) On the character of the work ;
(*e*) On the usual customs of the district.

Seating Accommodation.

To decide upon the degree of accommodation, it will be necessary to find out the **maximum number** who are

in the habit of remaining at the works for meals during any meal interval. (In some instances dinner will be the most popular meal, in others breakfast.) This figure can be taken as a basis to work upon, but it must not be overlooked that it is hoped to provide for a percentage, at any rate, of those who at present go to the coffee-shop or even go home. Personal inquiry by the officials of the firm is the best way of gauging this number ; workpeople are notoriously shy of filling up any forms which they think may commit them in any way.

Site and Construction.

The site is very important ; it should be in a **central position, easy of access** to all parts of the works. The building should not be a barrack, but should have an agreeable and **attractive appearance.** It should include dining-room or rooms, kitchen, scullery, larder, stores, catering office and sanitary accommodation. The stores, larder, &c., should open upon a yard, with an easy access for tradesmen's carts, &c. As the system of service would be a counter-service, the kitchen and scullery should abut direct upon the dining -room.

It is suggested that about **8½ square feet per person seated** should be allowed in the dining-rooms.

The following **inexpensive permanent construction** has been found suitable :—

Walls.—Nine-inch brickwork rendered externally with Portland cement ¾ inch thick and finished with a rough cast surface ; with large span roofs brick piers of greater thickness will be required under the roof principals ; the brickwork internally to be flat-pointed with a painted dado to a height of 5 feet (salt-glazed in lavatories, &c.), the brickwork above distempered, no plaster being used.

Roofs.—Boarded and covered with slates, the underside of boarding being painted a cream colour.

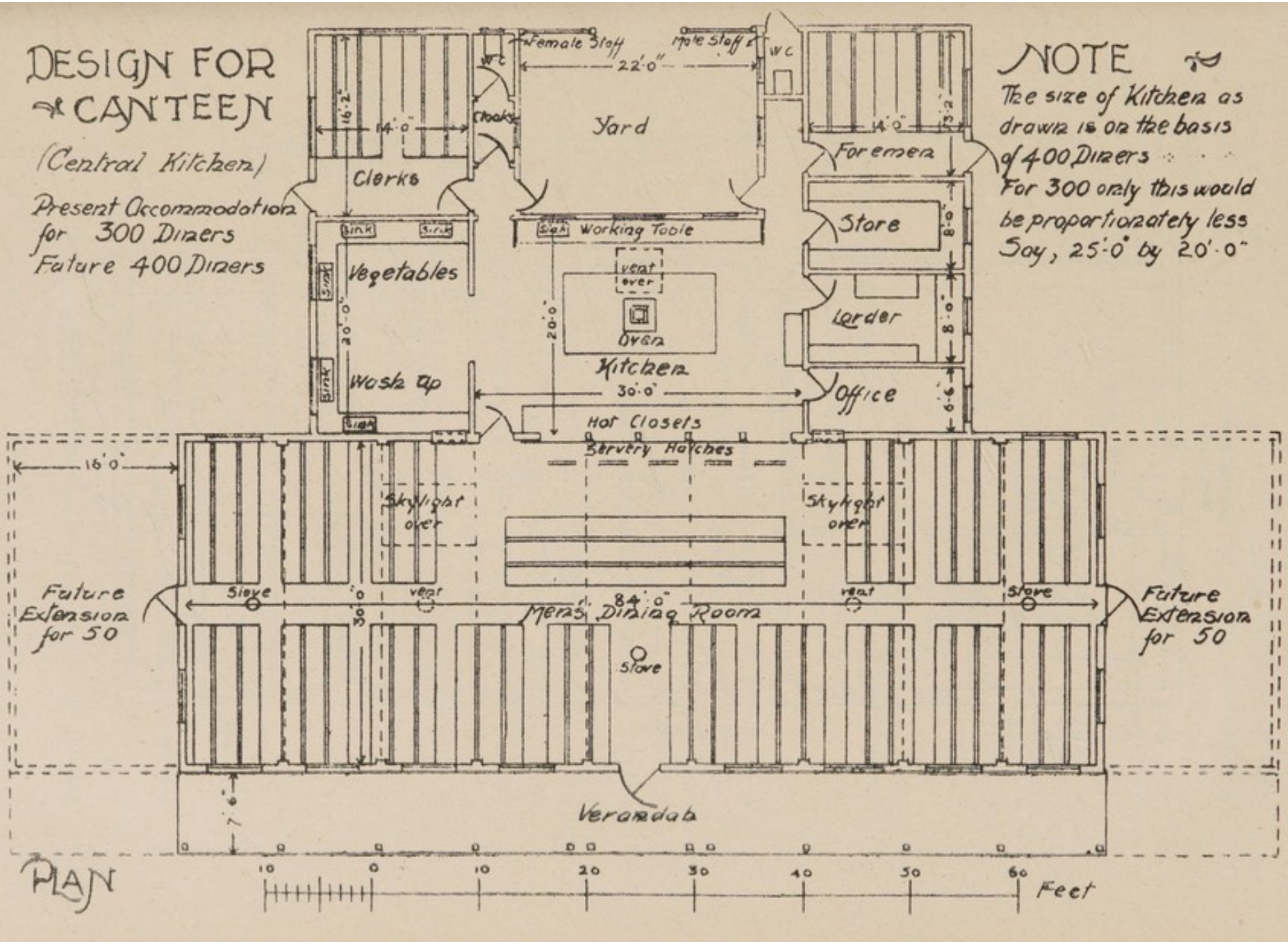
Floors.—Concrete with granolithic face.

The Store and Larder should be fitted with shelving of deal 1″ thick supported on 2″ by 1½″ framed bearers and uprights. The shelving should be kept 1″ away from the walls.

DESIGN FOR CANTEEN

(Central Kitchen)

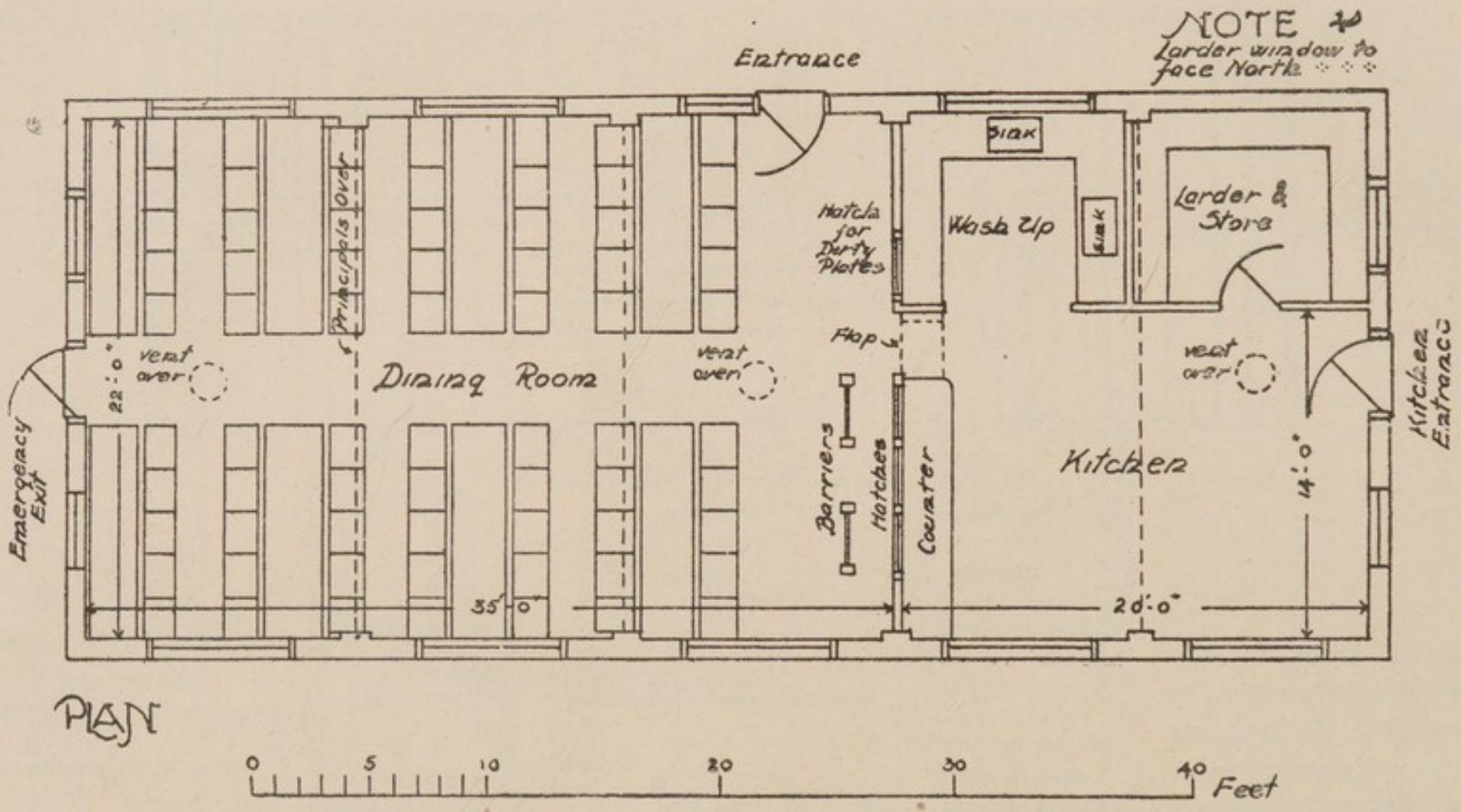
Present Accommodation for 300 Diners
Future 400 Diners



PLAN

NOTE

The size of Kitchen as drawn is on the basis of 400 Diners
For 300 only this would be proportionately less
Say, 25'-0" by 20'-0"


NOTE
Larder window to face North
Entrance
Sink
Waste Up
Sink
Larder & Store
Hatch for Dirty Plates
Flap
Principals Over
vent over
Dining Room
vent over
vent over
Barriers
Hatches
Counter
Kitchen
Emergency Exit
Kitchen Entrance
22'-0"
35'-0"
20'-0"
14'-0"
PLAN
0
5
10
20
30
40
Feet

The Larder should, if possible, face north, and perforated zinc panels should take the place of glass in one half the area of the windows to provide permanent ventilation.

Separate dining-rooms are usually provided for the two sexes. They should be so designed as to permit of their being thrown together to form a single hall for social, recreative or educational purposes.

Kitchen.

The position of the kitchen in the industrial canteen may be either central or terminal (see plans).

Boiler House.

Heating Apparatus and Hot Water Service.—Particulars and suggestions will be found in Appendix C.

Cooking Apparatus.

The efficiency of the cooking in a canteen depends to a large extent on the wise choice of the cooking apparatus. In small canteens gas is probably the most efficient cooking medium. In larger ones it may be cheaper to use steam (from the factory boilers or a separate boiler) for heating hot closets, boiling water, and steaming vegetables and puddings, with gas or coal ranges for roasting or frying. Electricity is clean in use, but expensive unless the current costs no more than $\frac{1}{3}$d. per B.T. Unit.

A good plan is to furnish different cooking apparatus manufacturers with particulars of the number to be catered for, leaving them to submit a scheme for the installation.

The following particulars may be useful :—

For 100 persons :—

1 double-oven range for roasting and baking, with hot plate for boiling, frying, etc.
1 hot closet and warming cupboard, about 48″ long by 30″ high by 24″ deep.
1 15-gallon boiler for vegetables, etc.
1 15-gallon boiler for tea water, washing up, etc.

For 250 persons :—

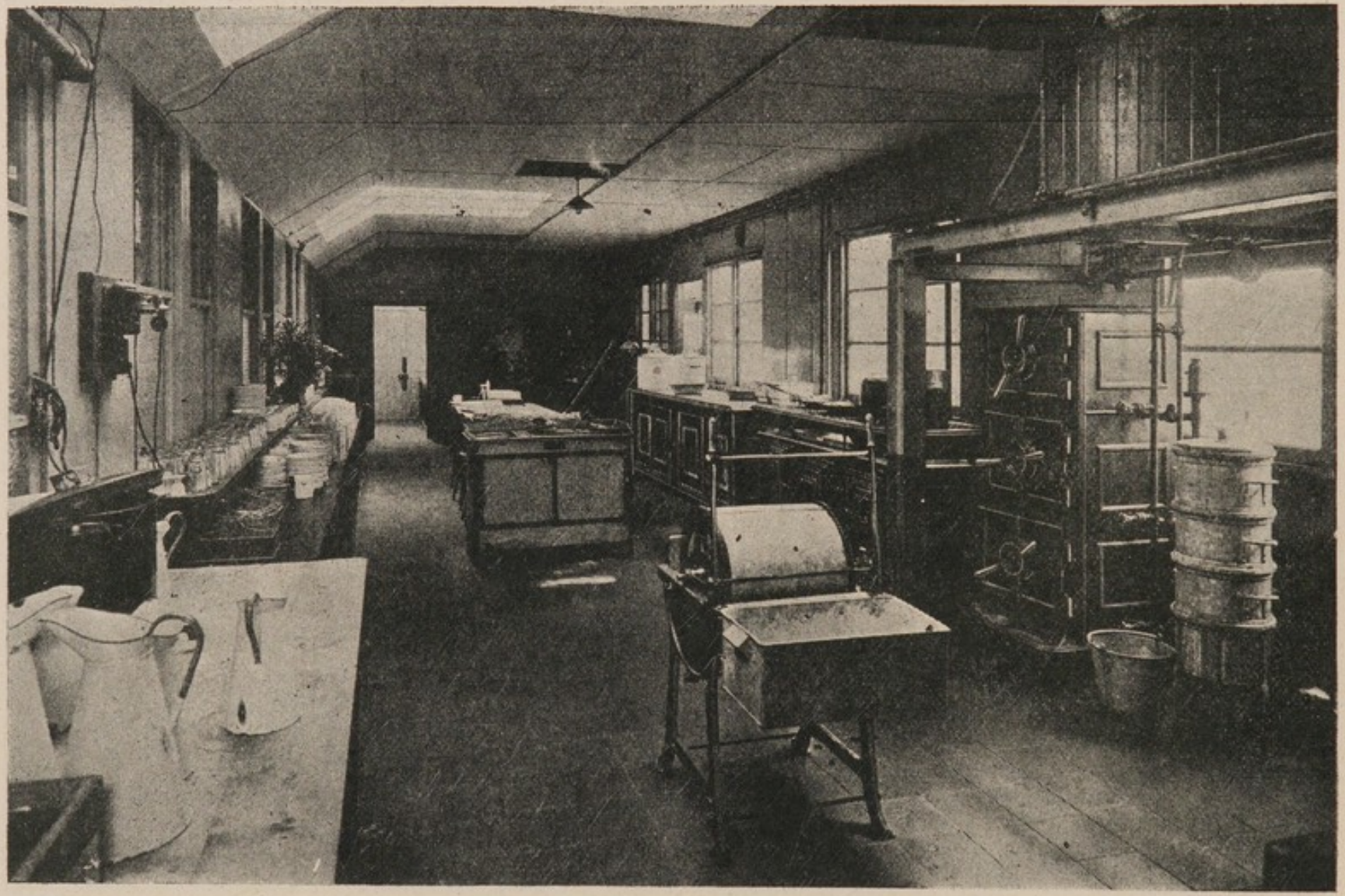
1 3-oven range for roasting and baking, with hot plate for boiling, frying, etc.
1 hot closet and warming cupboard, about 72″ long by 30″ high by 30″ deep.
1 potato and pudding steamer.
1 20-gallon boiler for vegetables.
1 25-gallon boiler for tea water.
1 10-gallon boiler for soup.
Boiler for supplying hot water through the sink taps.

For 500 persons :—

1 large roasting oven.
1 3-oven range.
Hot closets and warming cupboards to form part of each serving counter.
Carving table with hot closet under for warming plates.
1 potato steamer.
1 pudding steamer.
1 25-gallon boiler for vegetables.
2 25-gallon boilers for tea water.
1 20-gallon boiler for soup.
Boiler for supplying hot water through the sink taps.

Teak sinks (3 ft. long, 2 ft. wide, 1 ft. deep) are generally more suitable for washing up crockery, etc., than the ordinary sinks of glazed fireclay. The latter or sinks of galvanised iron can be used for vegetable preparation, etc. There will be a percentage of the users of the canteen at the commencement, at any rate who will require **"warming up" facilities.** These can be provided for by warming closets or hot plates. It is always advisable to undertake to warm up meals. Before some workers will use the canteen they must come and see things for themselves. It is often found that after a while they compare the meal which they themselves bring with that purchased in the canteen, generally to the disadvantage of the carried meal.

Kitchen of a large Canteen.



Canteen Kitchen.

General Equipment.

[Suggestions as to the equipment required are given in Appendix C (page 129).

Cost.

About **5d. per foot cube,** exclusive of central heating and lighting, is the standard cost for building the fabric. The complete equipment should cost approximately :—

47s.	per head	for	100	persons	seated ;
32s.	,,	,,	500	,,	,,
30s.	,,	,,	1,000	,,	,,

Taking a canteen seating 500 as an example, the total cost, including the building and its equipment, should be about **£7 per seat.** Smaller canteens cost rather more proportionately ; and, of course, the nature of the site has much to do with the cost of building.

Management and Administration.

The management of a canteen may be entrusted to (*a*) an outside caterer ; (*b*) a voluntary society, *e.g.*, the Y.M.C.A. ; or (*c*) may be undertaken by the employer.

Excellent as has been the work of the voluntary societies the canteen should undoubtedly be regarded as an integral part and a permanent feature of the works' organisation, and its control should be on the same footing as any other branch of the factory. The employer should appoint the manager or manageress, and should himself scrutinise the accounts of the trading or arrange for their scrutiny by a responsible person. He should watch the working and satisfy himself that full value is being obtained in the shape of increased contentment and efficiency of the workers for the capital outlay on the canteen and the current charges which he has to meet.

The selection of a canteen manager or manageress demands no less care than the selection of the head of any other department of the business. The **qualifications** required are organizing ability, power to maintain discipline, a thorough knowledge of buying foodstuffs, and a fair working knowledge of cookery.

A good way to popularise the canteen is to form **a committee of the workpeople** to act in an advisory

capacity. The general experience is that the workers themselves prefer not to have direct control. In order to dissipate any idea that the canteen is a means of exploitation of themselves, this workers' committee should have ready access to the trading accounts, etc.

Service.—Quick service is absolutely essential. The customers are not waited upon at the tables, but go to the counter for what they require, taking it themselves to the tables. To prevent loss of time a number of portions should be prepared beforehand, and stored in hot closets under the counter.

Staff of Canteen.—A sufficient number of cooks, servers, ticket-sellers, and storekeepers should be employed.

System of taking Cash.—The ticket or disc system is recommended; under no circumstances should loose cash be taken over the counter. When the customer comes into the canteen he buys at the ticket office discs or tickets to the value of the food required. After seeing the tariff, which is usually displayed at this office, he proceeds to the counter and tenders the ticket for what he requires. These tickets are put in a locked box by the server, and are counted at the end of the meal.

Buying.—Even if it is not deemed convenient to buy at the local market, the daily prices as quoted should be carefully studied for the purpose of checking excessive charges.

Tariff.—The usual tariff obtaining is: Cut from joint, 6d. and 7d.; made-up dish, 5d. and 6d.; vegetables, 1d. and 1½d.; puddings, 1½d. and 2½d.; tea, etc., 1d. In some canteens ½d. is charged for heating a meal brought by a worker, but water for heating the worker's own tea is not generally charged for.

Portions.—These should be standardised; about 2½ to 3 ozs. of cooked meat being given as a portion.

General Trading Accounts.—The factory account should bear the capital charges and such current expenses as rates, taxes, maintenance, fuel, light, and water,

Canteen Scullery.

Canteen Storeroom.

Counter Service

leaving to be charged against the canteen account the cost of food, wages, and general administration charges.

Success.*

The success of a canteen depends upon its character and its management :—

(*a*) The canteen must be accessible and attractive.

(*b*) It should be suitably constructed and equipped.

(*c*) The food should be varied, fresh and good.

(*d*) There must be prompt service.

(*e*) The canteen must be open at convenient hours.

(*f*) Arrangements for payment must be simple and convenient.

The good offices of the Canteen Committee of the Central Control Board (Liquor Traffic),† as the department responsible for advising in regard to canteens in controlled and uncontrolled factories as well as for transport workers, will be placed freely at the disposal of any factory authorities or proprietors desiring to make canteen provision for their employees.

* The whole question of canteen construction and management is discussed in "Feeding the Munition Worker," 1916, and in the Committee's Memorandum No. 6, both of which may be bought through the usual channels (see page 9).

† The Secretary of the Canteen Committee is Mr. A. B. Cane, and the Assistant Secretary Mr. P. R. Higgins ; the Organising Inspectors are Mr. A. F. Agar and Mr. F. H. Barry ; the Offices of the Committee are at 134, Piccadilly, London, W. 1.

Chapter X.

SICKNESS AND ACCIDENT.

Sickness due directly or indirectly to the industrial occupation takes various forms and degrees, from the passing headache to serious organic disease of fatal issue. The lungs, the heart, the digestive organs, the nervous system, the muscular system—each or all may be affected with results **harmful both to industrial efficiency and output,** and also to personal health and expectation of life. Moreover, it must be remembered that an undue proportion of sickness in any group of workers usually represents, among those not actually sick, lessened vigour and activity which cannot fail to reduce output. Disabling conditions or influences which injure some have a tendency to mark all. Employers and their workpeople should therefore have a general appreciation of these injurious conditions if they are to be on the outlook to guard against or mitigate their evil effect. Speaking generally, attention should be given to the following points :—

(*a*) Excessively long hours of work, particularly by night, if continued, produce fatigue, irritation, and sickness. "You will find," writes Sir James Paget, "that fatigue has a larger share in the promotion or transmission of disease than any other single causal condition you can name."

(*b*) Cramped and constrained attitudes or postures during work which prevent the healthy action of the lungs and heart.

(*c*) Prolonged and excessive muscular strain, *e.g.*, the lifting of heavy weights, or prolonged standing may produce rupture or varicose veins.

(*d*) Machinery accidents.

(*e*) Working in unventilated or insufficiently ventilated shops predisposes to disease and interferes with individual energy and physical capacity. The effect of continuously working in a stagnant or polluted atmosphere is not trifling or insignificant.

(*f*) The air, even if fresh, may be too hot or too cold, too humid or too dry; extremes should be avoided if reasonable bodily comfort and the most efficient work are to be ensured.

(*g*) Imperfect lighting, whether by day or night, conduces to eye strain and headaches.

(*h*) Working in the presence of gases, vapours, poisons, or other irritating substances, may lead to direct poisoning.

(*i*) Dust produced in certain industries, unless effectually safeguarded, may produce lung disease.

(*j*) The manufacture and use of high explosives involves risks to the workers.

In considering in particular the **physical capacity of a woman** for withstanding the fatigue consequent upon prolonged industrial employment, it has to be remembered that her body is physiologically different from, and less strongly built than, that of a man. Her muscular system is less developed. At the present time many workers have until recently lived a sedentary or domestic life, and have not been in the habit of taking active and regular exercises. Certain ailments and forms of physical disability to which women are liable are readily caused or at least accentuated by inattention to these considerations. Among such **conditions in women** are :—

(*a*) Disturbances of digestion due to unsuitable food, irregular and hurried meals, or fatigue.

(*b*) Anæmia, with possibly associated disease of the heart and circulatory system.

(*c*) Headache.

(*d*) Nervous exhaustion.

(*e*) Muscular pain and weakness, flat foot, &c.

(*f*) Derangement of special physiological functions.

Though these conditions may not in all cases be immediately incapacitating, they frequently tend to become chronic in nature and far reaching in effect, and they lead directly to mal-nutrition and to reduction of bodily energy. If allowed to persist, they invariably lay the foundations of ill-health and disease in later years.

Special problems also arise in the prevention of sickness amongst **boys and girls.** Both physically and mentally they are less capable than adults of prolonged effort or sustained attention to work. They need vital energy not only for the maintenance of health, but for growth ; even though there are no signs of immediate ill-health, the future growth and development may be stunted.

Indications of Sickness.

Indications of sickness in a factory fall, roughly, into four groups :—

(*a*) Absence, broken time, irregular time-keeping, or diminished output of the individual worker.

(*b*) Ordinary signs of ill-health.

(*c*) The sickness register.

(*d*) Death certificates. These, though few in number, may form important indications of the health of the workers as a whole.

Every case of lost time or absence calls for inquiry. It should be properly recorded. The study of such records is certain to disclose the existence of adverse influences or circumstances previously unsuspected which may denote the beginning of sickness. Unfortunately, the number of instances where reliable records are kept are comparatively few. Even when their importance is recognised, difficulties have arisen owing to pressure on the time of the Staff, or owing to the unsatisfactory character of many of the medical certificates supplied by workers. A form of Medical Certificate which if adopted should do much to obviate these difficulties is printed in the Appendix D.

Methods of Remedy and Treatment.

At the foundation of any sound system of dealing with industrial diseases lie two elementary principles :—

(i) That **prevention is better than cure ;** and

(ii) That for treatment to be effective it must deal with **the beginnings of disease.**

Bearing these in mind, the preliminary safeguard is to provide for the medical examination of all workers, in order to secure as far as may be their physical fitness for employment. In some munition works, and especially in those where dangerous substances are manipulated, **a preliminary medical examination of all workers is usual.** Such examinations are specially important at the present time, owing to the strain involved by the conditions of employment, and owing to the large number of persons who are taking up industrial employment for the first time ; but such examinations are always likely to be desirable where the work involves any special strain, and particularly so in the case of women. **Periodic re-examination** is practically confined to certain dangerous trades and processes, the workers in which have to be periodically examined under the Regulations of the Home Office or the Ministry of Munitions. Where they can be arranged for, such examinations might usefully be extended to workers engaged in other processes involving special strain or risk.*

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* Under Section 63 of the Factory and Workshop Act it is necessary for every boy and girl under 16 to be certified by the Factory Certifying Surgeon as physically fit for employment in the factory. Unfortunately this certificate is not always adequate for its purpose. The decision of the Surgeon has normally to be based simply on one brief examination. More often than not he has no previous knowledge of the boy or girl, and sometimes the records of the School Medical Service are not available. After a young person has once been admitted to a factory no further medical examination is required, except in the rare instances where the Factory Inspector may specially desire it. In view of the strain which industrial employment may often impose on growing boys or girls, it would undoubtedly be an advantage if arrangements could be made for their periodic re-examination.

Apart from their value in detecting early signs of ailment or defect, medical examinations are valuable as affording a convenient opportunity for the inculcation of sound doctrine as to personal, hygiene, cleanliness and healthy habits.

The second step is to reduce to a minimum any **unfavourable conditions** obtaining in the factory by providing proper sanitary conditions and accommodation, safeguarding machinery, controlling hours of labour, furnishing canteen facilities, and securing sufficiently warmed, lighted and ventilated work-rooms.

Thirdly, arrangements should be made for **adequate medical and nursing schemes.** Medical attendance is obtainable under the National Insurance system, or may be made available by the special provision of a medical and hospital service for the factory. Nursing can only be obtained by the employment of one or more trained nurses to undertake duties in the factory by night as well as by day. Such arrangements have been instituted in many munition factories, especially where women are employed, and have proved of great value to employers and workers alike. The **duties of the factory nurse** may include :—

(*a*) Supervision of the health of the workers.
(*b*) Superintendence of the rest room for those who are temporarily indisposed.
(*c*) Following up cases of sickness at home.
(*d*) Taking charge of first-aid treatment of injuries.
(*e*) In the absence of medical advice, observing and controlling in its initial stages any threatened outbreak of the influenza type of sickness, which if it extends may temporarily paralyse output.

Injuries and Accidents.

The provisions of the Factory and Workshop Act in regard to accidents fall into two main categories—(*a*) **the prevention of accidents,** and (*b*) **the notification and investigation** of certain kinds of accidents. The

provisions for the prevention of accidents include the proper fencing of machinery; the provision of safety valves, steam gauges and water gauges for boilers; the position and operation of self-acting machines; the cleaning of machinery by women and young persons; means of escape in case of fire; and the making of doors to open outwards; (see Sections 10 to 16). The occupier of the factory is required to notify to the Factory Inspector all fatal accidents and all accidents sufficiently serious to necessitate absence from work for a period of one day in some cases and of 7 days in others. Notification is also required of dangerous occurrences, such as explosions, fires or certain accidents to machinery.

Accidents in Munition Works.

How serious is the amount of disablement caused by injuries and accidents is shown by the fact that, though only accidents of a certain degree of severity are notifiable, the number notified annually in England and Wales amounts to over 150,000. To these must be added a vast number of minor injuries and accidents which in the aggregate cause perhaps an even larger amount of interruption to work. A somewhat formidable return of accidents is therefore to be anticipated in munition factories, which include not only metal and engineering work, but certain dangerous trades and the manufacture of explosives. Moreover, the introduction of new labour, and of employees unaccustomed to the processes concerned, particularly in conjunction with the need for speed and pressure, overtime and night work, with the consequent fatigue, must inevitably lead to greater risk of accident. **The injuries in a typical munition works** are not only open wounds, contusions and abrasions, injuries to the eye, sprains, simple and compound fractures, and injured limbs, but also scratches, cuts, burns, and other minor injuries which may readily lead to more serious conditions by neglect. The slightest wound may become infected with germs, and a greater or less degree of sepsis or blood poisoning supervene, with the resultant serious loss of time and efficiency and possibly even risk of life and limb.

Means of Prevention.

It has been estimated that from 25 to 40 per cent. of all industrial accidents are preventable if all practicable means are taken. It has been estimated, in America, that roughly—

30 per cent. of accidents are due to illness or to imperfections in machines ;
60 per cent. are due to apathy and lack of appreciation of danger on the part of operatives ; and
10 per cent. from wholly unpreventable causes.

Whatever the proportions may be there is no doubt that **a large number of accidents are preventable,** and the State which desires the maximum output of munitions, the employer who pays compensation, the Unions who subsidise absentees, and the operative who undergoes suffering and pain, and perhaps permanent disablement, are all alike concerned to secure a reduction in the number of accidents.

It is obvious that much can be done by adopting various **methods of prevention,** such as the proper and effective guarding of machinery, the provision of safety appliances, the proper regulation of dangerous processes, the adequate lighting of the factory, and the more careful cleaning of machinery. But however complete the provision made for securing safety, its success must largely depend upon the **intelligent co-operation** of workers and foremen in the maintenance and use of the appliances provided, and in the enforcement of precautionary regulations. As already suggested, many accidents occur through ignorance or apathy—"familiarity breeds contempt." One method of securing the necessary co-operation which might with advantage be more widely adopted is by the establishment of **Committees of Workers.** The duties of such Committees are to study the causes of accidents, to suggest and advise suitable means for prevention, to keep careful records, to make frequent inspection of machinery and plant, and to note any defects or dangers. The interest of the workers may be further encouraged by giving prizes for suggestions, or by awards to the Committee of

the Department where the greatest reduction of accidents has been secured. In some instances **monthly pamphlets** or bulletins have been published, dealing with safety and hygiene, with particulars of accidents, with notes as to their prevention, and illustrations of safe and dangerous methods of working.

Wherever possible, **training in the essentials of first aid** should be given to a sufficient number of workers to provide that in each shop there are at least one or two persons who know how to render first aid in case of injury. Distribution may also usefully be made of leaflets or **placards of instruction and advice.*** Any instruction or advice should be simple and precise, and should emphasise the need for treatment in all cases as well as methods of treatment.

In the majority of factories some provision is made for the treatment of injuries, but inspection indicates that there is great and urgent need of improvement, especially for treating minor injuries. While one factory may possess a well-equipped surgery with a trained nurse in charge, at another provision for treatment may be wholly absent, or the surgical equipment may be represented by a soiled roll of some so-called "antiseptic" lint or gauze, an open packet of absorbent wool, a few bandages, some antiseptic lotion, or an unclean pair of scissors, all kept in a dusty drawer. It is obvious that provision of equipment for first aid is worse than useless unless it is properly kept and maintained.

What is required is an adequate though simple organisation which provides (*a*) **a local dressing station or aid-post** in each workplace for minor injuries, and (*b*) **a central dressing station** or surgery for more serious cases or cases requiring continuous treatment. An Order† recently made by the Home Office under the Police, Factory, etc. (Miscellaneous Provisions) Act, 1916, Section 7‡, requires that in the case of blast furnaces,

* A First-Aid Leaflet has been issued by the Factory Department of the Home Office; extracts from it are set out at the end of this chapter. The British Red Cross Society's Manuals on First-Aid and on Nursing, by James Cantlie, M.A., M.B., F.R.C.S., are published by Messrs. Cassell & Co., Ltd. (price 1s.).

† The terms of the Order are given in Appendix E.

‡ The terms of the Section are given in Appendix A.

copper mills, iron mills, foundries and metal works a "First-Aid" box shall be provided in the proportion of at least one to every 150 persons, and an ambulance room wherever 500 or more persons are employed. Arrangements should also be made for the immediate conveyance to hospital of cases which cannot be treated on the spot.

Local Dressing Station or Aid-Post.

In order to be effective under industrial conditions any form of treatment for minor injuries must be **extremely simple, easily understood,** and **readily applicable.** Elaborate provision for the treatment of minor injuries is the less necessary because of its unsuitability under factory conditions, and because in machine shops wounds are usually comparatively free from germs. Further, the treatment must be always and promptly available. The workman who sustains a slight injury while at work will often decline to surrender a quarter of an hour of time and earnings in going to and from a central surgery to have his wound dressed. Time is a consideration, and the exigencies of factory life do not allow of an elaborate procedure. The aid-post may take the form of a **cupboard or box containing first aid materials,** with brief, simple, and clear instructions as to their use. Where there is no surgery the box should contain packets of sterilised dressings, a supply of iodine solution (alcoholic solution containing 2 per cent. iodine), a bottle of "eye drops," a pair of dressing scissors, some triangular bandages, safety pins, and a roll of plaster (one inch wide). The **sterilised dressings** may suitably be of three sizes* :—

(*a*) Three dozen **small size,** for fingers, composed of a strip of gauze or lint 8 inches long and 1 inch wide, with narrow tape attached to one end. The tape should be rolled up inside the strip, which is then wrapped in a cover of

* Such dressings may be obtained, amongst others, from Messrs. Cuxson, Gerrard & Co., Oldbury, Birmingham; and Southall Bros. and Barclay, Birmingham. Dressings are also prepared by Messrs. Burroughs, Wellcome & Co.; Reynolds & Bransom, 13, Briggate, Leeds; C. F. Thackray, Great George Street, Leeds; and the St. John Ambulance Association, St. John's Gate, Clerkenwell.

ordinary non-absorbent wool and the whole sterlised. In use the wool is first removed and the dressing unrolled round the injured finger, when the tape is disclosed ready for tying the dressing in position.

(*b*) One dozen **medium size,** for hands or feet, similar to the above, but 18 inches long and 1½ inches wide ; and

(*c*) One dozen **large size,** for which the ordinary field dressing may be taken as a pattern.

The aid-post should be under the care of an officer, preferably the foreman or forewoman, trained in first aid work. This officer should keep a note of every case dressed, and should be responsible for seeing that the box is kept stocked and in proper order. Ordinarily one such aid-post should be provided in each work place, but in large engineering shops several may be required.

*Central Dressing Station or Surgery.**

The central dressing station† should be easily accessible and specially constructed or adapted for the purpose. The room or rooms should, in large factories, provide for a surgery, a rest room, and a storeroom and nurse's room. Where a surgery is used for workers of both sexes a second small room will be found advantageous. The walls should be covered with glazed tiles, enamelled iron sheets, or washable paint ; the floor should be of smooth, hard, durable, and impervious material ; the natural and artificial lighting should be ample ; hot and cold water should be laid on or be immediately available ; the room should be warmed in winter. A glazed sink is needed, the waste pipe opening over the drain, and trapped outside the surgery. A footbath, preferably fixed and provided with hot and cold water, is desirable. The furniture should consist of a table, a couch, chairs,

* For information as to the conditions under which capital expenditure on an Ambulance Room can be regarded as an expense for the purposes of the Excess Profits Duty, see Appendix B (page 127).

† See illustration facing page 90.

and cupboards. The room should *not* contain a carpet, rugs, curtains, table cloth, window blinds, or wall pictures. The keynote should be **simplicity and cleanliness.** The floor should be washed once a day with antiseptic fluid, and the walls at least once a week.

The object of the central dressing station being the treatment of more serious cases than can be dealt with at the aid-post, and the re-dressing of cases of minor injury, it is desirable that it should be properly equipped. It may also be convenient to use it for the medical examination of applicants for work.

The station must be in charge of a competent person with knowledge of ambulance work. Wherever possible **a trained nurse should be on regular duty,** ambulance assistants being selected from employees trained in first aid work. Many large works now have a medical officer on the staff, who is responsible for the supervision of the surgery and available for serious cases before removal to hospital. **The equipment of the surgery** will largely depend upon the character of the accommodation provided and the experience of the person in charge, but the following will generally be required :—

(i) stretchers, splints and strong bandages for major accidents ;

(ii) bandages and dressings for minor injuries (a stock should be kept to replenish the aid-posts) ;

(iii) a simple steriliser and necessary surgical instruments such as scissors, forceps and tourniquet ; and

(iv) simple lotions and drugs (with sufficient enamelled basins).

Systematic Records.

As already suggested, it is important that a **full and accurate Register** should be kept of all cases of sickness and accident, with particulars of dressings, re-dressings, and treatment.

A case book should be kept drawn up somewhat as follows :—

Identification number.	Date.	Name of injured person.	Nature of injury or illness	How caused.	Progress of case with dates of subsequent dressings, and the occurrence of any sepsis.	Date of final dressing.
1	25.11.15	Mary Smith	Crushed thumb.	Fall of shell.	25.11.15, 26.11.15, 30.11.15.	3.12.15

Each case when first treated may appropriately receive a card, numbered to correspond with the entry in the case book, to be brought on the occasion of subsequent dressings.

This card must be brought to the surgery each time the patient comes for treatment.

Identification Number.	Name.	Nature of injury or illness.	Date.	Instructions.
1	Mary Smith	Crushed thumb	25.11.15	To come to-morrow.
			26.11.15	To come on 30th.
			30.11.15	To come on 3rd Dec.

NOTE.—Extract from First Aid Leaflet issued by the Home Office :—

TREATMENT OF MINOR INJURIES.

The following suggestions have the approval of H.M. Medical Inspectors of Factories in rendering first-aid in factories and workshops so as to prevent subsequent septic infection or blood poisoning.

A SCRATCH OR SLIGHT WOUND.

Do not touch it.

Do not bandage or wipe it with a handkerchief or rag of any kind.

Do not wash it.

Allow the blood to dry and so close the wound naturally : then apply a sterilised dressing and bandage.*

* Minute wounds can be efficiently closed by applying collodion.

If bleeding does not stop, apply a sterilised dressing and sterilised wool ; then bandage firmly.

If the wound is soiled with road dirt or other foul matter, swab freely with wool soaked in the iodine solution* and allow the wound to dry before applying a sterilised dressing.

A Burn or Scald.

Do not touch it.

Do not wash it.

Do not apply oil or grease of any kind.

Wrap up the injured part in a large dressing of sterilised wool.†

An Acid Burn.

Do not touch it, or apply oil or grease of any kind.

Flood the burn with cold water.

Sprinkle it (after flooding) with powdered bicarbonate of soda.

Apply a sterilised burn dressing of suitable size.†

However slight the burn, if the area affected is extensive a doctor must be consulted.

Do not remove any dressing, but, if the injured part becomes painful and begins to throb, go to a doctor at once.

Destroy all dressings, which have been opened but not used ; they soon become infected with microbes and then are not safe to use.

Note.—Danger from minor injuries arises from blood poisoning which is caused when microbes infect a wound. The majority of wounds are at first " clean," that is they are not infected with microbes ; such infection usually occurs later and comes from handkerchiefs or other materials applied to stop bleeding or to wipe away blood, and, in the case of eye injuries, from efforts to remove fixed particles with unclean instruments. **It is better to leave a wound alone than to introduce microbes by improper treatment.** The congealing of blood is Nature's way of closing wounds against infection, and should not be interfered with.

Burns and scalds when the skin is not broken will heal if left alone ; all that is necessary is rest and a protective covering. When blisters form they must not be pricked, except under medical advice.

Rest is an important aid to healing. A short rest at first allows healing to commence and often saves a long rest later. An injured hand or finger can be rested in a sling, and an injured eye by a bandage, but an injured foot or toe can only be rested in bed.

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* An alcoholic solution containing 2 per cent. of iodine.

† This would not exclude treatment by prepared paraffin or picric acid.

Surgery.

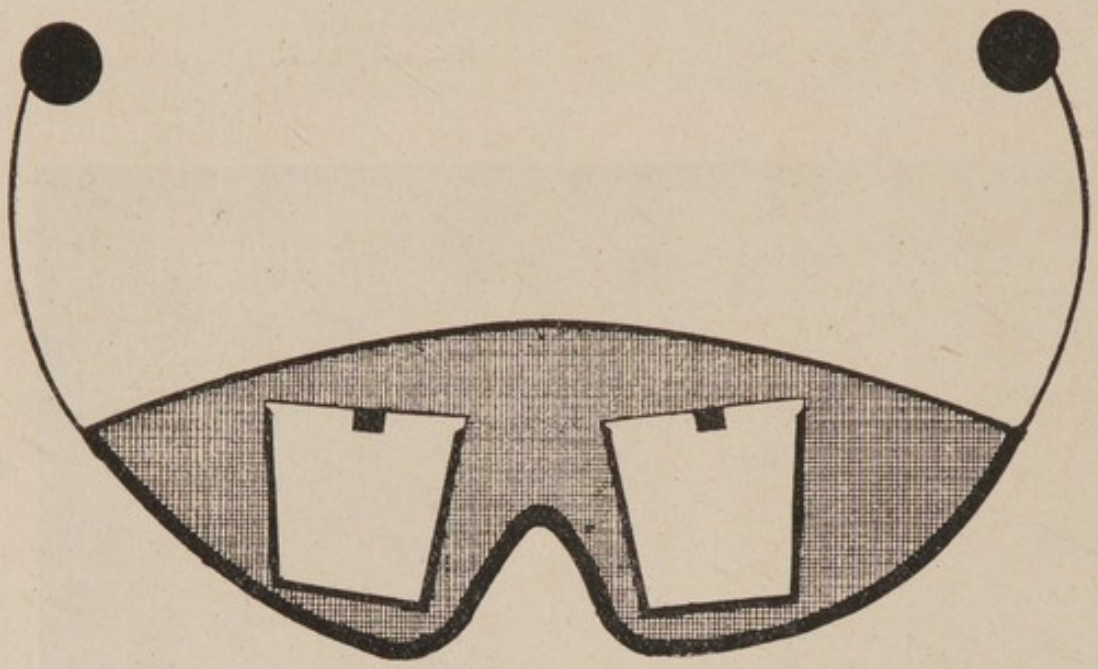

FIGURE 1.

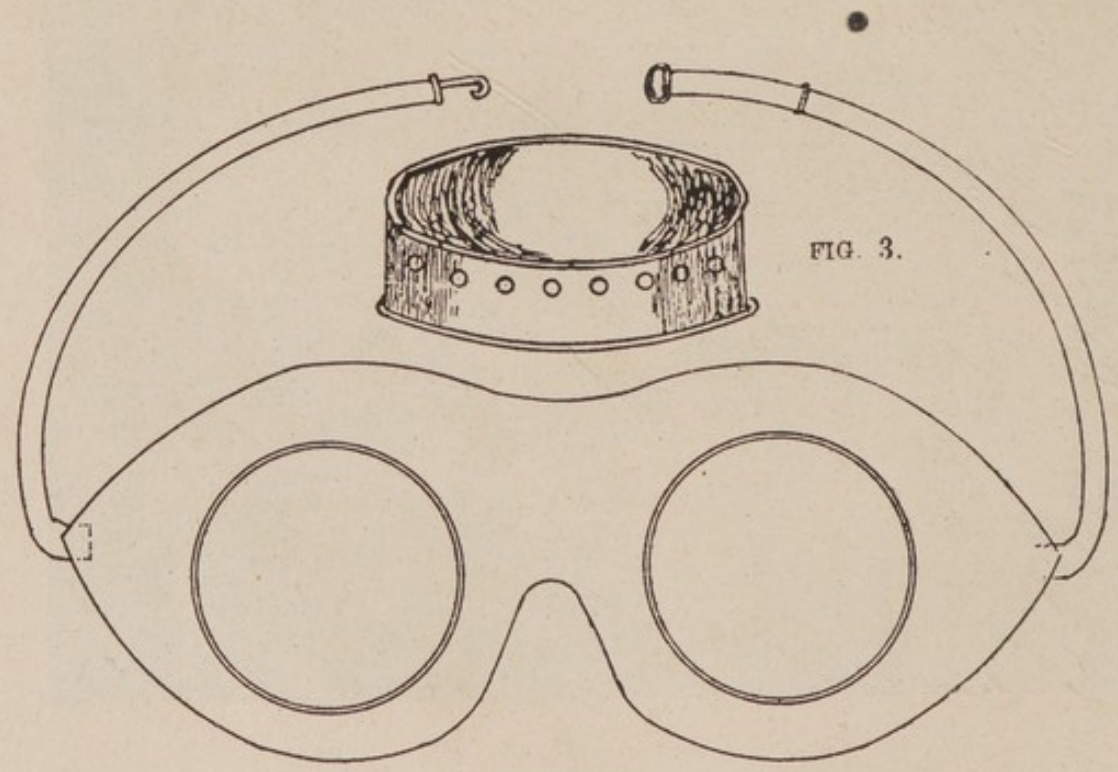

FIG. 3.

FIGURE 2.

Chapter XI.

THE PROTECTION OF THE EYESIGHT.

The rapid extension of munition work has led to a great increase in the number of accidents and injuries to eyes. The result has been not only personal suffering and inconvenience, but also serious loss of time and a reduction of output. The eyes are among **the hardest worked of all the organs of the body,** and they are extremely sensitive to external conditions. It is therefore not surprising that a number of special eye diseases and injuries from accidents to the eyes have come to be associated with particular processes in certain industries. Diseased conditions of the eye and defective vision are very common, and are **a serious and widespread cause of inefficiency.** Every effort, therefore, should be made to prevent them.

Industrial work may cause impairment of eyesight in three principal ways :—

(*a*) Injuries due to exposure to **intense heat or industrial poisons ;**

(*b*) Accidents due to **flying particles,** impacted bodies, &c., from lathe and grinding work ;

(*c*) Eyestrain due to **uncorrected errors of refraction** or other causes.

Apart from the immediately irritative effect associated with such work as acetylene welding, the influence of prolonged exposure to intense heat and light may take a long period to manifest itself. The effect upon eyesight of certain industrial poisons, such as lead, is in the bulk small, and no special action in regard to this matter is called for.

Accidents. There is reason for belief that eye injuries in munition works are relatively more frequent than in normal times, and that for engineering factories these cases probably represent about 7 per cent. of all accidents.

The accidents are mainly due to **particles of metal** which enter the eye ; the majority are slight in character and should give rise to no permanent damage if properly treated. To the minority (*i.e.* injuries sufficiently serious to come under observation) must, however, be added the graver conditions arising from infection following upon " fires " or other trivial eye injuries. Account must also be taken of the time lost and temporary inconvenience suffered from a much larger number of slight causes which may only incapacitate the sufferer for short periods, perhaps half a day. In so far as immediate reduction of output is concerned, these slight cases have probably a greater effect than the more serious injuries. Speaking of these cases, an ophthalmic surgeon writes :—

> " In most instances the actual physical damage is slight, and the worker will be able to resume his duties in a few hours, or utmost in one or two days, if only the injury to the eye be promptly and skilfully treated. If, on the other hand, the injury be neglected or if it be treated by anyone who is unskilful or careless, sepsis will almost certainly occur ; and all experience teaches that infection of the wound is a far greater danger than the actual physical damage to the ocular structures. The occurrence of sepsis at once transforms a very trivial injury to the cornea into a suppurative keratitis, which may run a prolonged course, lead to more or less impairment of sight, and in serious cases even destroy the eye."

Eye Strain. Broadly speaking, eye strain may be due to defects of vision or to the nature and conditions of work. It may be accentuated by age, fatigue, or unsatisfactory health of the worker ; by near-distance work, insufficient or excessive illumination and " glare," abnormal position, or long hours. For munition work the eyesight of the worker should never fall much below that of normally useful vision. For fine work the eyesight should be approximately normal. Notwithstanding the important bearing of good eyesight upon output, **the question has not hitherto received adequate attention.** Eye strain, including headache, may be one manifestation of general fatigue. It is thus likely to become more marked when long hours are worked, when night shifts

are necessary, or when workers are under-nourished, anæmic, or of poor general physique.

Many conditions likely to cause temporary or permanent damage to the eyesight of munition workers are admittedly preventable, while prompt and effective treatment of the injury when it has occurred will reduce suffering, hasten recovery, and lessen the chance of permanent injury.

Methods of Prevention.

To prevent accidents the first step is to take **general measures** such as the provision of suitable lighting throughout the factory, the establishment of canteens, and the allowance of adequate time for sleep and rest. Special arrangements naturally vary according to circumstances.

Secondly, there is the **Examination of Eyesight.** When operatives are being engaged for fine work, their eyesight should be tested by a medical officer, or, if he is not available, a nurse or welfare supervisor should apply simple eye tests to discover whether the vision is normal. Any worker who fails to reach the standard adopted should be referred to an ophthalmic surgeon or eye hospital for regular examination, and, **if necessary, supplied with glasses.** When workers are examined for glasses, the nature of the work to be performed should be specified whenever possible. For many people, and particularly those past middle-life, the glasses which give the best acuteness of distant vision do not also enable the owner to do fine work at close range and vice versa. Workers who complain of frequent headache, pain in the eyes, or show signs of conjunctivitis should also be tested.

Thirdly, there are **Eye-guards and Goggles.** Under certain conditions the eyes should always be guarded from flying particles of metal. To be effective, an eye-guard should

(*a*) prevent particles reaching the eyes from in front, from either side or from below. Practically nothing enters from above ;

(*b*) be light and comfortable, allowing free play of air ;
(*c*) not impede vision or become obscured by the impact of particles ;
(*d*) be strong and cheap.

The fact that no particles are likely to enter from above is important, because the upper part of the goggle can be left open to allow of ventilation. A closed screen is not only hot and uncomfortable, but the transparent medium, usually glass, may become obscured by condensation of moisture. Where fine work has to be executed there must be clear vision, and for this there is no better medium than glass goggles. The objection has been raised that glass broken by a flying particle may be driven into the eye and cause a worse injury than if it were not present. Such accidents appear, however, to be exceptional, and a foreign body of considerable size would be required to inflict it. Glass such as is used for shooting-goggles, of sufficient strength to stand the impact of pellets of shot should be employed. The main objection to glass, or, indeed, to any other transparent medium, is that after a time it becomes pitted and obscured. Eyeguards should therefore be so made that the glass can be easily removed and cleaned or replaced (see illustrations). Where there is exposure to bright light, as in the process of acetylene welding, the glass should be tinted or specially prepared to obscure the chemically active rays at or beyond the violet end of the spectrum. Dark blue glass is used for the purpose, but pale green or yellow tinted glass is preferable.

Treatment of Accidents.

First-aid treatment is all that can be rendered effectively in the factory. Every precaution should be taken to avoid increasing the injury by well-meant but misdirected efforts to give relief. Where a surgery exists all eye injuries should be sent direct to it, no treatment being attempted in the workshop. **If a doctor is available, the case should be referred to him at once.** If the injury is not serious and he is not available, the nurse in charge of the surgery should render first aid, the patient

being then sent to a doctor or hospital, even though the injury is apparently slight. At any factory where such injuries are common, the nurse should have had some ophthalmic training.

If there is no ambulance provision or a nurse, first aid can only be given by a fellow workman, who should be instructed as to the routine treatment which may suitably be applied. He should be **forbidden to exceed his instructions,** otherwise, though he may be successful in removing the offending particle, infected ulcers may follow the operation, or he may even perforate the cornea. First aid is mainly needed to relieve pain and should usually be limited either to the use of eye drops, which may be applied from a suitable bottle, or to a pad and bandage.* A camel's hair brush kept in the appropriate solution may be provided for the removal of visible particles which are not impacted or embedded, but its use should not be encouraged. After relief from pain the patient should be sent at once to a doctor or hospital.

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* Eye Injuries. (Home Office First-Aid Leaflet.) :—

Apply the eye drops† to the affected eyeball by means of the camel-hair brush in the bottle.

Do not try to remove any particle which cannot be brushed away.

Tie up with a clean handkerchief or bandage.

Go to a doctor *at once*.

Prevention is better than cure ; therefore, if your work entails danger to the eyes,

Wear Goggles.

Goggles have saved hundreds of eyes ; thousands have been lost for want of them.

† Instructions to chemist for making eye drops :—

Cocaine – – – – 0·5 per cent.,
Hyd. Perchlor. – – 1 in 3,000,
in castor oil.

Weigh 95 grammes of castor oil into a flask capable of holding twice the quantity. Add 0·5 gramme of powdered cocaine. Warm on a water bath till dissolved. While the solution is still warm (but not hot) add 1 cubic centimetre of a solution containing 3·3 grammes of mercuric chloride in 100 cubic centimetres of absolute alcohol. Mix the solutions by rotating the flask.

About half an ounce, or 15 c.c., of this solution should be supplied in a bottle from the cork of which a camel-hair brush is pendent in the fluid.

Chapter XII.

INDUSTRIAL DISEASES.

Legislative Provisions.

(*a*) The Factory and Workshop Act, 1901, contains numerous provisions for safeguarding the health of workers employed in certain "dangerous and unhealthy industries." **Section 73** requires the notification to the Chief Inspector of Factories of cases of poisoning from **lead, phosphorus, arsenic, mercury,** and **anthrax** by the medical practitioner attending the case. By an Order of January 1916, **toxic jaundice** was added, that is to say jaundice due to tetrachlorethane, T.N.T., or other nitro or amido derivatives of benzine, or other poisonous substance. The employer must also notify these cases to the Inspector of Factories and the Certifying Factory Surgeon. **Section 79** gives the Secretary of State power to certify that a process is dangerous, and to make such Regulations as appear to him reasonably practicable and prescribe the conditions under which employment in the process shall be carried on. These regulations impose duties on both the employer and the worker. Such Regulations have been made for the various lead processes, and also in connection with the manufacture of T.N.T. **Section 82** requires that the Regulations shall be posted up in conspicuous places where they may be conveniently read by the persons employed.

(*b*) Acting under the powers conferred by Regulation 35 A.A. of the Defence of the Realm Regulations, the Ministry of Munitions, with the concurrence of the Secretary of State, has made Regulations dealing with the **use and manipulation of T.N.T.**

(*c*) Under Section 8 of the Workmen's Compensation Act, 1906, the Secretary of State has power to make Orders extending the provision of the Act to diseases contracted in the course of employment. Several Orders* have been made extending the provision of the Act, under

* Statutory Rules and Orders, 1913, No. 814 ; 1914, No. 1007 ; 1915, No. 660 ; 1916, No. 286.

certain conditions, to **toxic jaundice, dermatitis** and other diseases arising from the manipulation of T.N.T. and other industrial poisons.

TRINITROTOLUENE (T.N.T.).

T.N.T. when manufactured and used in a pure condition or compounded with ammonium nitrate (**amatol** or **ammonal**), is by far the most important of the dangerous substances used in the production of high explosives. Danger arises not only from its explosive power but from its liability to affect the health of the workers exposed to it. Operatives engaged in its manufacture, packing or loading, may become affected. Apart from this, unless the incidence of poisoning is rigidly controlled other workers may become disorganised through fear of contact, and fresh labour may become difficult to obtain.

T.N.T. may be absorbed through the skin or through the digestive tracts, or by inhalation of fumes or dust. Poisoning normally takes one or more of the following forms :—

(*a*) T.N.T. stains the skin yellow. Skin Disease (**Dermatitis**) is due to a direct irritant action. Some workers are more susceptible than others. The effects, like those of other irritants, are increased by flushing, perspiration, and mechanical friction. Localised rashes, especially where there is pressure or friction as from bands or ill-fitting clothes, are common. The parts most frequently affected are the hands, wrists, face, neck, and feet. There is ground for the view that dermatitis is distinct in its incidence from other forms of its poisoning.

(*b*) **Digestive troubles.**—Gastritis, with pain in the stomach, vomiting, and constipation, may be early symptoms.

(*c*) **Blood changes** may be shown in characteristic pallor or duskiness of the skin with blueness of the lips, and by breathlessness upon slight exertion. These signs are an indication for cessation from work, during which they will generally disappear rapidly. They must be taken as a warning that the absorption of

T.N.T. is going on, and if this cannot be explained by faulty factory conditions or by careless and unnecessary handling — when proper precautions ought to prevent recurrence —they point to a special susceptibility, and the worker should be transferred to other employment.

(*d*) **Liver degeneration, "toxic jaundice."** — Jaundice is here a sign of gravely serious illness, and will be shown by a yellow tinge first of the whites of the eyes and later by yellowness of the skin. (This must not be confused with the yellow staining which T.N.T. itself may cause in the skin by direct contact.) Jaundice may appear without obvious warning, though rarely before the fourth week of employment, and it is probable that in almost all cases it arises after a preliminary warning, which has been given by the blood changes just mentioned but which has been overlooked. Every effort should be made to recognise the first beginnings of this illness, and to take them as an indication for immediate cessation from all T.N.T. work and for proper medical treatment.

To detect a case of T.N.T. poisoning care must be taken to avoid confusion with digestive disturbances due to other causes. Accounts given by patients may be unintentionally misleading. The yellow staining which usually occurs with T.N.T. cannot be taken as in itself a sign of poisoning. The following points are the more important indications of T.N.T. poisoning :—

(*a*) Pallor of the face and an ashen grey colour of the lips, tending to disappear if the worker becomes excited, as by medical examination. Sometimes the lips and tongue are purple in colour ; the tongue is generally free from fur.

(*b*) The character and situation of the stomach pains.

(*c*) The presence of constipation and stomach distention.

Treatment when jaundice is absent should be simple and successful. It should include the (1) immediate removal from contact, (2) rest in bed for a day or two, (3) a diet consisting of milk, milk puddings, fruit and green vegetables, with drinks such as barley water, tea and coffee. **If jaundice is present, rest in bed from the first is essential.** Milk should be given in small quantities to begin with, the amount being slowly increased to four pints a day.

The occurrence of T.N.T. poisoning depends sometimes upon personal idiosyncrasy. Women do not appear to be more readily affected than men. Boys and girls may be more susceptible than adults, and, in consequence, their employment has been forbidden under the age of 16, and is only allowed under the age of 18 with the special consent of the Ministry. Serious poisoning seldom occurs within the **first four weeks of employment.** While the great majority of workers are insusceptible and remain so, a small minority are susceptible and liable to succumb between the 5th and 15th week of exposure. The few affected are not always those who owing to ill-health or malnutrition might be expected to be especially liable. Industrial conditions, though important, have perhaps less influence than personal idiosyncrasy.

It is essential that strict measures should be taken for prevention. The precautions prescribed by the **Regulations of the Ministry*** for the use and manipulation of T.N.T. are as follows :—

(*a*) Exposure to dust and fumes should be reduced to a minimum by cleanly methods of work and by ventilation and cleaning of workplaces.

(*b*) No person may be employed for more than a fortnight without an equal period of work at a process not involving contact with T.N.T., unless such employment has been specially approved by the medical officer of the factory.

(*c*) It is of the utmost importance that all workers should obtain ample and suitable food. Every person employed should be supplied gratis daily with half-a-pint of milk.

* The Regulations are given in full in Appendix F (page 135).

(*d*) Special working costumes should be provided for all persons employed. These should be cleansed or renewed at least once a week.

(*e*) Cloak-rooms should be available where clothing put off during the working hours should be placed.

(*f*) Washing facilities are essential, with a suitable supply of soap, nail brushes, and towels.

(*g*) A constant medical supervision should be exercised not only by formal medical examination but also by scrutiny of the workers while at work. The medical officer should have power of immediate suspension where necessary. Careful health records should be kept.

(*h*) A special official should be appointed to secure the carrying out of the prescribed regulations. A woman welfare supervisor is also essential wherever women are employed.

Similar preventive measures are required by the Home Office and the Ministry for the manufacture of T.N.T.

Lead.

Disease and its causes.—Operatives come in contact with lead and its compounds in a variety of processes in munition factories :—

In (*a*) smelting lead and spelter ;

(*b*) making sheet lead and bullets ;

(*c*) file cutting ;

(*d*) hardening and tempering metals ;

(*e*) common tinning ;

(*f*) soldering and plumbing ;

(*g*) the manufacture of accumulators and of indiarubber ; and

(*h*) the use of lead paints and red lead.

Under industrial conditions lead gains access to the body principally by the **inhalation of lead fumes or dust.** Lead tends to accumulate in the body, and careful investigations have established that a daily dose of as

little as 2 milligrammes must be regarded as capable, when inhaled as fume or dust, of setting up chronic poisoning. Lead may also enter the system through the digestive tract, by eating with unclean hands, or by putting pipes or other articles into the mouth while the hands are soiled with lead. Lead is a cumulative poison, that is to say, even small doses absorbed day after day tend to collect in the system and finally cause disease; but, as in the case of T.N.T., exposure prolonged over months appears to establish a degree of immunity.

Symptoms of lead absorption :—

(*a*) Blue line at the edge of the gums.
(*b*) Headache.
(*c*) Colic pains.
(*d*) Constipation.
(*e*) Great pallor of the face.
(*f*) Muscular weakness.

Prevention.—The prevention of inhalation of dust or fumes is the principle underlying the Regulations made by the Secretary of State for the chief industries concerned with that manipulation of lead and its compounds. Inhalation of lead in the form of fumes or dust can only be avoided with certainty by **preventing the production of dust** (*e.g.*, by keeping all lead material damp), and by ensuring the lead fumes do not escape into any place in which work is carried on. The nature of certain processes, however, may render the production of dust inevitable or the escape of fumes possible. Under such conditions **localised exhaust ventilation** should be applied as close as practicable to the point of origin, so as to withdraw the dust or fumes from the atmosphere of the workplace. **Respirators** may be required in a few exceptional cases, but as a protection against dust only a few of the many forms of respirator obtainable are effective, and no one of them is comfortable to wear; while as a protection against fumes no respirator exists which an operative can be asked to wear for prolonged periods.

To prevent lead entering the system through the digestive tract the following special steps should be taken :—

(*a*) **Smoking** should be prohibited in all places where lead is manipulated.

(*b*) **No person should be allowed to take a meal** or to remain during the time allowed for meals in any room where lead is used.

(*c*) **Special mess-rooms or canteens** should be provided where workers can take their meals. Good food is of special importance in helping a worker to resist poisoning. In particular, workers should not commence work without having taken food. Evidence shows that hungry and ill-fed workers succumb more readily than others, and excellent results have been obtained from supplying workers with at least half-a-pint of **milk or cocoa** before starting work in the morning.

(*d*) **Overalls** should be provided and cloak-rooms established, separate provision being made for the keeping of outdoor clothes and overalls respectively ; they should never be allowed to come in contact with one another.

(*e*) **Special washing facilities** should be provided, and should be sufficient to enable the workers not only to wash their hands but also their faces, necks and arms. Such facilities will only be effective if a sufficient supply of hot and cold water, clean towels, soap and nail brushes is always available.

In some processes the employment of women, boys and girls is forbidden. Where it is allowed **boys and girls should be closely watched,** because they are not so likely to observe the necessary precautions as grown-up people. Women should be especially careful, as the injurious effect of lead in them may seriously interfere with the health of their children or cause miscarriage. Only healthy and temperate persons should be employed.

The manifestations of poisoning can be detected by a medical man, and their presence indicates that the worker should be transferred to other work. The Home Office Regulations require employers to have persons engaged in various lead industries **examined periodically** by a surgeon, who is entrusted with powers of suspension from work. This medical supervision has been found of much value, and has been widely adopted even in industries not governed by Regulations. It may be usefully extended to all factories where the use of lead oxides or other of its many compounds may have been introduced into the manufacture of munitions. In the handling of metallic lead, *e.g.*, bullets, the risk of poisoning is slight, and medical supervision is less important.

Fulminate of Mercury.

Disease and its causes.—In the manufacture and use of fulminate of mercury there is a liability to mercurial poisoning and eczema. Owing, however, to the small amounts manipulated the symptoms of mercurialism are seldom marked, but soreness of mouth and gums (with or without a blue line) may occur, appetite may be impaired, headache, internal pains may be present, and there may be nervousness and depression. The last symptom is important, not merely as a sign of illness but as an indication that the operative should be removed from dangerous work which calls for a steady hand and a clear head. Eczema of the hand, forearm, and face commonly occur, and may cause serious disability.

Prevention.—The principal preventive measures to be adopted should include :—

(*a*) The provision of overalls and of adequate cloakroom and washing accommodation ;
(*b*) Adequate facilities for obtaining food. No worker should be allowed to commence work without food ;
(*c*) Careful selection of workers ;
(*d*) Where exposure is marked, periodical medical examination ;
(*e*) Transference to other work of those specially affected.

Tetryl (tetra-nitro-methyl-anilin).

Disease and its causes.—Manipulation of this explosive produces a light dust, which may cause troublesome eczema. Individuals vary in their susceptibility ; some appear to be almost immune, while others can hardly enter a room where tetryl is handled without suffering severely. Observation suggests that this may depend on the varying natural dryness or moistness of the skin of different persons. The parts most frequently affected are the conjunctivæ, the openings of the nostrils, and the chin. The hands and arms are less often affected, and in this the eczema caused by tetryl differs from that due to tri-nitro-toluol, which usually affects the forearms and hands. Operatives manipulating tetryl may also suffer from headache, drowsiness, and lack of appetite in varying degrees of intensity.

Prevention.—The principal measures to be taken consist in :—

(*a*) Avoiding the escape of dust by carrying out manipulations in glass cupboards with armholes for introduction of the hands.

(*b*) Providing light gauze veils to protect the faces of the workers.

(*c*) Supplying, if veils are not worn, some simple powder (such as a mixture of one part of zinc oxide to two parts of starch) for applying to the face before beginning work.

(*d*) Providing adequate washing accommodation and encouraging the use after washing of an application for the skin.*

(*e*) Excluding workers who show special susceptibility or idiosyncrasy.

Apart from its tendency to cause eczema, tetryl stains the skin and hair ; in order to prevent this, overalls and

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* An application found of value to prevent eczema is a mixture of two parts of castor oil to one part of lanoline ; this mixture, which should be rubbed into the skin after washing on leaving work, should be placed in the lavatories for general use.

gloves, similar to those recommended for workers manipulating tri-nitro-toluene should be worn, and, where women are employed suitable head-coverings should be used.

Picric Acid.

Picric acid (Melinite or Lyddite) is known chemically as tri-nitro-phenol, and is made by the nitrating action of mixed acids upon carbolic acid. The manufacture, though simple, exposes those engaged in it to risk of the inhalation of nitrous fumes. Workers engaged in the use of picric acid, however, are usually regarded as being employed on a non-poisonous occupation. Those handling it usually become dusted over with a fine yellow powder which stains the hair and exposed skin surfaces of the body a bright canary yellow colour. Occasionally an irritating dermatitis of a simple type is found on the hands and forearms; and those who are commencing work for the first time in picric acid may have an initial gastritis, which passes off in two or three days. Systemic poisoning, however, is practically unknown among picric workers, and much confusion has arisen between the negative effects of picric acid and the ill effects of T.N.T., since both stain the skin a yellowish colour and workers are apt to call all shell filling work T.N.T.

Except in relation to nitrous fumes, which are dealt with below, no special precautions are called for.

Nitrous Fumes.

The present demand for explosives, nearly all of which are products of nitration, has introduced increased risk of exposure to nitrous fumes, not only in nitrating processes, but also in the manufacture of nitric acid to be used in these processes. The Factory Department of the Home Office have issued the following memorandum:—

> In the manufacture of nitric acid, and in its use for various purposes, particularly in the manufacture of explosives, danger exists of accidental escape of nitrous fumes into the workplaces. The full effect of inhaling these fumes is not felt immediately, and unless workers are warned of the

danger, they may continue at work and unwittingly inhale a fatal dose.

In such a case the affected person develops an irritating cough which becomes steadily worse, until, three or four hours after exposure, he becomes seriously ill, suffering from marked dyspnœa and collapse ; sometimes these symptoms have come on after leaving work on the way home. The secretion of mucus now becomes profuse, and vomiting which helps to clear the air passages, may occur. The congestion of the bronchioles and alveoli progresses, and, if the case survives for 48 hours definite pneumonic consolidation may develop. More frequently a fatal issue results in about 30 hours, the patient remaining conscious until near the end.

Every case exhibiting the initial symptoms does not progress to a fatal termination, and recovery has occurred even after marked collapse and dyspnœa.

Prevention.—Notices warning those employed of the danger of remaining in an atmosphere containing nitrous fumes should be posted in every place where there is any possibility of these fumes escaping.

Emergency helmets* of a pattern which can be easily and quickly put on, and provided with a fresh air supply from without, should be kept in accessible places near at hand, and the efficiency of such helmets should be tested at least once a month.

Respirators such as are efficient to intercept dust are useless against gases, and must not be used.

Treatment.—The following routine may usefully be pursued pending the arrival of a medical man :—

Make the patient lie down.

* Such helmets can be procured from Messrs. Siebe, Gorman & Co., Ltd., 187, Westminster Bridge Road, London, S.E.

Keep him warm.
See that he has plenty of fresh air.
If he is blue in the face :—

(i) Administer oxygen ; and

(ii) If he has not been sick, give a drink of 1 ounce of salt in 10 ounces of lukewarm water and repeat the dose until he is sick ;

(iii) Meanwhile, send for a doctor.

Persons even apparently slightly affected must not be allowed to walk home until permitted to do so by the doctor.

Dermatitis.

Disease and its causes.—The occurrence of serious dermatitis, or eczema, caused by exposure to trinitrotoluene and to tetryl has already been referred to ; and similar trouble may result from exposure to fulminate of mercury. Apart, however, from these special substances, eczema is liable to occur among munition workers employed in engineering works, who come in contact with certain fluids used to lubricate and to cool metals. Two forms of inflammation of the skin, which, however, may coexist, result—(i) yellow pustules and boils, and (ii) more general inflammation which in marked cases develops into typical weeping eczema. Probably the occurrence of pustules and boils is due to sebaceous glands and hair follicles becoming blocked and infected with oily grime rubbed in by soiled overalls. The more general inflammatory conditions appear to be caused by the direct action of the fluids used, accentuated by the abrasive effect of fine particles of metal produced during machining processes.

Prevention.—Clean overalls, and the provision and use of suitable washing accommodation with hot water laid on, have proved to be the best means of prevention.

The First Aid Leaflet issued by the Factory Department of the Home Office contains the following advice in regard to eczema from lubricating oil :—

> " Dermatitis and eczema from oils and fluids used to lubricate and cool metals can best be prevented by cleanliness of (1) the overalls, and (2) the skin. All overalls should be washed weekly; and the hands and forearms daily in warm water before leaving the factory. Lanoline and castor oil ointment (equal parts) applied to the skin after washing is a help. When dermatitis and eczema occur washing should be stopped and a doctor seen at once."

Experience has shown that, if lubricating and cooling fluids are filtered free from metal particles, and if they contain a small amount of some antiseptic, say carbolic acid up to 1 per cent. or other coal tar antiseptic, cases of eczema do not occur. Antiseptic lubricants and cooling fluids are rapidly coming into general use in engineering shops, and cases of eczema are less prevalent than formerly.

Chapter XIII.

WELFARE SUPERVISION.

Under modern industrial conditions the employer usually has neither the time nor frequently the experience to give the requisite attention to many of the complicated problems affecting the health and welfare of his workers. There has therefore been an increasing tendency, notably where women or boys are employed to **appoint an Officer specially for the purpose.** This Officer is generally called a "Welfare Supervisor" or "Welfare Superintendent."

Welfare Supervisors.

Before setting out the various duties which may be assigned to Welfare Supervisors, it may be well to enter a caution against certain misunderstandings which are liable to arise as to the aim and purpose of welfare supervision. In the first place, it will permanently succeed only in so far as it proves to be of definite benefit to the employer and employed alike, and it will fail in so far as any endeavour is made to conduct it in a spirit of patronage or superficial philanthropy. Secondly, any scheme of welfare supervision must be **based on an adequate wage system.** Without this failure is inevitable. Lastly, welfare supervision is not intended to and cannot replace trades-unionism. Welfare Supervisors, if they are to be successful in removing adverse conditions, must be in sympathy with the workers and able to keep the employer personally informed of their circumstances and desires, both individually and collectively. Supervisors ought not to interfere with the work of the Trades Unions; they are after all the servants of the employer and cannot as such be accepted as the authorised and official representatives of the workers, even as regards matters which affect only the conditions in the particular factory in which they are employed.

*Duties.**

While the opportunities of useful work open to good Welfare Supervisors may be almost unlimited and cannot in all directions be clearly defined, the evidence shows that it is essential that they should possess a recognised **status** and should have certain specified **duties.** What these duties are will depend upon the circumstances of the factory and the capacity and status of the Supervisors. The following include the principal duties which have been successfully undertaken in different factories.

Engagement of Workers.—The selection of women or boy workers as regards their general suitability should be undertaken by the Welfare Supervisor, persons to be employed in a particular department being, if necessary, subsequently chosen by a foreman or other person responsible for the work from a technical standpoint.

When workers are medically examined, the Supervisor should be informed of any physical conditions likely to affect the operative's work.

Whatever their exact duties in these respects may be, Supervisors should always have an early opportunity of getting into touch with a new worker in order from the first to establish those personal relationships upon which the success of their work largely depends. A few words of friendly conversation may be of great assistance in making the new workers appreciate the aim and the purpose of the work, and in familiarising them with their strange surroundings.

Records.—A record should be opened for each new worker containing information as to age, physical condition, home circumstances, &c.

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*Pamphlets setting out shortly the duties of Welfare Supervisors, for women and for boys respectively, have been prepared by the Health and Welfare Section of the Ministry of Munitions (6, Whitehall Gardens, London, S.W. 1), and can be had on application.

To this record should be added from time to time details of progress, ill-health, broken time, and other matters likely to prove of value. Apart from their immediate purpose such records may prove of material assistance in determining the suitability of the worker for other employment after the war.

Lost Time, Sickness, Poor Output, Incapacity.—All such cases should be reported to the Supervisor, whose duty it should be to investigate the causes and, where practicable, to take steps to remove them.

Wages.—Though Supervisors have no responsibility for fixing the wages, they should receive particulars of the wages earned by all workers, or at any rate by all those who fall below a certain level. The amount of the wage may afford a valuable indication of the progress of the worker. Further, low wages mean low output, and it is obviously important that the causes should be ascertained in each case. Low wages may be due to illness, fatigue, slackness, unsuitability of the worker for the job, difficulties of housing and transit, home troubles, and sometimes an inequitable operation of the wage system.

Dismissals or Withdrawals.—It is a common experience of industrial firms that a large number of workers, and especially boys, leave work for various reasons within the first few months of their employment. This leakage represents a serious loss of efficiency, and all cases should be investigated by the Supervisor. Departure may be due to ill-health, change of residence, or marriage (in the case of girls); or it may be due to general dissatisfaction, dislike of work, disappointment over wages, or a simple desire for change. Cases of proposed dismissal in particular, should be carefully investigated in order to determine the real

causes of trouble and to remove possible misunderstandings.

Working Conditions. — Supervisors should always be intimately informed as to the working conditions in the factory (*e.g.*, hours of work, wages, ventilation, heating, seats, lavatories, rest-rooms, and cloak-rooms). Any complaints or representations should be fully and promptly investigated. In some instances the remedy for defects may lie within their own competence. More often it will be their duty to bring them to the notice of the General Manager or other Officers, according to the nature or importance of the defect. These duties are fundamental, and experience shows that if wisely performed they do not, as has sometimes been feared, in any way undermine the authority of the foreman or other officials.

Night Supervision.—Close supervision of women and girls, especially at night, is greatly needed, owing to the strain of the night shift and on moral grounds, and it should be an important duty of the Welfare Supervisor. Ordinary factory oversight is often more difficult at night than during the day, and may become somewhat lax.

Home Visiting.—Wherever practicable, home visiting should be undertaken. Workers who are ill may be visited in order to ascertain that they are properly cared for—a matter often of considerable difficulty in crowded areas. Apart from this, visits may usefully be paid to the parents of boys and girls and the opportunity taken to discuss with them the merits and progress, as well as the demerits, of their children. Misunderstandings as to wages can be removed. Parents as a rule greatly appreciate periodical reports as to progress, conduct, and time-keeping.

Feeding Arrangements.—The Supervisor should ascertain that workers can obtain suitable and nourishing food, and that adequate and convenient facilities are available for its preparation, purchase, or consumption. Where mess-rooms or canteens are provided by the firm, the Supervisor will often be charged with their direction or supervision.

Thrift.—The Supervisor should assist in any scheme for encouraging thrift which may be established through War Savings Associations or by other means. The arrangements, at any rate, in the case of boys and girls, are generally most successful when organised in close connection with the payment of wages. They should be such as to attract those who are not naturally thrifty.

Instruction.—Though Supervisors do not themselves undertake the instruction of workers, they are frequently responsible for securing the establishment of suitable courses and for encouraging the workers to take advantage of them. At the present time any extensive provision is unfortunately impracticable, but some firms have made arrangements for new workers to be instructed in the technical methods of the work they are to undertake and for them to be given a general outline of the aim and purpose of the work of the factory. Such instruction has proved to be valuable in promoting technical efficiency and in stimulating interest. It also affords an opportunity for determining the kind of employment for which the worker is likely to be best fitted.

Housing and Transit. — Supervisors should acquaint themselves with the facilities for housing available for the workers, and also as to the adequacy of the facilities for travelling to and from the factory. It may be necessary to

keep a register of suitable lodgings where this duty is not undertaken by outside agencies.

Recreation.—Facilities for indoor and outdoor recreation are of extreme importance for the health and welfare of the worker. Where existing organisations are insufficient to meet the needs, the Supervisor may have to take steps to secure some provision for Organised Games (especially for boys) and evening clubs. In some instances facilities for rest and recreation during intervals of work will prove of much benefit and be greatly appreciated. The conduct of arrangements for recreation should be so far as possible in the hands of the members themselves, and the position of the Supervisor should be one of advising rather than of controlling.

The duties outlined above, though mainly concerned with matters of health and individual welfare, are to some extent distinct from those usually entrusted to trained nurses or to the medical staff engaged to render first-aid or subsequent treatment of accident and sickness. The advantage, however, of bringing the work of the nurse into touch with that of the Welfare Supervisor is manifest, and in suitable cases the duties of Welfare Supervisor may be properly undertaken by the nursing staff—strengthened and, if necessary, re-organised for the purpose. When the number of employees is small, and full-time service is not required, the duties of Welfare Supervisor may be undertaken by an existing member of the staff who possesses special qualifications for the work, and is given the time and status requisite for its proper performance.

Qualifications.

Welfare Supervisors should be directly **responsible to the General Manager,** should act on instructions received from him, and refer to him direct in all questions of difficulty. The qualifications and personality of Supervisors should be such as to fit them for responsibility and

to command the respect of workers and foremen. They should be of good standing and education, of experience and sympathy, tactful and sensible in dealing with others, and should possess a good understanding of industrial conditions. (A period of actual work as an operative is of great value.) Experience of clubs or other forms of social work greatly assists towards a proper understanding of and sympathy with the worker. A number of short courses of training have recently been held which, though necessarily limited in their scope, have been of much assistance in fitting Supervisors for their duties and responsibilities. It is to be hoped that as the demand for candidates to fill new appointments grows less urgent and immediate, it will become the normal practice for all Supervisors to undergo a regular course of training before commencing work.*

Supervisors for Women.

The Health of Munition Workers Committee, in their Memorandum No. 2 on "Welfare Supervision," expressed the opinion that the appointment of Women Welfare Supervisors was urgently necessary **in all cases where women are employed.** The Ministry of Munitions, in addition to requiring such appointments to be made in all factories where T.N.T. is used, have been active in securing the general adoption of the recommendation. In this policy they have had the cordial co-operation of the Home Office, who only allow women and girls to be employed at night where a woman supervisor or responsible forewoman is appointed to supervise their welfare. As the result of the policy pursued several hundreds of appointments have been made during the last eighteen months.

Supervisors for Men and Boys.

In the same memorandum the Committee also recommended the appointment of Welfare Supervisors in any factory where **100 boys** are employed, and

* Courses of Social Welfare and allied subjects are provided at the London School of Economics and at most of the Universities. Particulars may be obtained from the Health and Welfare Section of the Ministry of Munitions, 6, Whitehall Gardens, S.W. 1

experience shows that appointments can advantageously be made even where the numbers are smaller. The need for such appointments is equally great whether the boys are employed in a body or whether they are separately employed to help men, though in the latter case the difficulties of supervision are frequently greater. Much has been done by the Welfare Department of the Ministry to enlist the interest of employers, but development has to some extent been limited through the lack of suitable candidates, which must continue to exist until after the war.*

The Committee further recommended that a suitable system of welfare supervision should be established in any factory where **500 men** were employed. The need

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* It may be of interest to give the following statement of duties assigned to the "Boy Visitors" in the scheme of welfare supervision for boys which has been framed for a Government Factory :—

"The Boy Visitors' work is directed to improving the boy workers' moral and material well-being and to reducing the difficulties which slackness, ill-discipline, &c., cause the factory staff.

The present abnormal conditions of work, high wages, lack of healthy recreation, and in many cases the absence of the father, tend to thriftlessness, ill-discipline and other evils.

In fairness to the boy it should be said that bad time-keeping &c., may be the outcome of genuine fatigue, illness, home troubles or discontent. It is the business of the Boy Visitor to get at the root of these troubles by personal work amongst the boys and to inform the factory officials of the knowledge which his investigation of the boys' circumstances, home life, &c., will give him.

The Boy Visitor will, by personal guidance, work towards getting contented, well-disciplined boy workers, and the information he gathers will always be available to assist the staff in the smooth working of the factory.

1. To meet new boys on entry and keep a record of the boys' progress and career in the factory.
2. To deal with absentees and bad time-keepers—first with the boy, then, if necessary, with parents.
3. To see boys before dismissal or leaving and if necessary to see the parents.
4. To investigate shop and police reports and make recommendation thereon.

for such appointments, though less clearly defined than in the case of women and boys, undoubtedly exists, but much progress in this direction can hardly be anticipated in view of the present unavoidable dearth of suitable candidates.

Conclusion.

Though it may still be too early to form any final judgment as to the exact part which welfare supervision will play in **future industrial organisation,** the evidence already forthcoming is sufficient to leave no doubt as to the value of such supervision and of the benefits derived from it. The success attained is the more marked when regard is had to the limited experience of industrial

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5. To keep an eye on the feeding arrangements, dining halls, lavatory accommodation, &c., and to report and make suggestions thereon to the Welfare Supervision Department.
6. To enquire into and discuss with the boys their complaints and troubles, and, where necessary, present them on behalf of the boys to the proper authorities.
7. To overlook the general conditions and health of the boys, and, where necessary, arrange for medical inspection.
8. To suggest suitable candidates for convalescent homes after sickness or injury.
9. Where necessary, to visit the homes of the boys who are evidently ill-cared for, and report upon the home conditions, &c. To note specially the state of clothing and boots of boy workers.
10. To encourage and arrange recreation, sports, &c., at spare times.
11. To keep in personal touch with the boys by means of individual talks, meeting them at meal times, &c., and advising them in difficulties, encouraging them to thrift and well-doing.
12. To gather information as to boys' characters and progress and capabilities for promotion and for post-war employment.

N.B.—The Boy Visitor has no executive authority and his function is to assist the boy when he is in difficulty or trouble and to place his case in a very tactful way before the Foreman or Manager. It is emphasised that great tact is necessary in the relations of the Boy Visitors as the boys' friend with the foremen and officials. The Boy Visitor should clearly show to the officials that his work will not in any way reduce their authority, but will strengthen it and help to secure efficiency and discipline in the factory."

conditions inevitably possessed by many of the Supervisors appointed, to the newness of many of the conceptions of industrial organisation involved in the work, and to the absence of any substantial body of experience or tradition to guide Welfare Supervisors in their work. When so large a number of appointments are made in a brief period some mistakes are unavoidable, but failure where it has occurred has quite as often been due to the slowness of the management or the workers to understand the aim and purpose of welfare supervision. The difficulties in fact have only been such as were to be anticipated in the early days of what is in the main a new principle in industrial organisation. While experience may show that welfare supervision can best develop more widely in some directions than in others, there is no reason to doubt its substantial value.

Chapter XIV.

OUTSIDE FACTORY CONDITIONS.

The present position may be briefly stated as follows :—

(i) By the agency of the State, men, women, and boys and girls are being exported from their homes and imported into munition areas.

(ii) By the agency of the State the liberty of the individual to throw up his or her work and to take labour elsewhere has been restricted, though now relaxed.

(iii) On the State, therefore, the responsibility lies, not only for caring for workers inside the factory, but also for providing outside the factory the safeguards needful for their health and morals, the maintenance of which is essential to the nation.

The problems of health outside the factory which present themselves for solution may be roughly grouped under three heads :—(*a*) Personal, (*b*) housing, (*c*) leisure.

Personal Problems.

Only normally healthy and wholesome persons should be exported.—In some cases women and girls received in lodgings and hostels have been found to be in such a condition of person and clothing that the help of the sanitary authority had to be invoked for cleaning or disinfection. In other cases, men, women and girls have been imported who suffer from physical disabilities, or are in an unsuitable physical condition. In some instances women of bad character have been associated in lodgings or hostels with respectable women and girls. Such instances, if not numerous, yet have far-reaching effects, and rumours of such run quickly through a neighbourhood, losing nothing by repetition, and cause many housewives to close their doors against munition workers as lodgers.

All women and girls, before being exported, should be examined by a nurse, and if considered necessary should be referred to a doctor for a medical certificate.

Mothers of infants or of families of young children should not be exported.

No person should be exported without a sufficiency of clothing or of money.—Women and girls frequently arrive at munition centres without luggage or any clothing except what they are wearing, and without any money. As the first wages are not due for a week, and frequently are not paid until after ten days or a fortnight (the first week or a few days' wages being kept back), the plight of these women and girls in a strange town is not only uncomfortable, but a serious danger.

Women travellers across country should be seen off and met at the station.—The local Labour Exchange, Advisory Committee, or district agents should be invited to assist in regard to these matters.

Housing Problems.

Suitable and sufficient board and lodging should be provided for all exported women and girls not otherwise provided for.—For this purpose there should be provided :—(*a*) Reception or clearing house, (*b*) hostels, (*c*) lodgings, (*d*) convenient means of transit, (*e*) arrangements for sickness, and (*f*) arrangements for maternity cases.

The congregation of great numbers of workers in particular centres has necessitated large schemes of temporary housing. In some areas, clearing houses and hostels have been established in existing buildings by voluntary agencies, and also by the State acting either directly or through the agency of private firms. In addition, the State has had to erect temporary hutments, providing in some instances for several thousand workers.

Hostels are not generally attractive to industrial workers who are unused to communal life, moreover the housing together under new conditions of large numbers of women and girls of various ages and classes creates difficulties not easily overcome. Much depends on the personality of the Lady Superintendent and the character of her assistants and servants, who should be

carefully chosen and controlled. As much freedom as is compatible with good order should be allowed to the inmates who are independent workers not living under any community rule. The bedrooms should be separate self-contained cubicles. The public rooms, dining and recreation rooms should be bright, airy and well warmed ; in addition, the need for rest and the companionship of a few friends should be met by a sufficient number of small sitting rooms. Their absence has doomed some otherwise good hostels to failure, since many women and girls soon tire of organised recreation night after night, and having worked hard in a factory for many hours, crave the quiet rest of a room more nearly resembling home. The cost of building a temporary hostel of wood, concrete blocks, or other temporary material is about 7d. per foot cube (say £20–£40 per place), including necessary dining and recreation rooms but exclusive of paving, fencing, drainage, and road making. Furnishing and equipment costs £18–£20 per place. The cost of catering per head per week varies from 10s. 6d. to 15s., and including all current charges 15s. to 20s. Associated with hostels there are sometimes rest homes.

Lodgings, with or without board, with a family is the readiest and generally most acceptable arrangement for women and girls. In many localities " Lodgings Committees " exist usually as Sub-Committees of the Local Advisory or other Welfare Committees, and the Ministry of Munitions has recently developed a scheme by which not only is a lodgings register compiled and kept up to date but the lodgings are systematically inspected by voluntary or paid " Investigators " working under the direction of the such committees. By this means not only are causes of friction or complaint between landlady and lodger often removed, but young girls away from home are helped when they are ill or in difficulties, and much is done to foster a friendly spirit towards the workers in the whole district. If there is serious overcrowding the Billeting Board can be called in. This Board has the power to set up special committees—or to use those already existing—and to appoint and pay Executive Officers (male or female) whose duty it is to make a complete survey of all possible lodging accommodation in the town. If the supply of voluntary lodgings is insufficient the Board can institute compulsory billeting and insist on householders taking munition workers, at the time setting up a standard both of accommodation and of payment. The Executive Officer has charge of as many Lodgings Investigators as may be necessary, and all complaints either from landladies or lodgers are at once investigated. In the last resort legal penalties can be exacted for refusal to provide adequate and decent accommodation, while, on the other hand, householders are ensured against the loss sometimes caused by defaulting lodgers, since the Board has power to pay—and recover—such debts.

Special arrangements are needed for **cases of sickness** occurring among workers living either in hostels or in lodgings. Large hostels should have an hospital attached. Small hostels should be provided with a sick-room. For lodgers living with a family, and sharing a room or bed with others, removal to a Nursing Home or a Cottage Hospital may be necessary, and local accommodation of the kind may need to be increased. Provision should also be made for maternity cases among imported workers, whether wives or single women, and special arrangements for the health and maintenance of the prospective mother may be required.

Leisure.

Recreation is a necessity for munition workers, and special provision should be made for it on behalf of the large numbers of persons away from home and friends. Especially should the leisure of the week-ends be provided for, so that the benefits which proper rest and recreation afford may be secured. This important matter cannot be left to chance. If opportunities of wholesome amusements, refreshment and recreation are not provided, the public-houses and less desirable places of entertainment may benefit, but everyone else suffers.

Steps should be taken, if possible in co-operation with the local authority, to organise (preferably with the assistance of a committee of the munition workers themselves) recreation on a scale sufficient to meet the needs of large numbers. "Winter gardens" and cafés for refreshment, music, dancing, etc., are attractive, and full use should be made of all public halls in winter and parks and open spaces in summer for entertainments, bands and sports. Social clubs, cinemas, baths, bowling greens, skating rinks, playing fields, etc., are all valuable in this way.

A rivalry between employees of different firms can often be encouraged with advantage. Not only may interest and keenness be thus developed, but each factory may come to possess an *esprit de corps* and corporate entity of its own.

The conditions, under which contributions by firms to recreation schemes can be charged against excess profits, are set out in Appendix B (page 127).

Facilities for worship, instruction and religious ministration according to the preferences of the various denominations are no less worthy of consideration for munition workers than for the Army and Navy. The existing local provision may not always be adequate or conveniently situated.

Public order.—To bring large numbers of young people into any locality must increase the difficulty of maintaining public order and good behaviour at all times. Just as in university towns there are proctors and in military centres there are military police, so where large numbers of women and girls are assembled for munition work Women Police and patrols are required. In many towns these officers are now working successfully; they are "sworn in" and work under the Chief Constable, and are trained as recognised members of the force. Women patrols have been found very useful working in co-operation with the regular Police.

The encouragement of sobriety among the population is an important branch of the welfare work, questions as to the number and the status of the public houses in munition areas, the hours during which drink may be sold, and other matters of a like nature, should be referred to the Central Control Board (Liquor Traffic)* for consideration and action in accordance with the needs of each locality. The Restrictions of the Board are now in force in almost all munition areas, and include (*a*) the daily sale or supply of drink for 5½ hours only, (*b*) restrictions on the off sale of spirits, (*c*) no treating, (*d*) no credit sales, (*e*) no canvassing or soliciting, and (*f*) alcoholic beverages are diluted. Constructive work has also been carried out in the improvement of public-houses and the establishment of canteens.

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* Latymer House, 134, Piccadilly, London, W. 1.

APPENDIX A.

POLICE, FACTORIES, ETC. (MISCELLANEOUS PROVISIONS), ACT, 1916, SECTION 7.

FACTORIES AND WORKSHOPS.

7.—(1) Where it appears to the Secretary of State that the conditions and circumstances of employment or the nature of the processes carried on in any factory or workshop are such as to require special provision to be made at the factory or workshop for securing the welfare of the workers or any class of workers employed therein in relation to the matters to which this section applies, he may by Order require the occupier to make such reasonable provision therefor as may be specified in the order, and if the occupier fails to comply with the requirements of the order or any of them, the factory or workshop shall be deemed not to be kept in conformity with the Factory and Workshop Act, 1901.

(2) The following shall be the matters to which this section applies :—

Arrangements for preparing or heating, and taking, meals ; the supply of drinking water ; the supply of protective clothing ; ambulance and first aid arrangements ; the supply and use of seats in workrooms ; facilities for washing ; accommodation for clothing ; arrangements for supervision of workers.

(3) Orders may—

(*a*) be made for a particular factory or workshop, or for factories or workshops of any class or group or description ;

(*b*) be made contingent in respect of particular requirements upon application being made by a specified number or proportion of the workers concerned, and may prescribe the manner in which the views of the workers are to be ascertained ;

(*c*) provide for the workers concerned being associated in the management of the arrangements, accommodation or other facilities for which provision is made, in any case where a portion of the cost is contributed by the workers ; but no contribution shall be required from the workers in any factory or workshop, except for the purpose of providing additional or special benefits which, in the opinion of the Secretary of State, could not reasonably be required to be provided by the

employer alone, and unless two-thirds at least of the workers affected in that factory or workshop, on their views being ascertained in the prescribed manner, assent.

(4) If, in the case of any order proposed to be made for a particular factory or workshop, the occupier, or, in the case of an order for factories or workshops of a particular class or group or description, the majority of the occupiers of factories or workshops of that class or group or description, dispute the reasonableness of the requirements in the proposed order or any of them, the objection shall be referred for settlement to a referee selected in accordance with rules made under this section, but the Secretary of State may so refer any objection though not made by a majority of the occupiers if he thinks desirable.

(5) Save as otherwise expressly provided in the order, the occupier of a factory or workshop shall not make any deduction from the sum contracted to be paid by him to any workman or receive any payment from any workman in respect of any provision made in pursuance of an order under this section, and, if he makes any such deduction or receives any such payment, he shall be guilty of an offence against the Truck Act, 1831, and shall be liable to the penalties imposed by section nine of that Act as if the offence were an offence mentioned in that section.

(6) The Secretary of State may make rules as to the time within which, and the manner in which, notice of objection to any order may be made, and as to the selection of, and the procedure before, a referee and the cost of the proceedings before a referee (including the remuneration of the referee).

(7) Any order made under this section may be revoked at any time in whole or in part by the Secretary of State, without prejudice to the making of a further order.

(8) This section shall not apply to domestic factories or workshops.

(9) The Secretary of State may by a special order made in accordance with the provisions of section one hundred and twenty-six of the Factory and Workshop Act, 1901, extend the matters to which this section applies to matters other than those mentioned in this section.

Orders under this Section have been made by the Home Office in regard to :—

(*a*) *Drinking Water*, dated October 9th, 1917 (see page 69, on which the substance of this Order is given).

(*b*) *First-Aid*, dated October 12th, 1917. (The terms of this Order are given in Appendix E, page 133.)

(*c*) *Manufacture of Tinplates*, dated October 5th, 1917, dealing with the provision of protective clothing, cloakrooms, messrooms and facilities for washing.

APPENDIX B.

Conditions under which Expenditure on the Provision of Canteens, Cloakrooms, Recreation, etc., can be regarded as an expense for purposes of Excess Profits Duty.

Capital Expenditure on Improved Accommodation within the Factory.

The accommodation most frequently required includes canteens, mess-rooms, rest and ambulance rooms, cloakrooms and changing rooms, lavatories, baths, sanitary accommodation and similar structures.

In order to encourage firms to provide improved accommodation it has been decided to allow them to charge in their accounts, as a working expense, a proportion (varying according to circumstances) of any capital outlay of this nature when making up their accounts for the purposes of the Excess Profits Duty.

In the case of canteens and mess-rooms the Canteen Committee of the Central Control Board are empowered to recommend that the cost of the building and equipment may be written off, if it is considered by the Committee to be reasonable and economical; where this cost or any part of it is treated as a trade expense under this concession the canteens or mess-rooms must be maintained permanently in use for the purpose for which they were provided. Proposals for the provision of canteens must be submitted before the work is begun to the Secretary, Canteen Committee, Central Control Board (Liquor Traffic), Latymer House, 134, Piccadilly, London, W. 1.

In the case of other accommodation, some allowance in respect of the cost is given in certain cases in assessing this duty, but schemes must be submitted to the Ministry beforehand, and they will only be approved if the Ministry are satisfied not only that the improved accommodation is necessary but also that the scheme is reasonable and economical in construction and cost. It is a condition of the acceptance of this concession that the firm undertakes to bear the cost of maintaining the accommodation, not only while it remains "controlled" but afterwards.

Contributions to Recreation Schemes outside the Factory.

Where a Recreation Scheme has been approved by the Welfare and Health Section of the Ministry of Munitions, the Board of Inland Revenue are prepared to allow contributions on a capitation basis to be made by "controlled" establishments subject to the following conditions:—

(*a*) The Board of Inland Revenue desire that applications shall be based on a capitation estimate, *i.e.*, a rough

estimate of the number of workers for whom it is proposed to cater must be drawn up, and a grant of so much a head asked for.

(*b*) Managers of the factories concerned must be consulted from the first with regard to such schemes, as the money, in the case of Controlled Firms, does not come as a direct grant from the Treasury, but when the scheme is approved by the Welfare and Health Section any sum contributed by such firms is allowed as an expense for Excess Profits Duty.

This means that while the firm have full discretion in making a contribution, any contribution is in fact largely from money which would otherwise pass to the State.

(*c*) Schemes should allow for expansion and should cater for a reasonable proportion of those employed. They may include both men and women, and provide for indoor and outdoor recreation.

(*d*) The chief expenditure contemplated should be concerned with initial establishment or extension of premises, as ordinary running expenses should be covered mainly by the workers' own subscriptions.

(*e*) In the case of schemes started on a comparatively modest scale a small capitation grant should be asked for, a proviso being made that an additional grant may be necessary later should the scheme prove a success. A grant of 6d. or 7d. a head may be sufficient at first, which may later require to be increased to 2s. 6d. or 3s. 0d., but if only a small number of workers is catered for out of possibly some thousands of employees it should be made clear whether :—

(i) Other recreation schemes are catering for the rest.

(ii) The proposal is to use a central club for committees and organisations which will affect large numbers outside its actual walls.

(iii) Any schemes, such as dances or sports, are contemplated which will include larger numbers.

In the case of National Factories the Treasury is prepared to consider similar contributions. The procedure as fas ar the Local Recreation Committee is concerned is the same as for a Controlled Factory, *i.e.*, the Manager of the Factory must approve the application for a grant, and the scheme must equally have the approval of the Welfare and Health Section of the Ministry of Munitions.

APPENDIX C.

CANTEEN EQUIPMENT.

Heating Apparatus and Hot Water Service.

The larger canteens should be heated by a low-pressure hot water system, capable of maintaining a uniform temperature of 60° F. In smaller canteens gas radiators or slow combustion stoves may be suitable.

If an independent boiler is required for steam cooking it may conveniently be placed in the heating chamber, and if the lavatories form part of the canteen building the hot water service boiler should also be installed here. This last boiler would, of course, also supply the hot water for the sinks.

A supply of hot water to the lavatory basins and to the sinks will be necessary, and the heating coil for drying wet clothes in the cloakrooms should be run from this service, which will be in operation throughout the year and not merely in winter.

The boiler should be of cast-iron, 33″ high by 28″ diameter, and should be capable of raising eighty-four gallons of water per hour from a temperature of 50° to 150° F. It should be combined with a vertical galvanised iron storage cylinder, removable for cleaning. The cylinder should be connected with a galvanised iron sheet storage tank with a capacity of eighty gallons, fixed at high level in the kitchen or on the roof.

The Heating and Hot Water Boilers should be fixed complete with deadweight safety-valve, and furnished with a set of stoking tools.

General Equipment.

The following is a list of the general equipment required:—

Catering Office Equipment.

Chairs.
Desk.
Safe for money.

Messroom.

Cash till.
Cloth (American) or linoleum for tables and counter.
Chairs or short benches (with backs).
Curtains or blinds for window (dark).
Scraper mat at door.
Tables (2′ 3″ by 2′ 6″ wide).
Waste-paper baskets.

Cutlery.

Carving knives and forks.
Forks.
Knives.
Spoons (dessert).
Spoons (mustard).
,, (table).
,, (tea).
Steels.

Glass and Crockery.

Basins (sugar).
Bowls (soup).
Cups and saucers.
Egg-cups.
Jugs (milk).
,, (water).

Meat dishes.
Mustards.
Peppers.
Plates (meats and puddings).
Plates (small).
Salt pourers.
Teapots.
Tumblers.
Vinegars.

Linen.

Dusters.
Glass cloths.
Hand towels (small).
Kitchen rubbers.
Muslin strainers.
Roller towels and roller.
Swabs.

Kitchen, Scullery, and Larder Requisites, etc.

Basins (pudding).
,, (pudding, one person).
Bins (flour).
,, (sanitary).
Bowls (enamelled).
Bread knife.
Bread-cutting machine.
Broom (bass).
Brushes (scrubbing).
,, (sweeping).
Bucket.
Canister (tea).
Chairs (kitchen).
Chopper (meat).
Chopping board.
Corkscrews.
Cullenders.
Dish covers (wire).
Dustpan and brushes.
Fish kettle.
Flour dredger.
Frying pan.
Graters.
Gravy strainer and ladle.
Jugs (enamelled).
Kettles.
Knife boxes.
Knife-cleaning machine.
Knives (cooks').
Lemon squeezers.
Meat hooks.
,, safe.
Milk measurer.
Mincing machine.
Oval pots with covers.
Pastry board and rolling pin.
Pie-dishes (enamelled).
Plate covers (tin).
Potato-peeling machine.
Saucepans.
,, (milk).
Saw (butcher's).
Scales and weights.
Scoop.
Sieves (wire).
Sink baskets.
,, brushes.
Spoons (iron).
,, (wooden).
Steamer.
Step ladder.
Table (rigid).
Teapots (enamelled).
Tins (baking).
Tin-opener.
Tools (mixed).
Towel rack.
Trays (japanned or wood).
Urns (4-gallon).

Knives, forks, spoons (dessert and tea), cups and saucers, one for each person seated, allowing for a few dozens over; plates, double the seating accommodation (same size of plates should be used for meat and pudding); tumblers, egg-cups, soup bowls, and small plates, half the seating capacity; jugs, sugar basins, mustard pots and salt-cellars, table-spoons, about one-tenth of the seating capacity.

APPENDIX D.

MEDICAL CERTIFICATES OF INCAPACITY FOR WORK.

[Booklets of medical certificates on the lines set out below can be obtained on application to the Health and Welfare Section of the Ministry. They are intended to be used for persons employed on Munitions of War who are found to be unfit to follow their present occupation. They are for factory purposes only.]

MINISTRY OF MUNITIONS FACTORY CERTIFICATE.

I hereby certify that on...20*th March*...191...7,...I examined (Name).....*John Smith*.....(Sex)...*M*.....(Age)...44..... (Address).....21, *High Street, London*,..... who states his or her present occupation to be.....*fitter*..... and who in my opinion is rendered (i) unfit to follow that occupation through disease of (ii)—

(1) Respiratory Tract, viz. :.....*Broncho-Pneumonia*.....
(2) Digestive Tract, viz. :.....
(3) Circulatory System, viz. :.....
(4) Central Nervous System, viz. :.....
(5) Special Sense Organs, viz. :.....
(6) Locomotive System, viz. :.....
(7) Skin, viz. :.....
(8) Other conditions, viz. :.....

Is **immediate** rest from work necessary ?.....**Yes**.....

Absence from work (iii) $\frac{\text{is}}{\text{is not}}$ likely to be necessary for longer than a week.

(Signed).....*W. Robinson*.....
(Registered Medical Practitioner).

(Date).....20*th March*, 1917.....

(Address).....*High Street, London*.....

To be filled up by the Firm :

(1) Period of absence.....Days.
(2) Name and Address of Firm.....

(i), (ii), (iii) See Notes.

IMPORTANT.—This Certificate must be sent to the Factory the same day that it is obtained completed from the Doctor.

Notes.

(i) The words " unfit to follow that occupation " are to be understood to include not only cases in which the patient's illness (or injury) renders him physically incapable of performing his work, but also cases in which the illness (or injury) is of such a nature that the patient's health would be seriously endangered by continuing to perform it.

(ii) The exact diagnosis should be entered under the appropriate heading. If an exact diagnosis cannot be recorded the system of the body principally affected should be indicated by initials. See sample forms at end of the book and back of cover.

(iii) The words " is not " or " is " (as the case may require) to be struck out where it is possible to make this prognosis.

As suggestions for filling in a diagnosis in the appropriate category, the following examples are given :—

1. Respiratory tract, *e.g.*, Bronchitis, pulmonary tuberculosis, pneumonia, adenoids.
2. Digestive tract, *e.g.*, Tonsilitis, indigestion, appendicitis, diarrhœa, colitis, gastric ulcer, gastric carcinoma.
3. Circulatory system, *e.g.*, Anæmia, morbus cordis, angina pectoris, varicose veins.
4. Central nervous system, *e.g.*, Debility, tabes, neurasthenia.
5. Special sense organs, *e.g.*, Astigmatism, cataract, otorrhora.
6. Locomotive system, *e.g.*, Rheumatism, sciatica, lumbago, chronic arthritis.
7. Skin, *e.g.*, Scabies, industrial dermatitis.
8. Other, *e.g.*, Nephritis, measles, salpingitis, lead poisoning.

APPENDIX E.

FIRST AID.

ORDER, DATED OCTOBER 12TH, 1917, MADE BY THE SECRETARY OF STATE UNDER SECTION 7 (1) OF THE POLICE, FACTORIES, &C. (MISCELLANEOUS PROVISIONS) ACT, 1916, IN REGARD TO AMBULANCE AND FIRST AID ARRANGEMENTS AT BLAST FURNACES, COPPER MILLS, IRON MILLS, FOUNDRIES, AND METAL WORKS.

In pursuance of Section 7 of the Police, Factories, &c. (Miscellaneous Provisions) Act, 1916, I hereby make the following Order, and direct that it shall apply to all factories in the following classes :—

Blast Furnaces.
Copper Mills.
Iron Mills.
Foundries.
Metal Works.

First Aid.

1. In every factory to which this Order applies and in which the total number of persons employed is 25 or more, the occupier shall provide, in readily accessible positions, " First Aid " boxes or cupboards in the proportion of at least one to every 150 persons.

The number of " First Aid " boxes or cupboards required under this provision shall be calculated on the largest number of persons employed at any one time, and any odd number of persons less than 150 shall be reckoned as 150.

Provided

(i) that an ambulance room maintained in conformity with paragraphs 6, 7 and 8 of this Order may be counted as one of the " First Aid " boxes or cupboards required by this Order.

(ii) that the requirement of " First Aid " boxes or cupboards shall not apply to a blast furnace if an ambulance room is provided and maintained as aforesaid.

2. Each " First Aid " box or cupboard shall contain at least :—

(i) A copy of the First Aid Leaflet issued by the Factory Department of the Home Office.
(ii) Three dozen small size sterilised dressings for injured fingers.
(iii) One dozen medium size sterilised dressings for injured hands or feet.
(iv) One dozen large size sterilised dressings for other injured parts.
(v) One bottle of eye-drops, and
(vi) Sterilised cotton wool.

Each " First Aid " box or cupboard shall be distinctively marked, and if newly provided after the date of this Order shall be marked plainly with a white cross on a red ground.

3. Nothing except appliances or requisites for First Aid shall be kept in a " First Aid " box or cupboard.

4. Each " First Aid " box or cupboard shall be kept stocked and in good order and shall be placed under the charge of a responsible person who shall always be readily available during working hours.

A notice or notices shall be affixed in every workroom stating the name of the person in charge of the box or cupboard provided in respect of that room.

Ambulance Room.

5. In every factory to which this Order applies and in which the total number of persons employed is 500 or more, the occupier shall provide and maintain in good order an Ambulance room.

6. The Ambulance room shall be a separate room used only for the purpose of treatment and rest. It shall have a floor space of not less than 100 square feet and smooth, hard and impervious walls and floor, and shall be provided with ample means of natural and artificial lighting. It shall contain at least—

(i) A glazed sink with hot and cold water always available.
(ii) A table with a smooth top.
(iii) Means for sterilising instruments.
(iv) A supply of suitable dressings, bandages and splints.
(v) A couch.
(vi) A stretcher.

7. Where persons of both sexes are employed, arrangements shall be made at the Ambulance room for their separate treatment.

8. The Ambulance room shall be placed under the charge of a qualified nurse, or other person, trained in First Aid, who shall always be readily available during working hours, and shall keep a record of all cases of accident and sickness treated at the room.

Ambulance Carriage.

9. At every factory to which this Order applies and in which the total number of persons employed is 500 or more, the occupier shall, for the purpose of the removal of serious cases of accident or sickness, provide on the premises and maintain in good condition a suitably constructed ambulance carriage, unless he has made arrangements for obtaining such a carriage when required from a hospital or other place in telephonic communication with the factory.

10. This Order shall come into force on the 1st December, 1917.

GEO. CAVE,
One of His Majesty's Principal Secretaries of State.

Home Office, Whitehall,
October 12th, 1917.

APPENDIX F.

RULES FOR THE USE OF TRINITROTOLUENE.

Trinitrotoluene being an explosive substance within the meaning of Regulation 35 A.A. of the Defence of the Realm (Consolidation) Regulations, 1914, the Minister of Munitions hereby, in pursuance of powers conferred under that Regulation, and with the concurrence of the Secretary of State, makes the following Rules, and directs that they shall apply to all Factories and workshops in which Trinitrotoluene or any mixture containing it is used or manipulated.

These Rules shall come into force on 19th February, 1917.

Definitions.

In these Rules :—

T.N.T. means trinitrotoluene, amatol, ammonal, alumatol, or other mixture containing not less than 10 per cent. of trinitrotoluene.

T.N.T. PROCESS means

(*a*) manipulation, movement, or other treatment of *T.N.T.* in whatever form ; and

(*b*) cleaning any surface, or cleaning or destroying any receptacle or part thereof with which *T.N.T.* has been in contact.

APPROVED means sanctioned by a person definitely appointed for the purpose by the Department of the Ministry of Munitions for which work is carried on, who shall act on the advice of the expert Committee appointed to advise the Minister on these matters, which sanction shall be set out in writing and sent to the Factories and workshops affected, and may at any time be withdrawn by the aforesaid person.

EMPLOYED means employed at any *T.N.T. process* or in any place where any such process is carried on.

MEDICAL OFFICER means a duly qualified medical practitioner appointed by the Minister of Munitions, by whom his duties and remuneration shall be approved.

SUSPENSION means suspension from employment on any *T.N.T. process* or in any place in which a *T.N.T. process* is carried on, by certificate signed by the *Medical Officer*, who shall have powers of suspension as regards all persons employed.

Duties.

It shall be the duty of the Employer to observe Part I of these Rules.

It shall be the duty of every person *employed* to observe Part II of these Rules.

Part I.

Duties of Employers.

1. NO T.N.T. PROCESS, for the carrying out of which any appliance has been *approved*, shall be carried out without the use of such appliance.

Provided always that, in case of breakdown or unforeseen urgency which has been notified by telegram to the Department concerned, the process may temporarily be carried out otherwise, if sanctioned by the Department of the Ministry for which work is carried on.

2. The ventilation of every place in which any *T.N.T. process* is carried on shall be *approved* and shall, if required, include an approved method for removing dust or fumes at the point of origin.

3. Arrangements for all process of filling shall be such that outside contamination of the article being filled shall be reduced to a minimum.

4. In every place in which any *T.N.T. process* is carried on, the floor, work-benches, trolleys and all fittings or appliances on which *T.N.T.* may accumulate, shall be cleaned by an *approved* method.

5. Funnels, trolleys, trucks, or other articles coated with *T.N.T.* shall only be cleaned by an *approved* method.

6. No oil or grease or other carbon compounds which are solvents of T.N.T. shall be used in any place in which any *T.N.T. process* is carried on, unless such use has been *approved*.

7. No person under 16 years of age shall be *employed* ; and no person under 18 years of age shall be *employed* unless such employment is *approved*.

8. No person shall be *employed* for more than a fortnight without an equal period of work at a process not involving contact with *T.N.T.* or an equal period of absence from work unless such employment has been approved by the Medical Officer.

9. (*a*) At every Factory and workshop there shall be a *canteen* approved by the Welfare Section of the Ministry.

(*b*) Every person *employed* shall be supplied gratis daily with half a pint of milk or an *approved* substitute.

10. There shall be provided for the use of all persons *employed*, *approved* working costumes, which costumes shall be washed, cleansed or renewed at least once every week, either on the premises or at an *approved* laundry.

11. There shall be provided and maintained for the use of all persons *employed*,

(*a*) a place or places, approved by the Welfare Section of the Ministry, for clothing put off during working hours ;

(*b*) an *approved* place or places for the storage of the costumes provided in pursuance of Rule (10), which place or places shall be separate from those required under paragraph (*a*) of this Rule, and under paragraph (*a*) of Rule (9).

12. (*a*) At every Factory or workshop where two thousand persons are *employed* there shall be at least one whole-time *Medical Officer* to supervise such persons, and at least one *additional Medical Officer* if the number exceeds two thousand.

(*b*) A Woman Welfare Supervisor, approved by the Welfare Section of the Ministry, whose remuneration and duties shall be *approved*, shall be appointed at all Factories and workshops where women are *employed*.

(*c*) There shall be appointed at every Factory or workshop a person or persons who shall supervise the methods and processes of work with a view to the carrying out of these Rules, and shall record, for the inspection of any authorised Officer, any breach of these Rules.

13. There shall be provided, for the purpose of cleansing from *T.N.T.* the skin of persons *employed*, any fluid or other material which may be *approved*.

14. (1) There shall be provided and maintained, in a cleanly state and in good repair, for the use of all persons employed in any *T.N.T. process* a lavatory under cover, with a sufficient supply of soap and nail brushes, and with either :—

(i) a trough with a smooth, impervious surface, fitted with a waste pipe without plug, and of such length as to allow at least two feet for every five such persons *employed* at any one time, and having a constant supply of water from taps or jets above the trough at intervals of not more than two feet ; or

(ii) at least one lavatory basin for every five such persons *employed* at any one time, fitted with a waste pipe and plug, and having a constant supply of water laid on.

(2) A supply of dry towels, renewed and washed daily, which shall consist of either :—

(i) a towel, at least five feet square in area, for each worker, or

(ii) one roller towel, fastened in position, and at least fifteen feet square in area, for every three workers ;

(iii) some other arrangement approved by the Welfare Section of the Ministry.

The responsibility for the carrying out of all arrangements specified in this Rule shall rest with the Welfare Section of the Ministry.

15. (*a*) Every person employed in a *T.N.T. process* shall be examined by the *Medical Officer* or the *additional Medical Officer*

at least once in every week or at such shorter or longer intervals as may be *approved*.

(*b*) A Health Record containing the names of all persons employed in any *T.N.T. process* shall be kept in an *approved* form.

(*c*) The employer shall notify to the *Medical Officer* the Officer responsible for seeing that *suspension* is carried out.

(*d*) No person, after *suspension*, shall be employed in any *T.N.T. process* without written sanction from the *Medical Officer*.

(*e*) Returns of the incidence of sickness due to *T.N.T.* shall be made, as required, to the Medical Adviser of the Ministry of Munitions in charge of these matters.

Part II.

Duties of Persons Employed.

16. (*a*) Every person *employed* in any *T.N.T. process* shall deposit in the place or places provided in pursuance of Rule (11) (*a*) all clothing put off prior to work.

(*b*) Every person for whose use an *approved* costume is provided in pursuance of Rule (10) shall wear the costume when *employed* in any *T.N.T. process*, and remove it before partaking of food or leaving the premises, and deposit it in the place provided under Rule (11) (*b*).

17. No person *employed* shall introduce, keep or prepare any food or drink, or make use of tobacco, in any place in which any *T.N.T. process* is carried on.

18. Every person *employed* in any *T.N.T. process* or in any place where any *T.N.T. process* is carried on, shall, before partaking of food, and before leaving the premises, wash in the lavatory provided in pursuance of Rule (14), and in doing so shall in no case wash in water already used by another person; and shall cleanse the skin if and as directed with any fluid provided in pursuance of Rule (13).

19. Every person employed in any *T.N.T. process* shall submit himself, when required, for examination by the *Medical Officer*, or the *additional Medical Officer*.

20. No person *employed* shall, after *suspension* under these Regulations, work in any *T.N.T. process* without written sanction from the *Medical Officer* entered in the Health Record.

21. No person shall interfere in any way, without the concurrence of the occupier or Manager, with the means provided for the removal of vapour, fumes and dust, and for the carrying out of these Rules.

22. A copy of these Rules shall be posted in prominent places in each Factory and workshop.

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