APPLICATION

OF THE

THREE-SHIFT SYSTEM

TO THE

IRON AND STEEL INDUSTRY

SEPTEMBER 1922

GENEVA
PREFATORY NOTE

This report on the Application of the Three-Shift System to the Iron and Steel Industry gives the results of an inquiry undertaken by the International Labour Office at the suggestion of the Taylor Society of the United States, an organisation composed of engineers, production managers, and labour managers interested in the study of efficiency in industry.

The long hours worked in the steel industry in the United States have been a subject of agitation for several years, particularly since 1910. The steel strike of 1919 increased interest in this question. The establishment of the Cabot Fund by a shareholder in the United States Steel Corporation who had initiated an investigation of long hours of work in the industry made possible the continuation of further studies. Certain members and representatives of the Taylor Society had been engaged for a special enquiry on the three-shift system in the steel industry of the United States, and, wishing to secure information from other countries, appealed to the International Labour Office to assist them. In December 1920, therefore, the International Labour Office circulated to the governments of the States Members of the Organisation and to representative associations of employers and of workers a questionnaire on the subject of the three-shift system in the iron and steel industry. The replies, translated and edited to secure uniformity in the manner and form of presentation, are published in full, arranged by countries under each question.

Although most of the replies to the questionnaire were received before the end of 1921, the publication was held back while attempts were made to secure additional and more precise answers to the queries. It was hoped to obtain from the different countries some more definite evidence of the effects upon output, unit costs, and the health of workers, due to substituting the 8-hour shift for the 12-hour shift. As it has been announced in the press of the United States that the replies to the questionnaire showed decreased output and increased cost as a result of going to the three-shift system, the International Labour Office has
thought it advisable to publish the replies in full without waiting for further and more complete information.

In fact, the replies are inconclusive, but they may serve at some future time as a basis for definite conclusions when more complete information becomes available. The 8-hour day has been in operation in the iron and steel industry for only a very short time, under conditions utterly unlike those prevailing before the change was made from the 12-hour day. No statistical testing of the results is therefore possible. Only opinions are available, and these are by no means consistent or based on scientific study.
# TABLE OF CONTENTS

**Prefatory Note**

Summary

Replies to Questions: Extent and Effect of System

- I. Extent of three-shift system
- II. Date and means of introduction
- III. Prospects of change in the future
- IV. Increase in number of men required
- V. Effect upon output per man per day
- VI. Quality of product, consumption of materials, cost of repairs, and accident frequency rate
- VII. Effect of change on interest, energy and health of workers, and effect of greater leisure
- VIII. Proportion of workers on shift work and day work
- IX. Hours of workers on day work
- X. Extent of seven-day week
- XI. Schedules of shifts
- XII. Improvements in technique
- XIII. Effect on labour cost and total cost

Appendix I: Extracts from Laws

Appendix II: Collective Agreements

Appendix III: Extracts from Publications

Appendix IV: Questionnaire of the International Labour Office

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefatory Note</td>
<td>3</td>
</tr>
<tr>
<td>Summary</td>
<td>7</td>
</tr>
<tr>
<td>Replies to Questions: Extent and Effect of System</td>
<td></td>
</tr>
<tr>
<td>I. Extent of three-shift system</td>
<td>21</td>
</tr>
<tr>
<td>II. Date and means of introduction</td>
<td>28</td>
</tr>
<tr>
<td>III. Prospects of change in the future</td>
<td>37</td>
</tr>
<tr>
<td>IV. Increase in number of men required</td>
<td>43</td>
</tr>
<tr>
<td>V. Effect upon output per man per day</td>
<td>48</td>
</tr>
<tr>
<td>VI. Quality of product, consumption of materials, cost of repairs, and accident frequency rate</td>
<td>56</td>
</tr>
<tr>
<td>VII. Effect of change on interest, energy and health of workers, and effect of greater leisure</td>
<td>65</td>
</tr>
<tr>
<td>VIII. Proportion of workers on shift work and day work</td>
<td>74</td>
</tr>
<tr>
<td>IX. Hours of workers on day work</td>
<td>79</td>
</tr>
<tr>
<td>X. Extent of seven-day week</td>
<td>82</td>
</tr>
<tr>
<td>XI. Schedules of shifts</td>
<td>87</td>
</tr>
<tr>
<td>XII. Improvements in technique</td>
<td>99</td>
</tr>
<tr>
<td>XIII. Effect on labour cost and total cost</td>
<td>103</td>
</tr>
<tr>
<td>Appendix I: Extracts from Laws</td>
<td>110</td>
</tr>
<tr>
<td>Appendix II: Collective Agreements</td>
<td>136</td>
</tr>
<tr>
<td>Appendix III: Extracts from Publications</td>
<td>142</td>
</tr>
<tr>
<td>Appendix IV: Questionnaire of the International Labour Office</td>
<td>151</td>
</tr>
</tbody>
</table>
APPLICATION OF THE THREE-SHIFT SYSTEM
TO THE
IRON AND STEEL INDUSTRY

SUMMARY (1)

This enquiry into the application of the three-shift system in
the iron and steel industry was limited to blast furnaces (including
coke works), open hearth furnaces, Bessemer converters, and rolling
mills (including plate mills, tube works, and wire works). It did
not cover foundry work, forging, fabricating, or any of the more
refined manufacturing processes in the iron and steel industry.
The investigation was intended to elicit the following information:

(1) The extent to which the three-shift system had displaced
the two-shift system; the circumstances and date of the change;
and the opinion of employers and workers on the effect of the
system.

(2) The change in the number of men, output per man per day,
quality of product, consumption of materials, labour cost, and
total cost, consequent upon the substitution of the three-shift
for the two-shift system.

(3) The effect of the three-shift system on the health, accident
frequency rates, energy, and interest of the worker; the use made
by the workers of their greater leisure.

(4) The arrangement of shifts adopted in order to give each
worker one day's rest each week; any improvements in the tech-
nique for carrying through the change of shift-system which have
been suggested by recent experience.

(1) Printed also in: International Labour Review, Vol. VI, No. 4, October 1922,
pp. 547-558.
The distribution of the replies from governments, employers, associations, and workers' organisations, in the different countries, was as follows:

<table>
<thead>
<tr>
<th>Governments</th>
<th>Employers</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Canada</td>
<td>Czechoslovakia</td>
</tr>
<tr>
<td>Belgium</td>
<td>Czechoslovakia</td>
<td>Germany</td>
</tr>
<tr>
<td>Canada</td>
<td>Finland</td>
<td>Great Britain</td>
</tr>
<tr>
<td>Germany</td>
<td>Great Britain</td>
<td>Germany</td>
</tr>
<tr>
<td>Italy</td>
<td>India</td>
<td>Roumanian</td>
</tr>
<tr>
<td>Poland</td>
<td>Japan</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>New Zealand</td>
<td>Kingdom</td>
</tr>
<tr>
<td></td>
<td></td>
<td>South Africa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sweden</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Switzerland</td>
</tr>
</tbody>
</table>

The replies illustrate certain defects which are almost unavoidable in the case of enquiries by questionnaire, and which detract considerably from its value as a method of scientific investigation. In spite of every effort to make the questions precise and unambiguous, they have been given varying interpretations. Some answers are vague and inexact, while others ascribe effects to the change from two to three shifts which might have been due in part at least to other causes. In fact, the answers to the questionnaire do not make accurate comparisons of the three-shift system and the two-shift system possible in any respect, because of the disturbed economic and industrial conditions which have prevailed during and since the change to three shifts. In only one country, i.e. Great Britain, was the three-shift system installed long enough before the war to enable useful and accurate comparison of the efficiency of the two systems to be made. Unfortunately the British iron and steel manufacturers and workers furnished no comparative statistics of quantity, quality, and cost of output, or information on the effects on the health and welfare of the workers under the two systems and under similar industrial conditions.

**Extent of the Three-Shift System**

The iron and steel industry in almost every country in Europe is now carried on under the three-shift system; the few exceptions are countries where the industry is unimportant. Outside Europe the three-shift system has been introduced in isolated cases in Canada, India, Japan, and South Africa. It is noteworthy that the great
Tata Iron and Steel Works in India has adopted the system. The only rolling mill in New Zealand operates with two 10-hour shifts, the sole reason adduced for not making the change being that sufficient skilled workers are lacking. In China the two-shift system is still universal.

The three-shift system in Europe is a post-war phenomenon; only in some British firms did it exist before the war, but in 1919 it spread throughout Europe. The initiative in bringing about the change from the two-shift to the three-shift system is ascribed sometimes to the employers, sometimes to the force of public opinion, and more often to the workers. In Great Britain and Italy the application of the three-shift system is made universal in practice through collective agreements. In some countries it is a necessary corollary to the 8-hour legislation which has been enacted. The following statement shows the date when the system was generally introduced in the various countries; it also shows how the change was brought about.

<table>
<thead>
<tr>
<th>Country</th>
<th>Date of introduction of 3-shift system</th>
<th>Means by which change was effected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>8 January 1919</td>
<td>Act of 19 December 1918</td>
</tr>
<tr>
<td>Belgium</td>
<td>Early in 1920</td>
<td>By agreement and by individual employers (1)</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>During the war</td>
<td>Act of 19 December 1918</td>
</tr>
<tr>
<td>Finland</td>
<td>During 1918</td>
<td>Act of 27 November 1917 (amended by Act of 14 August 1918, and by Resolution of 20 December 1919)</td>
</tr>
<tr>
<td>Germany</td>
<td>Early in 1919</td>
<td>Orders of 28 November 1918 and 17 December 1918</td>
</tr>
<tr>
<td>Great Britain</td>
<td>Early in 1919 (2)</td>
<td>Trade union agreements signed in February and March 1919</td>
</tr>
<tr>
<td>Italy</td>
<td>Adopted in many establishments in 1919 and in others in 1920</td>
<td>Trade union agreements</td>
</tr>
<tr>
<td>Poland</td>
<td>—</td>
<td>Order of 23 November 1918, replaced by Act of 18 December 1919</td>
</tr>
<tr>
<td>Roumania</td>
<td>November 1918</td>
<td>(2)</td>
</tr>
<tr>
<td>Serbo-Croat-Slovene Kingdom</td>
<td>Firm A: 15 January 1919</td>
<td>Act of 12 September 1919</td>
</tr>
<tr>
<td>South Africa</td>
<td>February 1920</td>
<td>—</td>
</tr>
</tbody>
</table>

(1) Confirmed by Act of 14 June 1921.
(2) One firm reports the introduction of the system as far back as 1897.
(3) Only the iron and steel works of Reshitza, one of the blast furnaces existing in the Banat and Transylvania, have substituted the three shift system, in virtue of a proposed Act for an 8-hour day (prepared by the Hungarian Government between 1 Nov. 1918 and 21 Mar. 1919, when those provinces were Hungarian, but not proceeded with on account of the fall of that Government).
<table>
<thead>
<tr>
<th>Country</th>
<th>Date of introduction of 3-shift system</th>
<th>Means by which change was effected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>Between April and October 1919</td>
<td>Royal Decree of 3 April 1919 (and Act of 15 January 1920)</td>
</tr>
<tr>
<td>Sweden</td>
<td>Adopted in blast furnaces and converters from 1916 and in open hearth furnaces and rolling mills from 1 July 1920</td>
<td>Act of 17 October 1919</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1 October 1919</td>
<td>Act of 27 June 1919</td>
</tr>
</tbody>
</table>

In Austria, Belgium, Czechoslovakia, Finland, France, Germany, Lithuania, Poland, the Serbo-Croat-Slovene Kingdom, and Switzerland the 8-hour laws limit the hours of work in continuous industries to 56 per week or 168 over a period of three weeks. In Denmark no more than 160 hours may be worked over three weeks. An average of 48 hours per week may be worked in Norway, while in Portugal hours of work must never exceed 48 in any week. In Spain, by agreement between employers and workers, work in excess of 48 hours per week may be permitted up to a maximum of 60 hours. In Austria, Belgium, Czechoslovakia, Poland, the Serbo-Croat-Slovene Kingdom, and Spain all work in excess of 48 hours per week must be paid for at overtime rates, which are from 20 to 100 per cent. higher than rates for normal hours.

Clauses prohibiting a reduction of wages by reason of any shortening in the hours of work occur in the laws of Belgium, Czechoslovakia, France, Poland, Portugal, the Serbo-Croat-Slovene Kingdom, and Spain.

The collective agreements instituting the three-shift system in the British iron and steel industry embody the principle, admitted by both parties, that the cost of providing the third shift necessitated by the introduction of the 8-hour day should be borne partly by the workers. In this respect, therefore, British and typical Continental practices are radically different. The agreements define what percentage of his wages is to be contributed by each worker. For example, one agreement covering South Wales specifies that those workers whose weekly wages were not more than £4 17s. 6d. should contribute nothing towards the cost of the third shift, but that wages above £4 17s. 6d. should contribute a percentage rising to a maximum of 33 1/3% for wages of £11 11s. 6d. and over, the increase in the percentage being directly proportional to the wage rate. This agreement came into operation as from February 1919. Another agreement stipulates that “it
shall be open to the employers and workmen at any works to make
adjustments with the object of reducing the number of men per
shift employed at particular occupations where this is practicable”.

Effects on Output and Cost

In gauging the effects of the three-shift system on output and
cost, two considerations must be kept in mind: first, the short
period during which the three-shift system has been tried, and,
secondly, the fact that it has been tried under economic condi­
tions totally dissimilar to those under which the two-shift system
prevailed. Most of the replies to the questionnaires sent out by
the Office were based on experience of the three-shift system
varying from 1 year to 2½ years, which is certainly too short a
period within which to arrive at conclusive results as to the change.
The change could hardly be expected to bear immediate fruit.
The new experiments in management and methods of produc­
tion which must necessarily follow in order to make it successful
require a considerable period of trial.

Introduced in most countries shortly after the war, the effects
of the three-shift system must be compared with those of the
two-shift system during and before the war. In other words,
comparison under similar or nearly similar conditions of the
general economic situation is quite impossible. The change from
the two-shift to the three-shift system took place about the same
time as a number of other changes, economic and political, the
effect of which on production in the iron and steel industry can
hardly be segregated from that of the change of the shift system.
It is, indeed, evident that the exhaustion, physical and mental,
of the workers, the spirit of unrest, the disorganisation of commerce
and transport, and the dearth of raw materials had a total effect
upon output and cost vastly greater than that of the substitution
of three shifts for two.

The replies of Austria, Germany, and Poland stress the impor­
tance of underfeeding, fatigue, and lack of discipline consequent
upon the war as factors in the falling off in output. In these coun­
tries, again, and in Great Britain and Italy, raw materials are stated
to have deteriorated or been wanting. How severe is the effect
of bad coal upon output and cost is made clear in the report of the
Industrial Fatigue Research Board, to which both employers
and workers in Great Britain refer in their replies.
At one works I was told that during the war the coal used had so greatly deteriorated in quality that 15 per cent. more was needed to produce a ton of iron than shortly before the war. Also 70 per cent. more limestone had to be added to flux the extra ash in the coal. In consequence of the increased bulk of material required and of its inferior quality the output of pig-iron from the furnaces had fallen 19 per cent. (*).

As circumstances approach to normal again, production may be expected to improve. In Austria (workers' report) and Germany (Government's report) production has slowly increased since 1919. A similar improvement is anticipated in Italy (Government's report) and Great Britain (workers' report).

It is unfortunate that more data are not available concerning the several firms in Great Britain which introduced the three-shift system before the war, since these are the only cases where a fair comparison could be made between the effects of the two systems of shifts. However, the Industrial Fatigue Research Board, investigating ten open hearth furnaces in England which went over to the three-shift system in 1913, found an improvement of 9 to 18 per cent. in output after the change of system.

No general idea of the effect on the output due to the change of shift system can be obtained from the replies. Statistics are given only in a few cases; elsewhere it is merely stated that "a decrease" or "no change" has taken place. There are only a few instances of an increase, namely in Great Britain, Japan, and South Africa. Table I is a tabulation of the replies given to the question as to the effect on the change on output.

The increase which has taken place in the staff after the change of shift system is generally between 30 and 50 per cent. Here again the British, Finnish, and Japanese firms have been able to manage with a smaller increase of staff, which probably accounts for the better output per man per day which they obtain. The only conclusion to be drawn from Table II is that the introduction of the three-shift system has generally required an increase of from 30 to 50 per cent. in the number of workers in the different branches of the steel industry.

Since wages were rising and the purchasing power of money falling in almost all countries at the time of the introduction of the three-shift system, and since, as has been pointed out above, the productivity of labour and of plant was low for various reasons

unconnected with the change of shift system, it is not possible to make a general estimate of the effect of the change upon costs. It is, however, evident that labour costs have usually increased about 50 per cent., seeing that in most countries there has been no reduction either in earnings or in the number of men per shift, and little or no increase in output per man per day. In Great

<table>
<thead>
<tr>
<th>Country</th>
<th>Blast furnace</th>
<th>Open hearth furnace</th>
<th>Bessemer converter</th>
<th>Rolling mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>33 (2)</td>
<td></td>
<td>33 (4)</td>
<td>33</td>
</tr>
<tr>
<td>firm B</td>
<td>21 (2)</td>
<td>33 (2)</td>
<td>35 (5)</td>
<td>42 (5)</td>
</tr>
<tr>
<td>firm C</td>
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<td>33</td>
</tr>
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<td>6.5 (2)</td>
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<td>5</td>
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<td>58 (4)</td>
<td>58 (4)</td>
<td>22 (4)</td>
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<td>7.5 (9)</td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>7 small furnaces</td>
<td>10 (6)</td>
<td></td>
<td>6.5 (2)</td>
<td>22</td>
</tr>
<tr>
<td>2 furnaces</td>
<td>14 (6)</td>
<td></td>
<td>44 (2)</td>
<td>5</td>
</tr>
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<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>17 (2)</td>
<td>18 (2)</td>
<td>6 (2)</td>
<td>27 (2)</td>
</tr>
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<td>50 (2)</td>
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<td>firm F</td>
<td>33 (2)</td>
<td></td>
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</tr>
</tbody>
</table>

(1) In some cases the percentages have not been given in the replies, but it has been possible to calculate them from the data.

(2) Martin furnaces.

(3) It is assumed that “daily output of workers” means output per man per day.

(4) Figures relate to June 1919, six months after change of system.

(5) The percentages of decrease are obtained by comparing the average output per man per day in Sept. and Oct. 1918 with the average output per man per day in May, July and Aug. 1919.

(6) Figures taken from Report No. 5 of Industrial Fatigue Research Board.

(7) Small bar mills; increase.

(8) Rail mills.

(9) Wire mills.

(10) Effect of good discipline and bonus; exceptional cases.
TABLE II. PERCENTAGE INCREASE OF STAFF REQUIRED IN ORDER TO MAINTAIN PRODUCTION AT SAME LEVEL ON SUBSTITUTION OF 3-SHIFT FOR 2-SHIFT SYSTEM (shift workers only)

<table>
<thead>
<tr>
<th>Country and organisation replying</th>
<th>Blast furnace</th>
<th>Open hearth furnace</th>
<th>Bessemer converter</th>
<th>Rolling mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>50</td>
<td>50</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>employers</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>firm A</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>firm B</td>
<td>46</td>
<td>22 (1)</td>
<td>24 (2)</td>
<td>29</td>
</tr>
<tr>
<td>Canada</td>
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<td></td>
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</tr>
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</tr>
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<td>Finland</td>
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<td></td>
</tr>
<tr>
<td>firm A</td>
<td>30 (1)</td>
<td>—</td>
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<td>30</td>
</tr>
<tr>
<td>firm B</td>
<td>6.5</td>
<td>43</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm C</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>50</td>
</tr>
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<td>Germany</td>
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<td>Government</td>
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<tr>
<td>workers</td>
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<td></td>
</tr>
<tr>
<td>Great Britain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>workers</td>
<td>40</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>6 small furnaces</td>
<td>13 (7)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>one furnace</td>
<td>17 (7)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government (3)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>28</td>
<td>14</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 firms (4)</td>
<td>40-48</td>
<td>49-50 (1)</td>
<td>—</td>
<td>40-45</td>
</tr>
<tr>
<td>Serbo-Croat-Slovene Kingdom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>—</td>
<td>50</td>
<td>—</td>
<td></td>
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<tr>
<td>South Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a firm</td>
<td>50 (8)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>32</td>
<td>32</td>
<td>—</td>
<td>25</td>
</tr>
<tr>
<td>firm B</td>
<td>50</td>
<td>50</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm D</td>
<td>—</td>
<td>50</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>firm E</td>
<td>—</td>
<td>25</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>firm F</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm G</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm H</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm J</td>
<td>—</td>
<td>60</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm K</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>firm L</td>
<td>30</td>
<td>30</td>
<td>—</td>
<td>50</td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>employers</td>
<td>40-50</td>
<td>40-50</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Switzerland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>firm A</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>30</td>
</tr>
</tbody>
</table>

(1) Martin furnace. (2) Thomas converter. (3) Electric furnace. (4) Sheet mills. (5) 20 to 50 per cent., chiefly because of stipulation made in the agreements in some districts that the third shift should consist of new hands added to the force. (6) Percentages refer to 5 furnaces and one mill owned by 4 firms. (7) Report No. 5 of Industrial Fatigue Research Board. (8) White and black labour each increased 50 per cent.
Britain, where the change has not always involved an increase of as much as 30 to 50 per cent. in the number of workers, and where the cost of the third shift was shared by employers and workers, instances occur where the increase in labour cost was only 5 to 10 per cent. The figures given by one British workers' organisation for the increase in labour costs are as follows:

<table>
<thead>
<tr>
<th>Approximate percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces in Scotland</td>
</tr>
<tr>
<td>Open hearth furnaces (selected cases)</td>
</tr>
<tr>
<td>Bessemer converters (selected cases)</td>
</tr>
<tr>
<td>Rolling mills (selected cases)</td>
</tr>
</tbody>
</table>

An Austrian factory inspector states:

In itself the three-shift system will naturally lead to increased wages costs and increased total cost for a fixed quantity of product. Yet there is no doubt that the more intensive use of all installations as a result of the 8-hour shift will entail a decrease in the amount of fuel required (for a fixed quantity of product), an advantage which might presumably outweigh the increase in wages costs for the third shift.

Only one firm reports a decrease in fuel consumption, while two report an increase; the remainder, though not specifically mentioning fuel, state either that no change has occurred in the consumption of materials, or that there has been greater waste. On the contrary, workers' organisations in Czechoslovakia and Germany affirm that there has been a saving. There is some evidence that the distribution of responsibility over a greater number of workers leads to a certain amount of waste. The worker does not hand over tools and equipment to the group of workers from whom he took them over, and it is therefore much more difficult to fix the responsibility for damage. A Polish firm reports that in the case of an open hearth furnace a squad often prolongs certain processes longer than necessary in order to leave a more difficult process to be done by another squad in the following shift. With regard to cost of repairs, the evidence indicates that, in so far as any change has been observed, there has generally been an increase. No alteration has been noticed in the quality of the product, except in Japan, where one firm reports an improvement.

**Effects on the Worker**

There is no clear evidence of any definite and ascertainable effects of the change of the shift system on the health of the workers.
The replies of employers and workers are contradictory on this point. With regard to accident frequency rates, there is evidence of a reduction in Austria, Germany, Italy (slight), and Poland. One Finnish firm alleges an increase of 50 per cent., and of the Spanish firms one alleges a decrease and four an increase. The general argument is, on the one hand, that the shorter hours may leave the worker with more spare energy and encourage attention to the avoidance of accidents; or, on the other, that the change of the shift system and the shorter hours may lead to a general speeding-up and intensification which may increase the number of accidents, while the introduction of insufficiently trained workers to man the extra shift may temporarily have the same effect.

The interest and energy of the workers seem, according to the almost unanimous reports of employers, to have decreased, but, as is pointed out in several replies, the decrease again is to be ascribed not to the change of shift-system, but rather to abnormal post-war conditions. Most workers' organisations and two Japanese firms, on the contrary, allege an improvement. One Japanese firm employing some 18,000 men states:

More initiative and surplus of energy are noticed. An increased number of men are proposing new schemes and more interest is shown in the work itself.

Time-keeping appears to have improved in Belgium, Great Britain, Italy, and Japan, but other replies do not indicate any change. The longer leisure seems to be spent at home or in gardening. Men often take up supplementary work either in their principal or some other occupation. In some cases, indeed, workers are said to obtain less rest under the three-shift system, for the reason that they now overtire themselves by supplementary work. Keener interest is being taken in trade unionism and politics. A number of employers aver that there has been an increase of alcoholism and other bad habits, especially among the younger workers.

**Technical Arrangements**

Table III shows the proportion of shift workers and day workers in the total force of establishments in different countries under the three-shift system. All the figures are for selected cases, and not general averages.
TABLE III. PROPORTION OF SHIFT AND DAY WORKERS

<table>
<thead>
<tr>
<th>Country</th>
<th>Blast furnace</th>
<th>Open hearth furnace</th>
<th>Bessemer and Thornes</th>
<th>Rolling mills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shift</td>
<td>Day</td>
<td>Shift</td>
<td>Day</td>
</tr>
<tr>
<td>Belgium</td>
<td>90</td>
<td>10</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>Canada</td>
<td>10</td>
<td>90 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>80</td>
<td>20</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>Great Britain</td>
<td>80</td>
<td>20</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>Japan</td>
<td>79</td>
<td>21</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>India</td>
<td>86</td>
<td>14</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td>90</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>75</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Electric furnace.

The 8-hour day, as has been shown above, is almost universal in European countries, and 48 hours per week seems to be the normal working time for day workers. In India and China the employees work 9 hours, and at a South African establishment 8 or 9 hours according to the grade or occupation of the worker. Where a Saturday afternoon holiday is given, daily hours may be extended to 9, but not so as to exceed 48 in the week.

Shift workers round blast furnaces usually work seven shifts per week. A 7-shift week is also frequent round open hearth furnaces; it is less so in the other two branches of the industry. In some countries definite holidays are prescribed by law for shift workers in continuous industries. In Belgium, though they may work an average of 56 hours per week, they must have 26 full days’ holiday in the year. Shift workers in Czechoslovakia must be given 32 hours’ uninterrupted rest per week to fall on a Sunday every third week. Finland requires a period of 30 uninterrupted hours’ rest per week, while in Norway it need only be 24 hours. In Poland and the Serbo-Croat-Slovene Kingdom shift workers must have 24 hours’ uninterrupted rest twice in three weeks. Swiss legislation provides for 52 holidays of 24 hours per year, to include 26 Sundays.

Shift schedules have to be planned to conform with the respective regulations of each country. There are three methods of changing shift commonly in use where work is continuous all the year round, none of which involves the employment of spare men. They are as follows:

**First System**
- First week: a. b. c.
- Second week: b. c. a.
- Third week: c. a. b.

The three-shift system.
Under this scheme each squad has 32 hours' rest once in three weeks, and at the other two week-ends 8 hours' rest only.

**Second System**

<table>
<thead>
<tr>
<th>First week</th>
<th>Second week</th>
<th>Third week</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. b. c.</td>
<td>c. a. b.</td>
<td>b. c. a.</td>
</tr>
</tbody>
</table>

Under this scheme each squad has a continuous spell of 16 hours' work once in three weeks, and at the other two week-ends has 24 hours' rest.

**Third System**

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (') 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24</td>
</tr>
<tr>
<td>Friday a a a a a b b b b b b b c c c c c c c c c c a a</td>
</tr>
<tr>
<td>Saturday a a a a a b b b b b b b b c c c c c c c c c a a</td>
</tr>
<tr>
<td>Sunday a a a a a b b b b b b b b b b b b b c c c c c c</td>
</tr>
<tr>
<td>Monday c c c c c c a a a a a a a b b b b b b b b c c</td>
</tr>
<tr>
<td>Tuesday c c c c c c a a a a a a a b b b b b b b b c c</td>
</tr>
</tbody>
</table>

(') i. e. from 12 p.m. to 1 a.m., and so on continuously.

Here squad b, whose standard shift is from 6 a.m. to 2 p.m. on Sunday, continues to work four hours later, to 6 p.m. on Sunday; while squad c, whose standard shift is from 10 p.m. Sunday to 6 a.m. Monday, begins work four hours earlier, namely, at 6 p.m. Sunday. Two squads therefore work 12 hours at the week-end (the third 8 hours), so that each squad has 24 hours free at one week-end in three, and 20 hours at the other two.

None of the schemes described above provides a rest period of 24 hours each week.

One or other of these three systems is in use in the works concerning which the replies give information in Austria, Belgium, Germany, Italy, Poland, and Spain. In Great Britain a rotation of shift is secured at some Scottish blast furnaces by the employment of a squad of spare men for the first shift on Saturday, the three regular squads then recommencing in the same order, so that all the men get 24 clear hours’ rest once in every week.

With regard to improvements in the technique for making the change from one shift system to the other, the replies do not go into detail, but convey a general impression that the change may be facilitated by any improvements in machinery which result in a saving of labour, so that the number of extra workers required may be reduced to a minimum; and by the use of the most modern devices for lifting, transporting, and carrying material, so that the speed operations may be increased to a degree which can be main-
tained by men working for 8 hours at a stretch, but which would be impossible for 12-hour shift workers. It may thus be possible to adapt the plant and organise labour so that no decrease occurs in output per man per day in spite of the reduction of hours. For Great Britain it is shown in the report of the Industrial Fatigue Research Board (1) that “the efficiency of mechanical charging is four to eight times greater than that of hand charging” in the case of blast furnaces, and five times greater in the case of open hearth furnaces; while in one rolling mill investigated it was found possible to increase output by 12 to 21 per cent. by eliminating stoppages and delays in the running. The report says elsewhere:

Nothing was more striking than to compare the efficiency of the plant employed in various districts of Great Britain .. In two districts it appeared to be the rule, rather than the exception, to charge the open hearth furnaces with molten iron instead of cold iron, but in three other districts this procedure is almost unknown, though it improves the output of basic steel furnaces 30 per cent. or more, with little if any increase of expense. It seems probable that, if all the iron and steel works in the country adopted the most efficient methods, they could, on an average, improve their output by something between 50 and 100 per cent. In other words they could enable their employees to earn more in 8-hour shifts than they had previously done in 12-hour shifts.

One more quotation must be made from the same report, to show how great is the effect on output of thorough co-operation between employers and workers.

An instance has recently been described (2), in which the interest of the men in their work was stimulated by the formation of a men’s society. Lectures relative to steel production were given by workmen and by managers, new methods of working were suggested and discussed, and, if after due trial they were found to be of practical value, they were permanently adopted. In consequence of these improvements and of the extra keenness of the men in working the furnaces the output of the hand-charged furnaces gradually increased to about 70 per cent. above its previous value. This striking result, be it noted, was achieved without any substantial alterations of plant whatever. Moreover, the casting of the steel was so much improved that the net final yield of saleable steel was raised some 30 per cent. above the old level.

**GENERAL CONCLUSIONS**

Some employers in Austria, Belgium, Italy, the Serbo-Croat-Slovene Kingdom, and Spain, after a comparatively short experience of the three-shift system, express themselves as unfavourable

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(2) *The Organiser*, Nov. 1919. London.
to the innovation, and would like to return to the two-shift system. Regarding Great Britain, one employer who introduced it in 1897 states that it has been a distinct gain both to employers and workers. He points out, however, that the change was accomplished under conditions very différent from those which obtained on the Continent, the workers having consented to some sacrifice in wages. The opinion of the workers is almost unanimously in favour of the three-shift system; only in Italy and Canada is there evidence that isolated groups of workers would prefer to return to the old system, chiefly in order to earn more money.

The information supplied in reply to the questionnaire is useful and interesting, although it is in many ways regrettably incomplete. For some countries whose iron and steel industry is important information is deficient or entirely lacking. The government officials who have drafted replies have rarely had sufficient statistical and other evidence at their command; and the replies from employers' and workers' organisations show a certain tendency to contradict one another—owing, no doubt, to an instinctive desire on the one side to resist concessions to the workers in the real or supposed interests of maximum production at the minimum cost, and on the other to represent in the most favourable light the results of all such concessions.

In spite of the fact that the three-shift system has now almost entirely replaced the two-shift system throughout Europe, the change is so recent, and has taken place under such abnormal industrial and political conditions, that a definite comparison between the two systems cannot yet be attempted. The effects of the change upon the individual worker, upon the amount and quality of the work done by him, and upon the costs of production cannot yet be disentangled from the universal psychological and material disturbances which have characterised the last few years.
REPLIES TO THE QUESTIONNAIRE

QUESTION I

To what extent has the three-shift system displaced the two-shift system in the iron and steel industry?

AUSTRIA

A Factory Inspector

The two-shift system has been entirely displaced by the three-shift system.

On account of the fact that new houses were not erected when works that had been closed down were again set going, and that the quarters available before the war were just sufficient for the two-shift system, considerable difficulty with respect to housing was experienced when the staff was increased, especially in rolling mills.

BELGIUM

Ministry of Labour

The system has been applied everywhere. In certain rolling mills, however, work is still carried on by means of two 8-hour shifts, the work in such cases not being continuous.

Firm A

In the blast furnace and coke furnace sections the three-shift system is applied to all workers. In the steel works section (includ-

1 A draft reply, drawn up by the Chief Inspector of Factories, was forwarded to the International Labour Office and also to certain associations of employers and of workers in Austria. The Central Federation of Industry (Hauptverband der Industrie) expressed their general agreement with the draft, but suggested certain alterations on points of detail; the Central Committee of Christian Trade Unions also suggested some additions; the Austrian Trade Union Council (Gewerkschaftskommission) expressed their agreement with the draft after it had been amended in one or two points by the Chief Inspector of Factories himself. Under the various questions are given the original draft replies, the amendments of the author, and the alterations suggested by the Central Federation of Industry and the Christian Trade Union Committee.
ing open hearth furnaces and Bessemer converters) and in the rolling mills (including sheet-rolling mills, wire-drawing mills, etc.) the three-shift system is applied to all machinery which is working continuously. In repairing, building, and finishing shops, the two-shift system has been kept.

**Firm B**

The three-shift system has completely replaced the two-shift system.

**Firm C**

The three-shift system has been introduced in all branches of the industry.

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**Canada**

**Canadian Government**

Out of 15 firms operating blast furnaces, open-hearth furnaces, electric furnaces, and rolling mills, three (A, B, and C) are partly on three-shift now and one (D) adopted the three-shift system in 1917-18 but replaced it again by the two-shift system. The remainder are on a two-shift basis and not contemplating change.

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**Czechoslovakia**

**A Firm**

The extent of the application of the three-shift system, as against that of the two-shift system, depends on circumstances. When our factory is working at full capacity, the great majority work in three shifts. At present, on account of trade depression, only a small proportion work in three shifts. The total number of our workers is at present about 27,000, of whom 1,000 work in three shifts.

**A Trade Union**

In all establishments in which work is continuous, the three-shift system is already in operation. In branches of the metal industry engaged in the later processes of manufacture, the one-shift is still general. The three-shift system has been adopted in tube-rolling mills, plate-rolling mills, in enamelling works, metal works, and galvanising works.

**Metal Workers' Federation**

In our territory no blast and smelting furnaces come into consideration, and the scope of the question is thereby considerably reduced.

On the other hand, in regard to several questions we do not possess the data which would be required in order to give a com-
plete and detailed reply. We are therefore obliged to confine ourselves to facts which we have ourselves ascertained, and whose accuracy we can guarantee.

FINLAND

Firm A
In order to change to two shifts from three there has been required an increased number of workers and more workers' dwellings. According as they have been increased, the work has been converted into three shifts.

Firm B
The three-shift system has been completely introduced.

Firm C
The two-shift system is on the whole no longer applied in our industries.

GERMANY

Ministry of Labour
In Germany the three-shift system has been in general operation since the end of 1918 or the beginning of 1919, in all works in which uninterrupted work is necessary. In some of these works the system of two 8-hour shifts is adopted in the case of certain kinds of work which admit of interruption, e.g. general work, transport of ore, etc.

In coke works, where the furnaces do not require the uninterrupted employment of the workers, the system of two 8-hour shifts not directly following one upon the other is in force.

Metal Workers' Federation
The three-shift system has been introduced in all establishments.

Christian Metal Workers
In about half of the establishments the three-shift system has been adopted; in the remainder two shifts of 8 hours each are worked.

GREAT BRITAIN

Iron and Steel Trades Confederation
The three-shift system has displaced the two-shift except in a few isolated cases.

In certain finished-product branches of the trade, such as the rivet, bolt and nut trade, nail and tube trades, the operatives are still working a single-shift day, but the week has been reduced to 47 hours. In other branches of the industry day men formerly working a 12-hour day are now on single or day shifts of 8 hours with a weekly total of 47 hours.
ITALY

Italian Government

In almost all undertakings the system of three shifts of 8 hours each has been substituted for that of two shifts in processes of a continuous character, while in those of a non-continuous character the normal working day of 8 hours (or 48 hours a week) remains in force.

JAPAN

Firm A (1)

Of the workers employed here 80 per cent. work on shifts while the remaining 20 per cent. are day workers, that is to say, only 80 per cent. have come under the three-shift system.

Firm B (2)

In the blast furnaces (including coke works), open hearth furnaces, and rolling mills, the three-shift system was adopted throughout instead of the two-shift system.

POLAND

Four Firms

The three-shift system has been in force in the Polish iron and steel industry since the early days of the political re-creation of Poland. It was introduced by an Administrative Order of 23 November 1918. A return to the two-shift system has not been considered, since it is illegal. Among all the criticisms of the law

(1) Concerning the replies as a whole to the questionnaire Firm A observes: "This reply is limited to blast furnaces, open hearth furnaces, converters, and rolling mills. In other words the investigation has been made concerning approximately 10,000 out of 17,000 workers and 800 day labourers employed at these works. It has been found difficult to ascertain the effect of the three-shift system by itself in consequence of the facts that the system has not yet been in force for any length of time; that extension of the works has been going on continually; that the kind, quality and quantity of the products have fluctuated considerably; that especially in the operation of the furnaces the output varies a great deal according to the condition of the furnaces and is dependent upon the raw materials; and, finally, that the wages of the workers have been greatly increased. Consequently, the reply states only the conditions which obtained both during the year preceding and the following the adoption of the three-shift system."

(2) Firm B made the following observations on the questionnaire as a whole: "No sooner was the three-shift system adopted at the mines than the general depression commenced in the iron and steel industry throughout the world. Many factories were obliged to reduce their activities and in consequence there was a feeling prevailing among the workers that unless they worked their hardest they would be discharged. This resulted in a certain amount of tension and consequently the direct result of the adoption of the three-shift system cannot be exactly determined. Briefly, however, the diligence of the workers to-day is more noticeable than before the adoption of the three-shift system, i.e. before the depression, but is yet considerably inferior to the pre-war standard."
of 18 December 1919 on the 8-hour day, which took the place
of the Administrative Order referred to above, one encounters no
proposals for a return to the two-shift system in the iron and steel
industry on the part of either employers’ associations or workers’
associations or of any prominent individual connected with the
industry.
(The above is in answer to questions I, II and III.)

Roumania

Workers

Of the blast furnaces existing in the Banat and Transylvania,
only the great iron and steel factories of Reshitza have substituted
the three-shift for the two-shift system.

Serbo-Croat-Slovene Kingdom

Firm A

The three-shift system has completely displaced the two-shift
system.

Firm B

Our works have two reverberatory furnaces (Martin) and a
steel rolling mill. In these two works the three-shift system has
been introduced.

South Africa

A Firm

The whole of the smelting furnaces are worked on the three-
shift system.

Spain

Firm A

Wholly.

Firm B

Three shifts have been formed from the same number of workers
as were formerly available, and wages have been modified, so that
each worker receives the same pay for 8 hours as formerly for 12
hours.

Firm C

As a result of strikes and abnormal conditions from which the
factory suffered last year the three-shift system has not been
introduced. In the rolling mill, work is carried on with two 8-hour
shifts only, and the Siemens furnace is not working at the moment.
A few experiments only have been made in this direction.
Firm I
Wholly, with a view to introducing the 8-hour day in factories which work continuously. In the rolling mills there is only one shift.

Firm E
Three shifts have been introduced in the Martin 15-ton furnace; a single 8-hour shift only works in the Bessemer converter and the rolling mill.

Firm F
In all branches where the work is continuous.

Firm G
Wholly, for in order to work the furnaces continuously and economically a third shift has been formed so as to introduce the 8-hour day.

Firm H
Wholly, three 8-hour shifts.

Firm J
In the factories working continuously, three shifts have been introduced.

Firm K
Wholly. Work was carried on with two shifts and a third shift had to be added, to introduce the 8-hour day.

Firm L
The three-shift system is applied to blast furnaces, Martin steel furnaces, puddling furnaces, and rolling mills.

Sweden

An Employers' Association
The three-shift system has been introduced at blast furnaces, Bessemer converters, open hearth furnaces, and at some rolling mills.

Switzerland

Federal Factory Inspectors(1)
The three-shift system is applied: in rolling mills and in Siemens-Martin furnaces, including the heating and annealing processes,

(1) The Swiss Federal Inspector observes as follows: “We may first observe that, in our opinion, the moment chosen for this enquiry is premature and unfavourable. On the one hand, experience under the three-shift system has been too short to allow of a definitive opinion being formed; on the other hand, up to the present the iron and steel industry has scarcely been working under
and in most brass works in the annealing process. For rolling purposes, brass works still work with only two shifts. This is a temporary provision.

A Firm

The three-shift system has replaced the two-shift system in all branches of the establishment.

normal conditions. We may also remark that certain of the questions asked do not correspond to existing conditions in Switzerland. This is of course due to the fact that they are determined by the situation in the iron and steel industry in America, to which they principally refer.

"So far as Switzerland is concerned, we consider the following installations as within the limits of the enquiry in the iron and steel industry: blast furnaces, open hearth furnaces (Siemens-Martin furnaces), Bessemer converters, iron and steel-rolling mills, plate and pipe-rolling mills, wire and pipe-drawing mills in the copper and brass industries. We have only made casual reference to electric furnaces for steel and iron manufacture, for although these are acquiring an ever increasing economic and technical importance, they would seem to come under the heading of "more refined manufacturing processes" which the enquiry leaves out of account.

"Finally, in accordance with the wording of the Questionnaire, we have taken no account of foundries and forges. Within the limits thus established the following should be mentioned:

1. Blast furnaces;
2. Factories with Siemens-Martin furnaces, one of which has Bessemer converters as well;
3. Rolling mills;
4. Brass works.

"It should further be noted that the blast furnaces have not been working for several years, and that the Siemens-Martin furnaces are being, or soon will be, replaced by electricity. The multiple shift system has never been applied in the case of Bessemer converters. They may therefore be left out of account."
QUESTION II

Where such a change has taken place—

(a) When was the three-shift system introduced?
(b) On whose initiative was the change made?
(c) Was the change finally brought about
   1. By law?
   2. By trade union agreements?
   3. By the action of employers’ associations or individual employers?
   4. By other means?

(In replying to (c) please give details, supplying copies of laws or agreements.)

Austria

A Factory Inspector

(a) The three-shift system was introduced everywhere with the coming into force of the Act of 19 December 1918 on 8 January 1919.
(b) and (c) Immediately after the revolution the workers appealed for the introduction of the 8-hour shift. The National Constituent Assembly immediately took in hand and passed the necessary Bill. The employers have carried out the transition from the two-shift system to the three-shift system without offering any resistance.

Christian Trade Unions

When this Act of 19 December 1918 came into force the change over on the basis of statutory regulations was accomplished without noticeable opposition on the part of the employers.

Belgium

Ministry of Labour

(a) The system has been in force since the beginning of 1920.
(b) The change was brought about as a result of pressure exercised by the workers, who threatened a general strike if the three-shift system were not introduced immediately.

Firm A

(a) Blast furnaces and coké furnaces. At the restarting of the blast furnaces after the Armistice (September 1919).

Steel works and rolling mills. The 8-hour day began to be applied in February 1920. Its application was universal by the beginning of June 1920. During this period these two sections were transferred to the three-shift system. The delay was necessary
in order to engage the extra staff, the staff being increased by 50 per cent. where three shifts were worked.

Subsidiary departments. Between February 1920 and the beginning of June 1920 these branches were put on to a one or two-shift basis.

(b) The employers accepted the three-shift system because they were driven to it by the tendency of the times, but they are persuaded that the system is harmful to Belgian interests.

(c) 1. No.
2. Under pressure of a movement of a political character.
3. The employers gave in on the question in a spirit of conciliation towards the tendency of the times, while protesting that the system would be disastrous for Belgium so long as other countries, notably Germany and the United States, did not adopt it.

Firm B

(a) The three-shift system was introduced: in blast furnaces and coke furnaces 1 October 1919; in Martin furnaces 1 November 1919; in “Thomas” steel works 1 January 1920; in rolling mills 1 January 1920.

(b) On the initiative of the trade union.

(c) By a collective agreement.

Firm C

(a) In January 1920.

(b) As a result of pressure exercised by the workers, who threatened a general strike if the three-shift system were not introduced at once.

Canada

Government

(a) Firm A has the sheet mill on three shifts.

Firm B changed electric furnace crews from two-shift to three-shift 1 January 1921.

Firm C introduced the three-shift system in the gas engine house at blast furnaces and for rail straighteners in the rail finishing mill on 1 November 1918.

Firm D gives the following statement regarding experience with the three-shift system:

We used the three-shift system in 1917-18 while running a 2 1/4-3 ton furnace, but the results were far from satisfactory, and on the installation of the 6-ton furnace in September 1918, by mutual arrangement made with the men, the plant was put on a two-shift basis of 11 and 13 hours. Experience has shown that in these shifts the men actually only work from 6 to 8 hours. Shifts were changed every two weeks and the men were better satisfied as they claim that they had more free time to themselves than in the three-shift system, besides earning more money. From our standpoint it was a very much better arrangement as there was less possibility of one shift passing their troubles on to the next shift. We do not believe that our men would be satisfied to go back to the three-shift system. Number of men per shift, 10; average number of men on day work, 5; day work hours 7 a.m. to 5 p.m.
(b) In the case of firm B the change was made on the initiative of the department Superintendent.
(c) 1. No.
   2. No.
   3. In the case of firm B the change was brought about by the management of plant.
   4. In the case of firm C the change followed a Board of Conciliation. No agreements are available.

CZECHOSLOVAKIA

A Firm
(a) When the factory is fully employed the three-shift system is applied in all departments. It is only for lack of work that the system of one or two 8-hour shifts has been introduced.
(b) The first steps towards the change were taken by the employers. In order to utilise time when the factory would otherwise have been stopped, the 8-hour shifts were introduced during the war, especially round the furnaces.
(c) The change was finally introduced on 1 December 1918 as a concession to the demands of the workers.

Metal Workers' Federation
The three-shift system was introduced in Czechoslovakia at the time of the collapse of the old régime, on the initiative of the workers. In the meantime, hours of work have been regulated by law, and the 48-hour week is now in operation in Czechoslovakia.

FINLAND

Firm A
(a) The three-shift system was introduced in 1918.
(b) The change was made on the initiative of the employers.
(c) By the 8-hour working day law of 27 November 1917.
   2. No.
   3. By action of employers.
   4. No.

Firm B
(c) 1. Definitely by law of the 27 November 1917.
   2. This law was carried through on account of the pressure of the barbarized Russian soldiers.
   3. Formerly introduced on our initiative in blast furnaces, and at intervals at the rolling mills on account of the fact that the welding furnaces could thus be better utilized. Increase of production about 30 per cent.

Firm C
(a) In June 1918.
(b) By law.
(c) 1. Yes.
Ministry of Labour

(a), (b), and (c). The change to the three-shift system was the result of the maximum 8-hour working day, which was effected by the Order concerning the regulation of hours of work for industrial workers — 23 November 1918 and 17 December 1918 (Reichsgesetzesblatt, pp. 1334 and 1436). Although, in many cases, the supply of skilled workers and of foremen necessary for the three shifts was not available, the 8-hour working day and with it the three-shift system had been introduced generally by the beginning of 1919.

Metal Workers' Federation

Simultaneously with the introduction of the 8-hour working day.

Christian Metal Workers

(a) In November and December 1918. Finally adopted on 1 January 1919.
(b) See pamphlet issued by the Christian Metal Workers’ Union: Um den Achtstundentag, by Wilh. Mauer, 1920.
(c) In the first instance, by an Agreement of the Central Industrial League (Zentralarbeitsgemeinschaft) of 15 November 1918 (Reichsarbeitsblatt of 17 November 1918, No. 12, § 9); then by an Order of the Federal Department for Industrial Demobilisation of 23 November 1918 (§§ II and VII, Reichsgesetzblatt, p. 1334); then by an Order of the Government of People's Commissioners, to take effect as from 1 January 1919 (Reichsgesetzblatt, p. 1303).

Great Britain

Iron and Steel Trades Confederation

(a) In the early months of 1919, the exact date varying in the different districts and branches of the trade.
(b) On the initiative of the workmen.
(c) By trade union agreement with the employers' associations. The question of 8-hour shifts was discussed with the South Wales Steel Employers in 1905 and was accepted in principle by their association. It was proposed by the men's representatives to the English Steel Ingot Makers' Association in 1907, but rejected. In 1912 it was again brought up and the employers agreed to consider schemes for general application.

In the meantime the majority of the Welsh Steel Works had applied the system and also several works in England. Further applications were made to the Steel Ingot Makers' Association but no agreement had been reached when the War broke out.

In June 1918 application was made to the various employers’ associations, and a Conference was held on 10 December 1918, representing the trade in the North of England and Scotland.
Negotiations were also opened with the trade associations in South Wales and other districts. Final agreements were signed about February and March 1919.

Documents attached:
1. The Newcastle Agreement, 19 February 1919.
2. Midland Wages Board Schedule of Reductions.
3. Arbitration Award re South Wales and Monmouthshire Steel Association.

**Firm A**

The arrangement was effected in December 1897 after a very long discussion with the representatives of the workmen, who, for the purpose of obtaining the much desired change, were quite prepared to make considerable sacrifices both in rates of wages and in the number of men engaged on particular jobs.

The arrangement finally concluded was the result of prolonged negotiations and mutual concessions.

**Italy**

*Government*

(a) The system was adopted in many undertakings as early as 1919, contemporaneously with the introduction of the 8-hour day. In others it was adopted in 1920. In the railways of Voltri it has been in operation since 1915, but limited to the electric furnace department. In the steel works of Magona d’Italia it has been in operation for about ten years.

(b) and (c) The initiative in the adoption of the three-shift system is due almost entirely to the workers’ organisations.

1, 2, 3, 4. The three-shift system was adopted in pursuance of agreements between employers and workers.

**Japan**

*Firm A*

The system was adopted:
(a) On 1 April 1920.
(b) On the initiative of the director of the works.
(c) And was brought into force as the revised form of the workers’ regulations laid down by the director of the works.

*Firm B*

The three-shift system was adopted:
(a) On 1 December 1919.
(b) On the initiative of the management of the mines.

The speedy adoption of the system was due partly to the desire expressed by a part of the workers while the direction was investigating the matter.

(c) By the action of the management of the mines as the result of a thorough enquiry and in order to conform to the trend of the times.
Poland

(See under question I, above.)

Roumania

Workers
(a) In November 1918.
(b) On the initiative of the workers' organisations (through the Central Office of International Organisations at Budapest).
(c) By legislative provisions made by the Budapest Government, and by agreement between the parties concerned.
Neither the text of the legal provisions nor that of the agreements is available.

Serbo-Croat-Slovene Kingdom

Firm A
(a) The three-shift system was introduced on 15 January 1919.
(b) The change was made on the initiative of the workers' organisations in agreement with the Government.
(c) The change was finally brought about:
1. By legal regulations.
We have no further details.

Firm B
It has been introduced on the initiative of the trade unions by order of the Government.

South Africa

A Firm
(a) February 1920.
(b) Employees approached the management.
(c) Yes, by management, as extra men were obtained.

Spain

Firm A
(a) 10 June 1919.
(b) Due to the general change that has taken place in social questions.
(c) 1. Royal decree of 3 April 1919 on the 8-hour day.
2. By agreement between employers and workers which came into force 10 June 1919.
3. No.
4. No.

The three shift system.
Firm B

(a) 15 October 1919.
(b) Due to the workers, who demanded it.
(c) 1. No.
   2. No.
   3. No.
   4. After a strike.

Firm C

In all branches of the works (except rolling mills and the Siemens furnace) the two 8-hour shift system is in force, the work being discontinuous.

Firm D

(a) In 1919.
(b) On the initiative of the management in order to conform with the law.
(c) 1. Yes. — Royal decree of 3 April 1919 on the 8-hour day.

Firm E

(b) On the initiative of the management, in order to conform with the law.
(c) 1. Yes, by virtue of a royal decree dated 3 April 1919, on the 8-hour day.

Firm F

(a) In August 1919.
(b) On the initiative of the company.
(c) 1. By virtue of legal provisions and by decision of the employers.

Firm G

(a) At the beginning of 1919.
(b) On the initiative of the employers, in order to fulfil the law.
(c) 1. Yes, royal decree of 3 April 1919 on the 8-hour day.

Firm H

(a) In October 1919.
(b) On the initiative of the employers to comply with the law.
(c) 1. Yes, royal decree of 3 April 1919.

Firm J

(a) 1919.
(b) On the initiative of the employers.
(c) 1. Yes, royal decree of 3 April 1919 on the 8-hour day.

Firm K

(b) On the initiative of the employers, but in virtue of the law on the 8-hour day.
(c) 1. Yes, royal decree of 3 April 1919 on the 8-hour day.
**Firm L**

(a) 1 October 1919.
(b) Due to the law.
(c) 1. Yes, royal decree of 15 March 1919.
   2. Yes, down to 1 October 1919, when the three-shift system was introduced.
   3. No.
   4. No.

**Sweden**

An Employers' Association

(a) The change from the two-shift system was introduced at the blast furnaces and the converters successively during the last five years, and at the open hearth furnaces and the rolling mills from 1 July 1920.

(b) and (c) At the blast furnaces and Bessemer converters in the first instance by action of individual employers and later by trade union agreements; at the rolling mills mainly through the initiative of the employers; and, finally, at the open hearth furnaces on account of the regulations in the new law of 17 October 1919.

**Switzerland**

Federal Factory Inspectors

The introduction of the three-shift system, so far as it has been carried out, dates from 1 October 1919.

It is difficult to say with accuracy whose was the initiative. The change is a natural consequence of the evolution of the past few years. General opinion was already prepared for it by the new Federal law of 18 June 1914 on labour in factories. It is true that this law has not yet entered into force, but it provided in principle, and under certain reservations, for the three-shift system in all factories where work was continuous. The general tendency was also accelerated by the strong movement in favour of the 48-hour week, which found expression in the Federal law of 17 June 1919 on hours of work in factories. This law prescribes the 48-hour week for factories which employ only a single shift, and the 8-hour day for factories which work with more than one shift. The Federal laws of 18 June 1914 and of 27 June 1919 on labour in factories came into force on 1 January 1920.

The introduction of the three-shift system prior to the entry into force of the law is due, firstly, to an agreement made on 11 April 1919 between the Swiss Association of Employers in the Machine and Metal Industries and the Swiss Federation of Metal Workers and Watch Makers; secondly, to a decision of the employer's association which, taking into consideration the fact that the new legal regulations could not maintain the time limit fixed by the agreement for the reduction of hours of work, recommended its members to carry the reform into effect as early as 1 October 1919.
A Firm.

(b) and (c) The Federal Factory Act of 18 June 1914 and the Amending Act of 27 June 1919 which came into force on 1 January 1921 provide for the introduction of the three-shift system. Its introduction on 1 October 1919 was the result of an agreement between the parties concerned.

Sections 53 and 54 of the Factory Act and the corresponding provisions in section 163 to 172 of the administrative regulations to the Factory Act should be consulted.
QUESTION III

Is any portion of the steel industry now contemplating

(a) Changing from two to three shifts?
(b) Changing from three to two shifts?

(Please state if any body of employers or employees is known to desire to change from three to two shifts.)

AUSTRIA

Employers’ Federation

(b) The abolition of the three-shift system would be desirable, and we repeatedly raised this demand, but failed in face of the opposition of the workers. Under the two-shift system output was greater and costs considerably lower on account of the smaller staff required. The industry cannot be fully employed for several years, even if raw materials were available, because the housing question cannot be so rapidly solved for the increased number of workers required under the three-shift system.

Christian Trade Unions

(b) Neither employers nor workers have expressed the desire to replace the three-shift system by the two-shift system.

BELGIUM

Ministry of Labour

(a) The change has already been made. In the rolling mills where the two-shift system is still being worked, the three-shift system will be adopted as soon as production can be increased, if sufficient workers can be engaged.
(b) None, as far as we know.

Firm A

(a) No.
(b) No. A change would be desirable, but the ideas which are still being spread among the workers by the trade unions prevent the re-establishment of normal conditions.

Firm C

So far as we know the question has not yet been raised, but we take this opportunity of stating that the change to the three-shift system has had an adverse effect on costs.
Canada

Government

Two firms, one of which operated an electric furnace, stated that they were just commencing operation and that later they might give information which would be helpful. One stated definitely that the three-shift system would be adopted.

Czechoslovakia

Metal Workers' Federation

We are not as yet aware that any establishments which have the two-shift system are contemplating a change to the three-shift system, nor do we know whether the three-shift system is to be abandoned and the two-shift system introduced in its place. There could be no question of this, except in cases in which the division of the work into two shifts is possible, and in this case the works would have to be closed for 8 hours out of the 24 (the Act does not admit of an extension of working hours beyond 48 per week, and therefore in continuous industries there can be no question of abandoning the three-shift system).

Finland

Firm A

(a) Partly converted into three shifts.
(b) No. After the 8-hour working day was introduced, it may be replied as far as the employers are concerned: it is not desirable. The worker would probably not offer any objection to it, as he could then stay at home during the nights (sic).

Firm B

(b) Not desirable for blast furnaces.
    Desirable for Martin furnaces.
    Not at all desirable for rolling mills.

Firm C

(a) Already an accomplished fact.
(b) No.

Germany

Ministry of Labour

A change in the legislation concerning the 8-hour day is not at present contemplated, nor is it possible. The provisions of the existing regulations are included in the bill concerning the hours of employment of industrial workers, which is in course of preparation.
Christian Metal Workers

(a) No.

(b) Yes, subject to maintenance of the 48-hour week, a corresponding prolongation of the individual shifts, to be carried out in works in which utilisable waste gases or cheap sources of power are not available, is suggested, in order that fuel to heat the furnaces and boilers may be economised.

The question is raised in employers' circles, but the proposal is rejected by the workers.

Great Britain

Iron and Steel Trades Confederation

No.

Firm A

What was the general economic effect of the change of shift-system is somewhat a matter of opinion as there are no direct statistics so far as I am aware, but my own recollection is clear that after the system had been in operation a short time no one would have been disposed to return again to the 12-hour shift.

Work was more regular, results more satisfactory, and, so far as the particular works I was then connected with were affected, the change was a distinct gain to the employers.

Italy

(a) and (b) While many metal-working employers are not disposed to abandon the three-shift system in order to return to the two-shift system, others would like to return to the old system, but do not care to express their desire from the certainty of meeting with energetic opposition on the part of the workers. On the other hand, it has been ascertained that some isolated groups of workers have endeavoured to return to the system of two shifts of twelve hours with the sole motive of earning more money, but this desire has had no effect on the majority of workers.

Japan

Firm A

At present there is no intention of changing either from the two to the three-shift system or vice versa. The opinion of the labourers and inspectors in various departments was consulted and it was found that there were scarcely any who preferred the two to the three-shift system.

Firm B

The steel industry practically ceased in July 1920 owing to the economic conditions of the world.
It is not clear how many were actually in favour of the three instead of the two-shift system. It is obvious, however, that few people would be opposed to less hours of work if the same amount of wages were given them.

**Poland**

(See under question 1, above.)

**Roumania**

*Workers*

(a) Yes.
(b) No.

**Serbo-Croat-Slovene Kingdom**

*Firm A*

(a) Yes, in the event of increased attention to work being shown.
(b) Neither the employers' nor the workers' organisations have so far expressed any desire to change from three to two shifts.

*Firm B*

Our establishment is of the opinion that the introduction has not had the expected advantages, especially as regards an increase of production. Therefore the three-shift system is not in our opinion desirable.

**South Africa**

*A Firm*

(a) As soon as we have another furnace in service and the trade demands such, three shifts will be worked on our finishing rolling mills.
(b) No.

**Spain**

*Firm A*

(a) The serious crisis in the iron and steel industry would be an argument in favour of abandoning a system which has increased to such an extent the amount of labour necessary. No workers' or employers' organisation, however, has made any proposal of returning to the two-shift system.

*Firm C*

(a) For the Siemens furnace, which will shortly begin to work, there is some idea of adopting the three-shift system, though the work will first be tried in two shifts, leaving the furnace to work at a reduced speed for the remainder of the time.
(b) No.
Firm D
(a) Already adopted.
(b) No.

Firm E
(a) Adopted wherever indispensable.
(b) No.

Firm F
(a) Already adopted for the continuous operations of blast and coke furnaces, blowers, boilers and locomotives; one 8-hour shift for auxiliary work.
(b) No.

Firm G
(a) Already adopted.
(b) No.

Firm H
(a) Adopted.
(b) No.

Firm J
(a) Already adopted.
(b) No.

Firm K
(a) Already adopted.
(b) We should return to the two-shift system if the law allowed it.

Firm L
(a) It was not convenient to do so.
(b) The law forbids it, but the change is desired.

SWEDEN

An Employers’ Association
(b) No.

SWITZERLAND

Federal Factory Inspectors
(a) Factories which are still permitted, under the transition régime, to work with two shifts will probably in time have to take to the three-shift system, unless they prefer to adopt a solution which will allow them to substitute for their uninterrupted day and night shifts a discontinuous method of work. In this case they will not be obliged to have recourse to three shifts. It should also be observed that the law fixes no limit to the period during which an establishment may profit by the transitional régime, but merely stipulates that the transitional régime shall be allowed for a reasonable period, where the conditions of work in a factory necessitate it. One of the chief reasons for the allowing of the
transitional period is that most of the workers employed in such factories do not live close to the factory, and must therefore use transport organisations to get to and from their work, which cannot easily put at their disposal the transport facilities necessitated by the three-shift system, especially at night-time. Another reason of which account had to be taken was the condition and development of technical equipment, the capacity of which could not have coped with the requirements of work at higher pressure. It should also be added that it was at the request of the workers that the two-shift system was maintained in the establishments in question, and that such establishments adopted of their own accord the principle of the 48-hour week for workers engaged in day and night work, although Article 171 of the Circular of 3 October 1919, explaining the application of the Factory Law, authorised the fixing of the actual hours of work at 10 hours for each shift.

(b) The return from the three-shift system to the two-shift system does not depend upon the will of an employer or of a branch of the iron and steel industry. The system established by the law is compulsory for all. Modification of this law would only be possible, in a case similar to that mentioned under (a) above, by the substitution for uninterrupted work of discontinuous work covering less than 24 hours per day.
QUESTION IV

Where a change has been made from the two to the three-shift system, how much greater has been the number of men required to run three shifts, as compared with two shifts? Please give separate percentages for

(a) blast furnaces;
(b) open hearth furnaces;
(c) Bessemer converters;
(d) rolling mills.

Include in the calculation only the men actually working on shifts.

Austria

A Factory Inspector

The total number of men in individual works was as a rule not increased, since, as a result of the decreased activity in almost all branches of industry, it was possible to re-arrange the existing number of workers. In the separate branches of industry — blast furnaces, open hearth furnaces, and rolling mills — the number of workers had, as a rule, to be increased by half. Only in isolated instances was it possible to supply the necessary number by a smaller increase. (Reserve labour is not taken into account in the above reply.)

Employers' Federation

The actual increase of staff by 50 per cent. cannot be introduced everywhere, very largely on account of the shortage of labour and housing.

Christian Trade Unions

In most undertakings the number of workers employed was increased.

Belgium

Ministry of Labour

(a) 50 per cent.
(b) 50 per cent.
(c) 50 per cent.
(d) 50 per cent.

Firm A

(a), (b), (c), and (d). Increase of 50 per cent. on the numbers under the two-shift system.
Firm B
The substitution of the three-shift for the two-shift system has necessitated extra labour as follows:
(a) Blast furnaces 46 per cent.
(b) Martin furnaces 22 per cent.
(c) "Thomas" steel works 24 per cent.
(d) Rolling mills, 29 per cent.

Firm C
(a) Blast furnaces 50 per cent.
(c) Bessemer converters 50 per cent.
(d) Rolling mills not more than 50 per cent.

Canada
(b) Around the electric furnace the force was increased one-third
(d) In the sheet mill the force was increased 50 per cent.

Czechoslovakia

Metal Workers' Federation
The introduction of the three-shift system has rendered an increase in the number of workpeople necessary, but the percentage increase is much less than is generally supposed. General work, such as the transport of raw materials and goods, is, as a rule, carried out only during the day. Warehouse workers, etc. are likewise employed only on one shift per day; accordingly, work which does not belong to the process of production does not come into consideration. We are, however, able to state that in establishments in which the three-shift system has replaced the two-shift system, the number of workpeople employed has been increased from 0 to 20 per cent.

Finland
Firm A
(b) About 30 per cent. (Martin furnaces).
(d) About 30 per cent. (rolling mills).

Firm B
(a) 5 per cent. (blast furnaces).
(b) 6.5 per cent. (Martin furnaces).
(d) 50 per cent. (rolling mills).

Firm C
The number of workers per day and night has been increased by the change from two to three shifts.
(b) 43 per cent. increase.
(d) 50 per cent. increase.
GERMANY

Ministry of Labour

As a result of the change from the three-shift to the two-shift system, it was necessary to increase by one-half the number of workers employed in industries in which work is continuous. This has actually been done in individual cases. In general, however, in most works, owing to the industrial situation, output was reduced, and various sections closed down, with the result that the total number of workers was not only not increased as compared with the total number in the last peace year, but even fell below that figure.

Metal Workers' Federation

About one-third more workers were engaged.

Christian Metal Workers

(a) 50 per cent.
(b) 50 per cent.
(c) 72 per cent., taking into consideration the very large increase in the number of unproductive workers (fitters, forge-workers, etc.).
(d) 70 per cent. under the same considerations as (c).

GREAT BRITAIN

Iron and Steel Trades Confederation

(a) Probably 40 per cent. increase of shift-men.
(b), (c), (d). 50 per cent. increase of shift-men.

ITALY

Government

Although many employers introduced the three-shift system with a view to obtaining the greatest possible reduction in their staff, it has been found in practice that the number of workers in the undertakings has increased by from 20 to 50 per cent., chiefly in consequence of the stipulation made in some districts by the workers that the third shift must be composed of new hands.

JAPAN

Firm A

The change in the number of workers employed at the time of the adoption of the three-shift system instead of the two was as follows: In the case of blast furnaces there was a decrease of 7 per cent.; this, however, was due to the fact that of the five blast furnaces there were two which stopped blowing. In the case of open hearth furnaces there was an increase of 28 per cent., in the converters 11 per cent., and in the rolling mills 18 per cent., the total increase being 6.5 per cent.
Four Firms

The increase in the number of workers in proportion to output is for two Martin furnaces 50 per cent.; for one Martin furnace 49 per cent.; for a small section rolling mill, working two 8-hour shifts, 40 per cent.; for one blast furnace 48 per cent.; for another blast furnace and for a rolling mill 40-45 per cent.; shift workers represent 80-85 per cent. of the total personnel.

Roumania

Workers

About 30 per cent.

Serbo-Croat-Slovene Kingdom

Firm A

(b) 50 per cent.

(c) When all our rolling mills are at work: 50 per cent., but as we have never been in full activity since 1918 the substitution of the three-shift system for the two shift system has not necessitated an increase of staff, as our various rolling mills are never all working at the same time.

(d) In the wire mills 50 per cent.

Firm B

At the reverberatory furnaces as well as at the rolling mills, wages have risen as a result of the introduction of the three-shift system by at least 33 1/3 per cent.

South Africa

A Firm

(b) Open hearth furnaces; increase of white labour 50 per cent. increase of native labour 50 per cent.

Spain

<table>
<thead>
<tr>
<th>Firm</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>32</td>
<td>32</td>
<td>--</td>
<td>25</td>
</tr>
<tr>
<td>B</td>
<td>50</td>
<td>50</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>E</td>
<td>--</td>
<td>50</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>F</td>
<td>50</td>
<td>25</td>
<td>1 shift only</td>
<td>1 shift only</td>
</tr>
<tr>
<td>G</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>H</td>
<td>50</td>
<td>--</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>J</td>
<td>--</td>
<td>60</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>K</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>50</td>
</tr>
<tr>
<td>L</td>
<td>30</td>
<td>30</td>
<td>--</td>
<td>50</td>
</tr>
</tbody>
</table>
An Employers' Association

(a) and (b) (Blast furnace and open hearth furnace) 40-50 per cent. greater.

Federal Factory Inspectors

It is not possible to give a complete answer to this question. It may generally be stated that no more supernumerary workers are required under the three-shift system than under the two-shift system, the number of such workers being determined by the necessities of the work. Although, as a rule, the introduction of the third shift has led to a 50 per cent. increase in the personnel, there are nevertheless cases where, thanks to the improvements made at the time when the third shift was introduced in the organisation of the establishment and its technical equipment, it has been possible so to economize labour that the increase in staff is not in arithmetical proportion to the increase in the number of shifts. We have at the moment no detailed information on this matter, and we are, therefore, not in a position to indicate exactly the increase in the number of workers in a shift. As regards the strength of the shifts, they vary according to the nature and importance of the establishments. It seems unnecessary to indicate the proportions here.

A Firm

The introduction of the three-shift system required an average increase of 30 per cent. in the number of workers in rolling mills as compared with the two-shift system.
QUESTION V

How does the output per man per day under three shifts compare with the output per man per day on two shifts in the case of:

(a) blast furnaces?
(b) open hearth furnaces?
(c) Bessemer converters?
(d) rolling mills?

Austria

A Factory Inspector

(a), (b), (c), and (d). No accurate answer can be given, because the daily output is influenced not only by the system of shifts but also, and to a more marked degree, by other causes, such as lack of coal, underfeeding, and psychological factors. Moreover the transition was effected so quickly that the technical arrangements for an increase of production with the same number of workers in one shift could not be made. And it is possible, particularly in the rolling mills, by the selection of more adequate or larger heating furnaces (continuous heating furnaces, etc.), and by the introduction of carrying and hoisting machinery (cranes, live roller gear beds of all kinds), to increase output by reducing the periods of inactivity of the furnaces, and by working the machinery at higher pressure.

Employers' Federation

The conclusion may be drawn from conditions in all other industries that an increase in output per man per day will not result from the introduction of the three-shift system.

Christian Trade Unions

So far as it is in general possible to judge on this point, it would appear that the introduction of the three-shift system was at first followed by a reduction in daily output. This fact should not, however, be attributed to the 8-hour shift, but rather to the totally inadequate food supply and to the coal shortage, in addition to which the technical improvements and equipment necessitated by the change were usually absent.

Recent enquiries undertaken by our Unions show that daily output has increased considerably since 1919 in almost all the undertakings concerned.
Belgium

Ministry of Labour

(a), (b), and (c). The hourly output is practically the same as before, according to statements made by the employers.

Firm A

(a) Blast furnaces and coke furnaces. The output of the equipment being independent of the workers, the system has had no effect, but the number of workers has increased 5 per cent. per ton produced.

(b), (c), and (d). The output per actual working hour has not increased. The output per day has decreased proportionately to the decrease in the hours of work.

Firm B

Taking 100 as representing the daily output of workers under the two-shift system, the output under present conditions is respectively: blast furnaces 79; Martin furnaces 66; Thomas steel works 65; rolling mills 58.

Firm C

The total output is exactly the same, and hourly output has therefore remained unchanged.

Canada

Government

No statements can be made regarding comparative output owing to slight experience with the three-shift system.

Finland

Firm A

(b) Martin furnaces: no change.

(d) Rolling mills: a decrease.

Firm B

(a) Blast furnaces: 5 per cent. decrease.

(b) Martin furnaces: 6.5 per cent. decrease.

(d) Rolling mills: 22 per cent. decrease.

Firm C

(b) Output has been decreased by 44 per cent. per man per day.

(d) Output decrease by 5 per cent. per man per day.
According to reports of the factory inspectors it would appear in many instances that the expectation which had been entertained that the workers would produce approximately as much in 8 hours as in the longer working hours formerly customary, has not been fulfilled. In some cases, the output, on the contrary, appears to have fallen, so that very often in three shifts the output is less than it was formerly with two shifts. This phenomenon is, however, not in the first instance to be attributed to the introduction of the three-shift system but to other causes, such as the general distaste for work, disturbed political conditions and the like, and, further, to the lack of discipline still to be observed in many places. Workers often begin work late and stop before the fixed hour, so that there is a lengthy interval when shifts are changed, and this naturally causes a considerable reduction in output. This disadvantage is more noticeable under the three-shift system, as the shifts are changed oftener than under the two-shift system. Exact statistical data concerning the reduction in output are supplied in a very few cases only. One factory inspector reports, for example, that in a certain large iron works the number of workers had risen by 33 per cent. in June 1919, as compared with the monthly average for the year 1913-14, while the output of crude steel had fallen by 43 per cent. (cf. Jahresbericht der Gewerbeaufsichtsbeamten und Bergbehörden, 1919, I, p. 500). The following table shows the output per shift in the various sections of a works in the same district.

<table>
<thead>
<tr>
<th></th>
<th>1913-1914</th>
<th>1919</th>
<th>1920</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metric tons</td>
<td>Metric tons</td>
<td>Metric tons</td>
</tr>
<tr>
<td>Blast furnaces</td>
<td>2,055</td>
<td>0,896</td>
<td>1,026</td>
</tr>
<tr>
<td>Coke works</td>
<td>6,508</td>
<td>2,540</td>
<td>2,675</td>
</tr>
<tr>
<td>Steel works</td>
<td>2,009</td>
<td>0,655</td>
<td>0,735</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>0,611</td>
<td>0,364</td>
<td>0,405</td>
</tr>
</tbody>
</table>

(Cf. Jahresbericht der Gewerbeaufsichtsbeamten und Bergbehörden, 1920, I, p. 562.) The figures show a gradual improvement in the situation, which is confirmed from other sources.

Metal Workers’ Federation

There has been an increase in output under the 8-hours shift system as compared with the former 12-hours shift in proportion to the greater number of workers employed.

Christian Metal Workers

Output per man per day under the three-shift system and under the two-shift system is shown in the following table.
### Introduction of the three-shift system

<table>
<thead>
<tr>
<th></th>
<th>Blast furnaces</th>
<th>Open hearth furnaces</th>
<th>Cogging mills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Middle of January 1919</td>
<td>1 December 1918</td>
<td>5 December 1918</td>
</tr>
<tr>
<td><strong>Output in</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 1918</td>
<td>42,001</td>
<td>11,051</td>
<td>28,589</td>
</tr>
<tr>
<td>October 1918</td>
<td>44,318</td>
<td>11,909</td>
<td>35,391</td>
</tr>
<tr>
<td>May 1919</td>
<td>23,807</td>
<td>10,629</td>
<td>20,219</td>
</tr>
<tr>
<td>July 1919</td>
<td>24,942</td>
<td>11,743</td>
<td>23,709</td>
</tr>
<tr>
<td>August 1919</td>
<td>25,775</td>
<td>11,045</td>
<td>23,229</td>
</tr>
<tr>
<td><strong>Number of shifts in</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 1918</td>
<td>9,337</td>
<td>9,449</td>
<td>11,964</td>
</tr>
<tr>
<td>October 1918</td>
<td>9,338</td>
<td>9,379</td>
<td>12,362</td>
</tr>
<tr>
<td>May 1919</td>
<td>12,989</td>
<td>9,106</td>
<td>11,052</td>
</tr>
<tr>
<td>July 1919</td>
<td>11,298</td>
<td>10,277</td>
<td>11,822</td>
</tr>
<tr>
<td>August 1919</td>
<td>11,232</td>
<td>10,234</td>
<td>11,312</td>
</tr>
<tr>
<td><strong>Output per man per day in</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 1918</td>
<td>4,498</td>
<td>1,170</td>
<td>2,390</td>
</tr>
<tr>
<td>October 1918</td>
<td>4,746</td>
<td>1,270</td>
<td>2,863</td>
</tr>
<tr>
<td>May 1919</td>
<td>1,833</td>
<td>1,167</td>
<td>1,829</td>
</tr>
<tr>
<td>July 1919</td>
<td>2,208</td>
<td>1,143</td>
<td>2,005</td>
</tr>
<tr>
<td>August 1919</td>
<td>2,295</td>
<td>1,079</td>
<td>2,053</td>
</tr>
</tbody>
</table>

In examining these results it should be remembered that the 8-hour day is only one of the various causes to which the fall in output is to be attributed. One of the chief causes is the shortage of raw materials in the months immediately following the revolution.

**Great Britain**

**Iron and Steel Trades Confederation**

(a) No increase in output as yet, owing to the raw material available being greatly inferior to the normal supply. Increased output could easily be obtained from better ores and coal.

(b), (c), and (d). No comparable statistics have yet become available. For more than twelve months after the change output was seriously affected by the dislocation of railway service due to the war and demobilisation.

Reports Nos. 5 and 6 of the Industrial Fatigue Research Board give particulars of investigations made as to the various results of reduced hours in steel works. In No. 6 Report it is stated that the increased output of the open hearth furnaces at a particular works, consequent on the change from two to three shifts, was from 14 to 18 per cent.
ITALY

Government

It is not possible, generally, to establish any useful comparison as to the daily output of the workers, partly because the night shifts are less under supervision, and partly because there is a greater loss of time in the changing of the shifts (a disadvantage which some employers have endeavoured to avoid by having the incoming shift on the spot ready to take the place of the outgoing shift); partly because the energy of the individual worker has undergone an appreciable reduction since the war; and partly also on account of the quality of raw materials and fuel. The net result of all these causes would, however, show a reduction in the daily output. It is not possible to say with certainty whether the reduction in the hours of work has contributed to this result. It is, however, probable that, when the shifts have once been definitely systematised, and, above all, when the working classes have settled down again, production will appreciably improve.

JAPAN

Firm A

The difference in index figures of output per man after the adoption of the three-shift system as compared with the former two-shift system, taking the index figure of the latter as 100, has been found to be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Two-shift</th>
<th>Three-shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig iron</td>
<td>100</td>
<td>83</td>
</tr>
<tr>
<td>N. B. The figures were taken exclusively from the workers engaged around blast furnaces.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open hearth steel</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td>N. B. During the past two or three years there have been many changes in the equipment, etc., of the open hearth furnaces, and the efficiency of the works was much affected. Consequently the direct influence of the new system cannot easily be determined.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Converter steel</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Rolled steel</td>
<td>100</td>
<td>87</td>
</tr>
<tr>
<td>N. B. At the small bar mills in the rolling mills, since the adoption of the three-shift system, good results have been noticed with an increase of approximately 50 per cent. in the total output and 27 per cent. in the output per head per day. In the mills, however, there was a decrease of approximately 28 per cent. in the total output and 40 per cent. in the output per head per day. It is clear that this decrease was caused partly by the decrease of orders and the frequency of change of rolls.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Firm B

The introduction of the three-shift system coincided, as has been already stated, with a general depression in the mining industry; activity was in consequence much diminished, with the result that the inferior workers were discharged while the more competent were retained. At the same time many improvements were made as the result of economic and technical studies. Consequently, although the output per head is a little more than before, it cannot be considered as resulting entirely from the adoption of the three-shift system, because other conditions have not remained the same.

(b) Although there was a slight decrease of output per head in the steel production after the adoption of the new system, the results cannot be ascertained owing to the closing down of the works within six months from the time of the adoption of the new system.

(c) Nothing special to state.

(d) Same as (b).

Four Firms

For a blast furnace and two Martin furnaces, the daily output of three shifts is stated to be equal to that of the two shifts previously employed; for one rolling mill, the hourly output is at present a little higher; for another rolling mill, and for a blast furnace, the output at the moment is slightly higher as regards work on hot metal, and considerably lower than the previous hourly output as regards work on cold iron, particularly such work as does not entail the employment of automatic plant. For one Martin furnace and one rolling mill, the present hourly output is stated to be lower than pre-war output. One factory states that any comparison with the two-shift system is impossible, in view of the fact that pre-war working conditions were much more favourable in respect of the supply of coal and raw materials, the physical staying-power and morale of the workers, etc.

Roumania

Workers

No statistics showing comparative daily output are available. We consider, however, that the output of workers is greater under the three-shift system.

Serbo-Croat-Slovene Kingdom

Firm A

(d) The rolling mills are producing 15 per cent. per day more under the three-shift system than under the two-shift system.

The wire mills register a 20 per cent. increase per day under the three-shift system.
Firm B
The capacity remains the same.

SOUTH AFRICA

A Firm
(b) Output reduced per man 22 per cent.

SPAIN

Firm A
(a) It has decreased.
(b) It has decreased.
(d) It has decreased.

Firm B
(a) Has fallen to two-thirds of previous output.
(b) Has fallen to two-thirds of previous output.
(d) One-half.

Firm C
(b) According to our company's view, output will decrease considerably. The work of the welding furnace does not demand the continuous presence of the worker, and consequently the 8 hours of his attendance in the factory are not all 8 hours of work.
(d) The case is the same for the rolling mills, where the machines need frequent oiling and adjustment. If the workers remain 24 hours in the factory, some of them will be looking on at the oiling, etc.

Firm D
(b) The same.
(d) Output has decreased generally from 7 to 10 per cent., but in certain exceptional cases, with good discipline, the same workers as formerly, and an intelligent application of a system of bonuses, it has been found possible to increase the output by from 7 to 10 per cent.

Firm E
(b) The same output.

Firm F
(a) Production remains at the same level, and the output per worker has decreased by one-third through the employment of three shifts instead of two.

Firm G
(d) It is thought to be a little lower, but it is possible that the unsettled social state of Barcelona has contributed to this decrease in output.
Firm H
(b) Output is at the moment less. This is chiefly owing to social conditions.
(d) Idem.

Firm J
(a) The same.
(b) Both daily and hourly output have decreased.
(d) Reckoned to be 10 per cent. lower with three shifts.

Firm K
(d) Equal or slightly less.

Firm L
(a) Same output with three as with two shifts.
(b) Idem.
(c) We have none.
(d) Same output with three as with two shifts.

Switzerland

Federal Factory Inspectors

The only experience we have obtained relates to iron rolling mills, where the results have not justified the hopes which had been entertained of the three-shift system. The reason for this must be sought partly in the discontent which exists at the moment in the labour world, and partly also in the technical inadequacy of the annealing plant which at present is insufficient for the additional strain put upon it under the three-shift system.

A Swiss Firm

Other things being equal, the three-shift system has not let to an increase in output.
QUESTION VI

Has the change from two to three shifts been attended by:
(a) any changes in the quality or uniformity of product?
(b) any saving (or waste) of materials?
(c) any lessening (or increase) in the cost of repairs or life of equipment?
(d) any reduction (or increase) in accident frequency rates?

In answering (a), (b), (c), and (d) please distinguish so far as possible between blast furnaces, open hearth furnaces, Bessemer converters, rolling mills.

Austria

A Factory Inspector

(a) No definite statements can be made. On technical grounds it may be assumed that under the three-shift system the workers, especially those employed at the furnaces, are, as a result of the shorter hours of work, in a position to pay increased attention to the process in hand, and to regularise it according to fixed rules, so that not only is there no depreciation in quality or in the uniformity of product, but on the contrary, there is an improvement in both.

(b) A saving in fuel as a result of increased uniformity may certainly be taken for granted.

(c) The cost of repairs will decrease, but the life of the equipment may be shortened as a result of intensive use.

(d) Statistics relating to accidents in the iron works and rolling mills may be taken from the report for the period before the war. For the year 1921, i.e. since the introduction of the 8-hour day, the number of accidents per 100 workers in the iron industry has fallen, but this may be attributed to the frequent stoppages of work. Generally speaking, the 8-hour shift will not entail a reduction in accident frequency rates, because it tends to an increase in the intensity of work. On the other hand, it may safely be anticipated that the high pre-war figures for sickness will appreciably decrease as a result of the reduced working hours.

The three-shift system leads to reduction in accident frequency rates. But if the intensity of work is increased too much, the risk of accident may also become greater.

Employers' Federation

The second sentence of the reply to question 6 (a) should run: "On technical grounds it might be expected..." and the addition should be made: "Experience proves that no such improvement in quality has yet been achieved."
The reply to question 6 (b) should run:
"There has been no saving in materials but rather waste, especially with respect to certain auxiliary materials such as coal, magnesite, etc., owing to the fact that carelessness or unskilful work on the part of one person may and does affect not only two but three individuals since the introduction of the three-shift system."

The reply to question 6 (c) should run:
"There has been no lessening, but an increase, in the cost of repairs and reduction in the life of equipment for the same reason as given under 6 (b)."

Ministry of Labour

(a) No change.
(b) No.
(c) No.
(d) No.

Firm A

(a) Blast furnaces and coke furnaces. No change; the quality of products is independent of the labour involved.

   Steel works and rolling mills. No.

(b) Blast furnaces and coke furnaces. There is a general waste of materials.

   Steel works and rolling mills. No change.

(c) Blast furnaces and coke furnaces. Great increase in cost of repairs and a shortening of the life of equipment.

   Steel works and rolling mills. Increase in cost of repairs and a shortening of the life of equipment.

(d) Blast furnaces, coke furnaces, steel works, and rolling mills. No change.

Firm B

(a) We have not noted any change.

(b) and (d) The causes of changes under these heads are too numerous for it to be possible to attribute any changes, for the better or the worse, to the introduction of the three-shift system. Moreover, the system has been in force for too short a time to permit of observations of this nature being made.

(c) Increase in cost of repairs.

Firm C

(a) No change.

(b) We have observed none.

(c) No.

(d) No.

Government

No change was observed in quality, etc., of product owing to slight experience with the system.
CZECHOSLOVAKIA

A Firm

No change is noticeable either in the quality and uniformity of the product or in the saving and depreciation of material, as a result of the introduction of the three-shift system. It is also impossible for us to furnish any information in respect of cost of repairs or of the increase in frequency of accidents.

Metal Workers' Federation.

No change for the worse in the quality and uniformity of the product is to be noted. On the contrary, there has been a saving of material, and naturally a consequent reduction in the cost of material. A better use is made of tools and machinery, and, as a result of uninterrupted use, a lengthening in the life of equipment is to be observed. The number of accidents has decreased, as the workers, owing to shorter working hours, are less tired and consequently more careful.

FINLAND

Firm A

(a) No.
(b) Saving in the consumption of fuel (in the rolling mills).
(c) Increased wear, and therefore somewhat greater costs of repair (in the rolling mills).

Firm B

(a) No (blast furnaces). No (Martin furnaces). No (rolling mills).
(b) Consumption of material unchanged (blast furnaces). Do. (Martin furnaces). Saving in fuel about 15 per cent. (rolling mills).
(c) Greater wear (in all).
(d) 50 per cent. increase (in all).

Firm C

(a) Could not be ascertained.
(b) No.
(c) No.
(d) Could not be ascertained.

GERMANY

Ministry of Labour

(a) In many cases the factory inspectors report a change for the worse in the quality and uniformity of the product since the introduction of the three-shift system. But as political changes took place at the same time, whose consequences, as already pointed out under question 5, have had an unfavourable effect upon the workers' zeal for their work, it is impossible to establish how far each of the various causes was responsible for this deterioration in the quality of the work. Further, at present a decided improvement in conditions is manifesting itself.
(b) and (c) Reports from many quarters agree in affirming that there is less economy in the use of material and that the life of equipment is shorter. This is to be attributed, in addition to the reasons given under question 5, to the fact that under the three-shift system, when shifts are changed, the worker does not hand over tools and equipment to the group of workers from which he took them over, but to a third group. It is, therefore, much more difficult to ascertain immediately who must be made responsible for any damage done, and consequently the incentive to exercise care in the use of material and tools is much reduced.

(d) After the return to peace conditions, the factory inspectors generally reported a decided decrease in the number of accidents. This was probably, in the first instance, to be attributed to the disappearance from the works of the often unsuitable substitute labour engaged during the war. However, accident figures are still in many cases below those for 1913, so that it cannot be denied that the three-shift system, i.e. the reduction in working hours, has had a favourable effect upon the frequency of accidents. Comparative statistics for the various classes of works were not available.

The following figures concerning the reduction in accident frequency rates are supplied by a factory inspector for the Arnsberg district, and relate to three works in the large scale iron industry.

<table>
<thead>
<tr>
<th></th>
<th>1918</th>
<th>1919</th>
<th>1918</th>
<th>1919</th>
<th>1918</th>
<th>1919</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works No. 1</td>
<td>4,760</td>
<td>7,854</td>
<td>635</td>
<td>453</td>
<td>133</td>
<td>58</td>
</tr>
<tr>
<td>Works No. 2</td>
<td>10,669</td>
<td>10,212</td>
<td>2,193</td>
<td>1,093</td>
<td>206</td>
<td>106</td>
</tr>
<tr>
<td>Works No. 3</td>
<td>610</td>
<td>1,046</td>
<td>91</td>
<td>160</td>
<td>149</td>
<td>153</td>
</tr>
</tbody>
</table>

The following table gives similar particulars, also supplied by a factory inspector, concerning a large smelting works in the Düsseldorf district:

<table>
<thead>
<tr>
<th></th>
<th>1913</th>
<th>1917</th>
<th>1918</th>
<th>1919</th>
<th>1920</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of workers</td>
<td>9,641</td>
<td>9,710</td>
<td>10,341</td>
<td>12,030</td>
<td>11,956</td>
</tr>
<tr>
<td>Total number of accidents</td>
<td>1,793</td>
<td>2,343</td>
<td>2,521</td>
<td>1,591</td>
<td>1,466</td>
</tr>
<tr>
<td>Total number of deaths</td>
<td>11</td>
<td>35</td>
<td>27</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>Number of accidents per 1000 workers</td>
<td>186</td>
<td>241</td>
<td>244</td>
<td>132</td>
<td>123</td>
</tr>
<tr>
<td>Number of deaths per 1000 workers</td>
<td>1.1</td>
<td>3.6</td>
<td>2.6</td>
<td>1.8</td>
<td>0.9</td>
</tr>
</tbody>
</table>

(Cf. Jahresbericht der Gewerbeaufsichtsbeamten und Bergbehörden, 1919, I, p. 524; 1920, I, p. 665.)
Metal Workers' Federation

(a) There has been no change in the quality of the product.
(b) In general there has been a saving of materials.
(c) There has been no reduction in the cost of repairs.
(d) There has been a reduction in the number of accidents.

Christian Metal Workers

(a) No.
(b) No.
(c) No.
(d) There has been an increase in the frequency of accidents, but in any case, only because, as a result of the increase of the number of workers necessitated by the introduction of the three-shift system, a large number of inexperienced workers had to be engaged.

Great Britain

Iron and Steel Trades Confederation

(a), (b), and (c). None reported.
(d) Statistics not yet available.

Italy

Government

(a) In general it may be asserted that no change has taken place in the quality or uniformity of the products.
(b) and (c) In some undertakings neither waste nor economy of raw materials has been observed to follow the adoption of the three-shift system. In others, on the other hand, a greater waste of tools, equipment and machinery has been observed, arising especially from the difficulty of fixing responsibility, which is easily passed on from one shift to another.
(d) The average number of accidents has hardly varied. In a few undertakings a slight diminution has been observed.

Japan

Firm A

(a) In the plate mills the adoption of the three-shift system results in standardising the quality of the product, and in consequence it has been found that there was an increase in the standard goods manufactured of approximately 10 per cent. as compared with raw material. In other mills the result of the adoption of the three-shift system has not been ascertained.
(b) The increase or decrease of the cost of repairs, excluding
materials or raw materials, after the adoption of the three-shift system has been found as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces</td>
<td>2.7 per cent. decrease</td>
</tr>
<tr>
<td>Open hearth furnaces</td>
<td>4.5 ★ increase</td>
</tr>
<tr>
<td>Converters</td>
<td>4.2 ★ decrease</td>
</tr>
<tr>
<td>Rolling mills</td>
<td></td>
</tr>
<tr>
<td>Large bar mills</td>
<td>25.0 ★ increase</td>
</tr>
<tr>
<td>Rail mills</td>
<td>15.0 ★ increase</td>
</tr>
<tr>
<td>Plate mills</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>8.7 ★ increase</td>
</tr>
<tr>
<td>Others</td>
<td>5.5 ★ increase</td>
</tr>
</tbody>
</table>

N. B. In the small bar mills and in the middle bar mills there was an increased consumption of materials such as oil, packings, gloves, tongs, etc., but the output also has increased.

(c) According to the report from the rolling mills there was decidedly an increase of repair expenses as the result of the adoption of the three-shift system even if various other circumstances are taken for granted. It has been thought also that the life of steam engines, heating furnaces, etc., has been shortened.

(d) There is an increase of nearly 20 per cent. of injuries. The principal cause was probably the extension of the works in 1920 by building new factories and also the unaccustomed working hours due to the introduction of the three-shift system.

**Firm B**

(a) No change.
(b) Nothing special to state.
(c) Repair cost has decreased slightly, but this cannot be regarded as the result of the adoption of the three-shift system. It should rather be considered as the result of tension brought about by the general depression in the industry.
(d) Nothing special to remark.

—— POLAND ——

**Four Firms**

(b) For one Martin furnace, no change; for another Martin furnace, a waste of material is reported, since one shift often prolongs certain processes longer than necessary in order to leave a more difficult process to be done by the following shift. This entails a higher expenditure for ferro-manganese and coal. In the case of one rolling mill, expenditure on coal has increased by 10 per cent. This rolling mill is worked by two 8-hour shifts, and the extra expense is caused by the necessity of banking furnace fires during the nightly break of 6 hours.

(d) Generally speaking, no change is noticeable in this respect. In one factory which includes blast furnaces and rolling mills, there has been a considerable reduction in the number of accidents (84 accidents among 1,480 workers in 1920, as against 386 among 2,054 before the war). The management attributes this decrease to some extent to the reduction in the number of workers employed.
in the factory at the same time (half the pre-war number), and to the
decrease in the number of machines working at once (50-75 per cent.)
of the pre-war figure.

/ Roumania

Workers
No information is available.

/ Serbo-Croat-Slovene Kingdom

Firm A
(a) No change in the quality of uniformity of product.
(b) No change.
(c) There has been an increase in the cost of repairs, but the
exact amount is uncertain, for we have not hitherto been in full
activity under the three-shift system.
(d) No change.

Firm B
(a) The quality of products has undergone no change.
(b) The consumption of material is the same.
(c) The cost of repairs is the same, also the durability of equip­
ment.

/ South Africa

A Firm
(a) No.
(b) No.
(c) Cost of repairs per ton of steel reduced owing to the cost
of same having to be proportioned over the greater output in the
24 hours. Life of furnace not increased.
(d) No.

/ Spain

Firm A
(a) No.
(b) No.
(c) An increase.
(d) No change observed.

Firm B
(a) No.
(b) Waste in rolling mill.
(c) Increase in repairing costs.
(d) Increase.

Firm D
(a) No variation observed.
(b) A certain amount of waste.
(c) No appreciable change noticed.
(d) Considerable decrease.
Firm E
(a) No.
(b) No.
(c) It is a more personal and consequently a more complicated matter to direct and organise the preservation of equipment without considerable loss.

Firm F
(a) No change observed.
(b) No change observed.
(c) An increase.
(d) No change observed.

Firm G
(a) No change observed.
(b) No change observed.
(c) No appreciable change.
(d) Increase, chiefly because less skilled labourers have had to be engaged for the third shift.

Firm H
(a) No appreciable change.
(b) Idem.
(c) Idem.
(d) A slight increase.

Firm J
(a) No change observed.
(b) Waste of materials.
(c) An increase.
(d) An increase.

Firm K
(a) Not observed.
(b) Idem.
(c) Idem.
(d) Slight increase, due to the lack of skilled workers in the third shift.

Firm L
(a) No.
(b) No.
(c) No.
(d) Same average percentage.

Switzerland

Federal Factory Inspectors

In the absence of adequate information we are unable to reply to this question.
A Firm

(a) and (b) No improvement in quality and no greater degree of uniformity has been noted, neither has there been any effort to be more economical in the handling of raw materials and the finished product.

(c) The cost of repairs and of replacing tools has on the whole increased.

(d) The number of accidents has not noticeably increased.

Note to (a), (b) and (c). It should be pointed out that a shortage of skilled workers has been felt as a result of the 30 per cent. increase in the number of workers required owing to the introduction of the three-shift system.
QUESTION VII

(a) What has been the effect of the three-shift system on the interest and energy which employees put into their work?
(b) What has been its effect on absence and tardiness?
(c) What seems to be the effect on the employee of his greater leisure?
(d) Has there been any noticeable effect on health?

Austria

A Factory Inspector

(a) and (b) By the introduction of the three-shift system a frequently formulated demand of the workers in the iron and steel industry has at last been met, and they, for their part, have endeavoured to increase their output by application and accuracy. Unfortunately, post-war conditions and especially the blockade have seriously interfered with the effects of the three-shift system, and in many respects have completely concealed them.

(c) and (d) The longer periods of rest have had an entirely favourable effect upon the workers. In most cases the dwellings of workers in the factories have gardens attached, and in view of the high price of vegetables, etc., many workers have devoted their free time to growing vegetables in the gardens. Longer periods spent in the open air instead of in the frequently smoky works have also exercised a favourable influence upon the general health conditions of the workers.

Employers’ Federation

The reply to question 7 (a), (b) should run:
“.... so that to-day it may be stated that the interest and energy of the worker have decreased.”

The reply to question 7 (c) should run:
“The longer periods of rest have had an unfavourable influence on the workers in so far as the majority of them devote their increased leisure to other occupations or to amusements which tire them out or make them disinclined for their chief occupation. This applies particularly to the younger workers who, although they are mostly unmarried, receive the same wages as older married workers.”

Belgium

(a) We have no information.
(b) Tardiness and absence are less frequent than before.
(c) We do not know.
(d) We have no exact information.

The three-shift system.
Firm A

(a) Blast furnaces and coke furnaces. The workers show less energy and no interest.
   Steel works and rolling mills. We consider that the workers show no more interest or energy.

(b) Blast furnaces and coke furnaces, steel works and rolling mills. No improvement.

(c) At present the majority of workers waste the extra rest hours which have been granted them. They neither educate themselves, nor engage in sport, nor take more sleep. A few of them try to add to their earnings outside the principal shop by working in other shops. Many of them indulge in gambling, and frequent the saloons and cinemas.

(d) Our doctors have not observed any improvement. The health of the worker is the same as before the introduction of the three-shift system.

Firm B

(a) We have not observed that the workers show any more energy or interest in their work. The contrary would rather seem to be the case, but it is possible that this may be due to causes which have nothing to do with the new system.

(b) We have noted an improvement in this respect.

(c) This is a general question to which we cannot reply for want of adequate information.

(d) This is a question to which we cannot reply for want of the necessary information.

Firm C

(a) We have observed no increase in the energy shown by the workers.

(b) Absence and tardiness are less frequent than before.

(c) We do not know.

(d) We do not know.

Canada

No change was observed. One firm states Labour unemployment seems to make men more anxious to do their work well.

Czechoslovakia

A Firm

Despite the shortened hours of work and the lengthened time of rest, the average production of the individual has decreased since the introduction of the 8-hour day. For the moment it is impossible to say whether the accuracy of the work has increased. The short time during which the 8-hour day has been in force makes it impossible to judge whether it has had any influence on the health of the workers.
Metal Workers' Federation

The three-shift system has led to a decided increase in output in works in our country, and also to an improvement in the quality of the work done, from the point of view of precision. The energy which the workers put into their work has increased, because it is easier to keep up the same degree of intensity of work for eight hours than in the case of an 11 or 12-hour working day. The health of the workers has improved owing to the three-shift system, and if sickness figures are still fairly high, this is to be attributed rather to under-nourishment and to the sufferings of the post-war period.

Finland

Firm A

(a) The interest and energy in the work are less.
(b) The absence has not been notably changed, tardiness occurs more frequently.
(c) Having a greater amount of leisure the workers have devoted themselves more to social subjects, which have had a disturbing influence on their capacity for work.

Firm B

(a) Decreased interest.
(b) No noticeable difference.
(c) The greater time of leisure has generally led to greater love of pleasure, contempt for work, and agitation against industrial peace.
(d) No.

Firm C

(a) The interest and energy of workers have not increased.
(c) The worker devotes himself more to agitation.
(d) No.

Germany

Ministry of Labour

(a) and (b) It is unanimously reported from all quarters that the interest and energy of the workers have decreased.

This, however, cannot be regarded as the result of the three-shift system in itself. It is rather to be attributed to the causes mentioned under 5. An improvement in conditions in this respect is, however, already reported from many parts of Germany.

(c) The older workers employ their extended leisure hours in their own house or gardens or allotments. It is reported from many quarters that they undertake work on their own account in their spare time, either in their own or in some other occupation. According to the reports the reduction in working hours appears, in many cases, to have had an unfavourable influence on the younger workers. They are often not yet able to employ themselves profitably on their own initiative, and they do not know
how to employ their free time. They live on the streets, and indulge in undesirable activities. (Cf. *Jahresbericht der Gewerbeaufsichtsbeamten*, 1919, I, p. 285.)

(d) It is not yet possible to establish whether the change in the length of the working day has had a favourable effect upon the health of the workers. In many establishments the health of the workers is worse than formerly; undoubtedly, however, this is a result of under-nourishment and other unfavourable conditions during the war.

*Metal Workers' Federation*

(a) The energy shown by the workers is greater than under the two-shift system.

(c) Free time is for the most part devoted to work in the worker's own home, since almost all workers have a plot of ground.

*Christian Metal Workers*

(a) In view of the unsatisfactory food conditions any statement which can be made is open to criticism.

(b) Idem.

(c) Opinion on this point is divided, both in employers' and in workers' circles. The factory inspectors also report cases of both good and bad effects.

(d) No effect is noticeable; this is probably to be attributed chiefly to unsatisfactory food conditions.

*Great Britain*

*Iron and Steel Trades Confederation*

(a) Blast furnaces, Scotland. Decided improvement.

(b) Blast furnaces, Scotland. Absenteeism diminished.

(c) Blast furnaces, Scotland. Improvement in vitality.

(d) Blast furnaces, Scotland. Men look more fit, but sickness statistics not yet available.

As to the other departments it may be said, generally, that the effect has been good in all the matters indicated.

*Italy*

*Government*

(a) and (b) No variation in the interest and energy of the workers has accompanied the introduction of the three-shift system. If deterioration in the activity of the workers exists it must be attributed rather to their state of mind than to the adoption of the three-shift system. It is certain, however, that the greater liberty obtained has diminished absenteeism among the workers, inasmuch as it leaves them with a sufficient margin each day for attending to their own affairs.
The greater leisure allowed by the introduction of the 8-hour system generally leads the workers residing in the country to work in the fields, and those residing in towns to undertake work on their own account, while it leads very many others to amusements and vice. No variation has been observed in the health of the workers.

Firm A

(a) More initiative and surplus of energy are noticed. An increased number of men are proposing new schemes, and more interest is shown in work itself.

(b) Good results have been noticed generally. The rate of attendance is as follows:

1. Under two-shift system 755
2. Under three-shift system 799

(c) More leisure, though considered by some to be harmful for unmarried persons, is found nevertheless to be beneficial for family life, since a longer time can be spent at home. It is said that one can have more time for sleep, and the new system is popular. As the result of the change more workers are raising poultry, planting vegetables, studying music, going in for physical culture, etc., but on the other hand it seems that there is an increase also of the drinking habit.

(d) It appears that the results have been generally good. It is reported that in a certain part of the blast furnaces there is less sign of fatigue during the summer time, and in certain parts of the rolling mills the workers look healthier as a whole than when they were working under the old system.

Firm B

(a) The decrease of fatigue in the work and increase of energy throughout the work are noticed, but this seems to be the result of the tension which is inevitable at the present moment. However, there is decidedly a great increase of the absence rate as compared with the pre-war days.

(b) At present there is less tardiness and a general increase of the attendance rate, but the contribution of the three-shift system to this result cannot be distinguished from that of other factors, e.g. increased attention to work occasioned by fear of unemployment.

(c) As the result of the increase of leisure the workers are enjoying greater comfort and opportunity for home occupations after their work. At least the workers are enjoying angling, netting, etc., in the neighbouring streams and on the seashore to an increasing extent.

(d) No special effect upon health has been observed.
Four Firms

(a) and (b) No useful information has been obtained from enquiries. Most factories assert the impossibility of ascertaining the exact effects, because of the inadequacy of the workers' food, and discontinuity in the working of the factories. Some factories report an improvement in the health of the workers, which is attributed chiefly to payments in kind made to the workers.

Workers

(a) The workers have shown an increasing interest and energy.
(b) A distinct saving.
(c) The longer time of rest has allowed the workers to take more interest in their families and in social life.
(d) Yes, a favourable effect.

Serbo-Croat-Slovene Kingdom

Firm A

(a) and (b) The effect of the three-shift system has been that the majority of the workers, when the 8-hour shift in the factory is over, place themselves at the disposal of private employers; consequently neither the interest nor the energy nor the zeal and punctuality shown by the workers have in any way improved.
(c) The effect on the employees of their greater leisure has been to increase their activity in their various societies.
(d) The change in the duration of the shifts has produced no noticeable effect on the health of the workers.

Firm B

(a) and (b) On introducing the three-shift system we had expected that the workmen in consequence of the shorter working time would develop their manual capacity. Generally this has not been the case; on the contrary, the workmanship during the 8 hours, when compared with the work done in former days during 12 hours, has considerably deteriorated.
(d) The introduction of the three-shift system has not had any noticeable influence on the health of the workers, who spend their off-hours unwisely, without regard to their health.

A Firm

(a) No extra energy on day shift, but improvement on the shift 10 p.m. to 7 a.m.
(b) No effect on absence. Improvement made on the charging of furnaces.
(c) None as far as can be seen. 
(d) Men do not appear so fatigued as when working the longer hours.

Spain

Firm A
(a) As a result of frequent disturbances and social conflicts, it is impossible to decide whether the lack of interest and energy observed is due to the institution of the 8-hour day. 
(b) The same may be said of the will to work. 
(c) Same reply as above. 
(d) Same reply as above.

Firm B
(a) Has roused neither interest nor energy on the part of the worker. 
(b) No change produced. 
(c) No effect. 
(d) No.

Firm C
(c) The better class of workers have devoted their time to work in the country. Nevertheless bad habits have increased. 
(d) Six hours of continuous work in a factory without rest imply a greater strain than the 12 or 14 hours with long intervals of rest, which were formerly worked.

Firm D
(a) No appreciable change noticed. 
(b) Sensibly diminished. 
(c) They have either taken up supplementary work or have taken to bad habits.

Firm E
(a) No difference observed. 
(b) No difference observed. 
(c) No effect.

Firm F
(a) No change observed. 
(b) No change observed. 
(c) More work is done on the land during rest hours. 
(d) No change observed.

Firm G
(a) A notable decrease. This is due chiefly to the fact that the introduction of the 8-hour day was accompanied by an increase of trade unionism. 
(b) Decrease as under (a), and for the same reasons.
(c) It is impossible to estimate results, chiefly because of the recent abnormal conditions in Barcelona, but an increase in bad habits has been observed.
   (d) Not noticeable.

Firm H

(a) Energy and interest less, for reasons which have nothing to do with the system. (See answer to question 5.)
   (b) As above (a).
   (c) No effect.
   (d) Idem.

Firm J

(a) Sensible decrease.
   (b) Idem.
   (c) Up to the present, an increase in bad habits.
   (d) Increase in alcoholism and venereal diseases.

Firm K

(a) The social conditions at Barcelona were disturbed at the time of the introduction of the three-shift system, and so, while the interest and energy of the worker have considerably diminished, it is not possible to tell whether this is due to the system.
   (b) Same reply as for (a) above.
   (c) Bad habits have increased, but the condition of Barcelona in the last few years should be borne in mind.
   (d) It has not been possible to calculate this.

Firm L

(a) No influence observed, favourable or unfavourable.
   (c) To judge by the health statistics, no effect. It may perhaps be affirmed that the general health has not improved.

Switzerland

Federal Factory Inspectors

For reasons stated elsewhere in the report(1) it is difficult to give a definite answer to this question. The three-shift system has not been in force long enough to allow of a definitive opinion being formed. We draw attention, however, to the answer to question 5.

As regards the effect of the reduction of hours of work, it should be observed that some of the workers utilise their leisure on other work by means of which they supplement their wages: It has also been noted that workers who live in the country, and work on the land as well as in the factory, appear to put in more agricultural work than was previously the case, and sometimes turn up at the factory insufficiently rested.

A Firm

Since the introduction of the three-shift system and generally since the reduction in working hours, the interest and assiduity shown by the workers in their work has decreased noticeably. In many cases the longer rest intervals are not used in order to rest. It is often observed that workers on the afternoon and night shift begin their work tired and exhausted. As has been established in many instances this is due to some spare time employment carried on outside in the workers' free time. In the comparatively short time since the application of the three-shift system it is impossible to establish whether it has had any favourable effect on the health of the workers.
QUESTION VIII

Under the three-shift system about what proportion of the workers in the different branches or departments of the steel industry are on the shift basis (a), and what proportion on day work (b)?

Austria

A Factory Inspector

(a) and (b) The proportion of the total number of workers in a factory to the number of shift workers varies. Before the war a coke blast furnace plant working in combination with a roasting furnace had 118 on continuous processes out of a total staff of 150; a rolling mill (medium and small section mills, boiler house and producer plant), 210 out of 500; a small thin-sheet rolling mill, 36 out of 50; a steel works (open hearth furnace and producer plant), 48 out of 700. The pre-war proportion of shift workers to those on day work readjusted for the three-shift system (by an increase of 50 per cent for shift workers) works out as follows:

<table>
<thead>
<tr>
<th></th>
<th>Shift-workers</th>
<th>Day-workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke blast furnaces and roasting furnaces</td>
<td>177</td>
<td>32</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>315</td>
<td>290</td>
</tr>
<tr>
<td>Thin-sheet rolling mills</td>
<td>54</td>
<td>14</td>
</tr>
<tr>
<td>Steel works</td>
<td>72</td>
<td>652</td>
</tr>
</tbody>
</table>

Belgium

Ministry of Labour

(a) and (b) All work three 8-hour shifts.

Firm A

Blast furnaces and coke furnaces. The three-shift system is applied to the whole staff.
Steel works and rolling mills. The three-shift system is applied to all workers in branches where the work is continuous.
In the subsidiary departments, the two-shift system remains in force.

Firm B

The proportions of shift workers and day workers are:

<table>
<thead>
<tr>
<th></th>
<th>Shift workers</th>
<th>Day workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces</td>
<td>90 per cent.</td>
<td>10 per cent.</td>
</tr>
<tr>
<td>Thomas steel works</td>
<td>86 »</td>
<td>14 »</td>
</tr>
<tr>
<td>Martin furnaces</td>
<td>86 »</td>
<td>14 »</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>65 »</td>
<td>35 »</td>
</tr>
</tbody>
</table>

Firm C

All work three 8-hour shifts.
Canada

Around the electric furnace, 15 are on three-shift and 139 on day work.

Czechoslovakia

A Firm

In our factory there are 1,700 shift workers.

Finland

Firm A

About 10 per cent. (rolling mills and Martin furnaces).

Firm B

Blast furnaces, 80 and 20 per cent. Martin furnaces, 85 and 15 per cent. Rolling mills, 75 and 25 per cent.

Firm C

All the workers referred to in the foregoing are working in shifts.

Germany

Ministry of Labour

Exact figures on this point are not available. As the three-shift system was introduced simultaneously with the maximum 8-hour working day, the number of workers employed on day work had to be increased at the same time. The relative proportion of the number of workers employed on a shift basis and those employed on day work has, therefore, remained almost unchanged.

Christian Metal Workers

On an average 75-80 per cent. of the total number of workers work in three shifts, and from 20-25 per cent. on day work. In the branches mentioned in the questionnaire, blast furnaces and coke furnaces, open hearth furnaces, Thomas steel works, rolling mills, the three or the two-shift system is employed exclusively ("wird nur in 3 resp. 2 Schichten gearbeitet").

Great Britain

Iron and Steel Trades Confederation

<table>
<thead>
<tr>
<th></th>
<th>3-shift workers</th>
<th>2-shift workers</th>
<th>8-hour day workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces, Scotland</td>
<td>80 per cent.</td>
<td>86 per cent.</td>
<td>50 per cent.</td>
</tr>
<tr>
<td>Open hearth furnaces</td>
<td>86 per cent.</td>
<td>90 per cent.</td>
<td>50 per cent.</td>
</tr>
<tr>
<td>Bessemer converters</td>
<td>86 per cent.</td>
<td>90 per cent.</td>
<td>50 per cent.</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>86 per cent.</td>
<td>90 per cent.</td>
<td>50 per cent.</td>
</tr>
</tbody>
</table>

The remaining percentage are day workers, some of whom are on two shifts.

Figures relate to selected cases, and are not general averages.
**A Firm**

The approximate number and proportion of employees in the various Departments of the steel works which employ both day work and shift labour are given below:

<table>
<thead>
<tr>
<th>Department</th>
<th>Day work</th>
<th>per cent.</th>
<th>Shift</th>
<th>per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric acid, bye-product and coke ovens plant</td>
<td>529</td>
<td>26</td>
<td>1,466</td>
<td>74</td>
</tr>
<tr>
<td>Blast furnace department</td>
<td>261</td>
<td>14</td>
<td>1,645</td>
<td>86</td>
</tr>
<tr>
<td>Open hearth department</td>
<td>333</td>
<td>16</td>
<td>1,796</td>
<td>84</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>315</td>
<td>11</td>
<td>2,526</td>
<td>89</td>
</tr>
<tr>
<td>Traffic and permanent way</td>
<td>1,590</td>
<td>28</td>
<td>4,041</td>
<td>72</td>
</tr>
<tr>
<td>Mechanical shops, etc.</td>
<td>1,281</td>
<td>46</td>
<td>1,505</td>
<td>54</td>
</tr>
<tr>
<td>Masonry department</td>
<td>325</td>
<td>55</td>
<td>272</td>
<td>45</td>
</tr>
<tr>
<td>Foundries, pattern shop, and timber yard</td>
<td>1,242</td>
<td>88</td>
<td>165</td>
<td>12</td>
</tr>
<tr>
<td>Electrical</td>
<td>189</td>
<td>21</td>
<td>721</td>
<td>79</td>
</tr>
<tr>
<td>Chemical laboratory</td>
<td>64</td>
<td>65</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>Main stores</td>
<td>92</td>
<td>74</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>Ice and aerated water plant</td>
<td>2</td>
<td>7</td>
<td>29</td>
<td>93</td>
</tr>
<tr>
<td>Time keeping department</td>
<td>189</td>
<td>66</td>
<td>97</td>
<td>34</td>
</tr>
</tbody>
</table>

**Italy**

In general there has not been any great variation in the proportions of workers working in shifts and those working by the day.

**Japan**

**Firm A**

The percentage of the day workers compared with the shift workers is as follows:

<table>
<thead>
<tr>
<th>Department</th>
<th>Day workers</th>
<th>Shift workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces</td>
<td>21</td>
<td>79</td>
</tr>
<tr>
<td>Open hearth furnaces</td>
<td>21</td>
<td>79</td>
</tr>
<tr>
<td>Converters</td>
<td>17</td>
<td>83</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>19</td>
<td>81</td>
</tr>
</tbody>
</table>

**Firm B**

The three-shift system applies to the whole of the workers.

**Poland**

**Four Firms**

In one factory, which includes blast furnaces and rolling mills, and in another which includes one Martin furnace and one rolling mill, the proportion of shift workers is 80-85 per cent.; in another factory which includes one blast furnace and one Martin furnace, the shift workers are only 26 per cent. of the whole.
Workers

No information available.

Serbo-Croat-Slovene Kingdom

Firm B
At the reverberatory furnaces as well as at the rolling mills the work is done in three continuous shifts. Day workers are not employed in either of the works.

South Africa

A Firm
90 per cent, shift work.

Spain

Firm A
All work in shifts, 152 workers in blast and coke furnaces, 133 in open hearth furnaces, and 368 in rolling mills.

Firm E
(a) 85 workers.
(b) Normal average 1,500.

Firm F
(a) 50 per cent.
(b) 50 per cent.

Firm G
(a) 111 workers (37 per shift).
(b) 129 day workers.

Firm H
(a) 7 per cent.
(b) 30 per cent.

Sweden

An Employers' Association
At the blast furnaces about 75 per cent. are on the shift basis and 25 per cent. on day work.
### Federal Factory Inspectors

<table>
<thead>
<tr>
<th></th>
<th>Number of workers per shift</th>
<th>Establishments only employing a single shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siemens-Martin Furnaces</td>
<td>13</td>
<td>1,715</td>
</tr>
<tr>
<td>Iron rolling mills</td>
<td>148</td>
<td></td>
</tr>
</tbody>
</table>

### A Firm

As the output has not increased under the three-shift system as compared with the two-shift system no increase in the number of workers employed on day work in connection with the shift system has been made necessary by the change. The number of day workers has, however, had to be increased because in October 1919 the 48-hour week came into operation for these workers also.
QUESTION IX

What are the hours of employees on day work?

Austria

A Factory Inspector

The hours of work for the day shift are also 8. Exceptions in the case of accessory employments, porters, fire watchmen and transport workers, who work on an average 10 hours per day.

Christian Trade Unions

The 8-hour shift applies to employees on day work. In individual undertakings, however, the 8-hour shift is almost entirely circumvented by the introduction of over-time, which has to be paid according to statutory regulations. Porters, night-watchmen, and transport workers have a working day of 10 to 12 hours.

Belgium

Ministry of Labour

8 hours.

Firm A

In theory, eight effective working hours; in practice, the actual working time varies from 7½ to 7¾ hours.

Firm B

8 hours.

Firm C

8 hours.

Canada

The hours on day work are 8, 9, 10, and 11.

Czechoslovakia

A Firm

All the workers work 8 hours, without exception, whether they are day workers or whether they work in one, two, or three shifts.

Metal Workers' Federation

The 48-hour week applies to these workers also.
FINLAND

Firm A
8 hours.

Firm B
8 hours.

Firm C
8 hours.

GERMANY

Ministry of Labour
8 hours.

Metal Workers' Federation
Working hours of workers on day work are 8 per day.

Christian Metal Workers
In summer from 6 a.m. to 2 p.m.; in winter from 8 a.m. to 4 p.m.

GREAT BRITAIN

Iron and Steel Trades Confederation

<table>
<thead>
<tr>
<th>Location</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces, Scotland</td>
<td>48 hours per week</td>
</tr>
<tr>
<td>Open hearth furnaces</td>
<td>47 hours per week</td>
</tr>
<tr>
<td>Bessemer converters</td>
<td>47 hours per week</td>
</tr>
<tr>
<td>Rolling mills</td>
<td>47 hours per week</td>
</tr>
</tbody>
</table>

INDIA

A Firm
The hours of employees at work are from 6 a.m. until 11.30 a.m. and from 1.30 p.m. to 5 p.m., making a total of 9 hours per day.

ITALY

Government
The duration of work is normally 8 hours (or 48 per week). Some undertakings have made considerable reductions in consequence of the industrial crisis.

JAPAN

Firm A
Nine hours. Sundays are holidays.

Firm B
Employees on day work have an 8-hour day.

ROUMANIA

Workers
Eight hours per day.
Serbo-Croat-Slovene Kingdom

Firm A

The hours for employees on day work are 8, i.e. from 7 a.m. to 12 (noon) and from 1 p.m. to 4 p.m.

Firm B

The length of each shift is 8 hours.

South Africa

A Firm

8 and 9 hours according to the grades.

Spain

Spanish Firms

B, C, D, E, F, J, K, L. 8 hours.

G. 8 hours and sometimes 10, the two hours of overtime being paid at the rate of time and a half.

H. 8 hours, but in exceptional cases overtime is paid for at time and a half.

Sweden

An Employers' Association

The hours of employees on day work are 48 per week, i.e. Saturday 5½ and other days 8½ hours.

Switzerland

Federal Factory Inspectors

By law the working week in single shift establishments is limited to 48 hours. In general the length of the day's work is from Monday to Friday — 8½ hours, and on Saturday — 4½ hours. The following division is also found, though rarely: 8½ hours five days a week, and 5½ hours on Saturday. Saturday afternoon is free without exception.

A Firm

The hours of employment of workers on day work are Monday to Friday 8½ hours, Saturday 5½ hours.

The tree shift system.
QUESTION X

To what extent do the individual shift workers work seven days per week around
(a) blast furnaces?
(b) open hearth furnaces?
(c) Bessemer converters?
(d) rolling mills?

Austria

A Factory Inspector

According to statistics (see answer to question 8) the number of shift workers in blast furnaces working 7 days in the week is 177 out of a total of 209.
(b), (c), and (d). In the open hearth furnaces, Bessemer converters, and rolling mills, the Austrian Sunday Rest Act provides for a break of 12 or 24 hours, so that shift workers as well as others only work for 6 days.

Belgium

Ministry of Labour

(a) 100 per cent. (b) 100 per cent. (c) 0 per cent. (d) 0 per cent.

Firm A

(a) 90 per cent. of the workers employed exclusively in blast furnaces and coke furnaces.
(b), (c), and (d). No worker works 7 days per week.

Firm B

(a) Blast furnaces 100 per cent.
(b) Martin furnaces 100 per cent.
(c) Thomas Steel works 0 per cent.
(d) Rolling mills 0 per cent.

Firm C

(a) Blast furnaces 100 per cent.
(c) Bessemer converters 0 per cent.
(d) Rolling mills 0 per cent.

Canada

Government

Of the ten firms working 2 shifts, seven change shift to give one day's rest in seven, one gives two days' rest and one has 7-day
labour. Of the three firms working partly on three shifts, two give one day's rest in seven, and the third does so "when conditions permit".

**Czechoslovakia**

Metal Workers' Federation

Seven shifts are comparatively rare in our works, and occur only in the case of workers employed at the furnaces and in the electric light stations. All works within the sphere of activities of our Union work for 6 days only, and consequently work 6, 12, or 18 shifts a week.

**Finland**

**Firm A**

(a) Statement in table under answer to question 11.
(b) Idem.

**Firm B**

(a) A portion of the year the shift work is carried out in 7 shifts per week. (Blast furnaces.)
(b) The shift work is carried out on an average in 7 shifts per week. (Martin furnaces.)
(c) Two weeks 6 shifts, the third one 5 shifts. (Rolling mills.)

**Firm C**

(c) Work only 6 days per week.

**Germany**

Ministry of Labour

In all continuous industries work goes on for 7 days a week. On Sundays, however, only absolutely necessary work is done.

**Christian Metal Workers**

Every man has every third Sunday free.

**Great Britain**

Iron and Steel Trades Confederation

(a) Blast furnace men. Shift men 75 per cent.
(b) and (c) 5-10 per cent., being gas producer men, crane men and those engaged in sundry occupations necessary to put the furnaces ready for Sunday night shift.
(d) A few men engaged in repair work, etc.

**India**

A Firm

Individual shift workers in the following departments work as follows:
(a) Blast furnaces: 7 shifts of 8 hours per week.
(b) Open hearth furnaces: 6 shifts of 8 hours per week.
(c) Bessemer converters: not yet working.
(d) Rolling mills: 6 shifts of 8 hours per week.

ITALY

Government
Normally no worker does more than six days' work in the week.

JAPAN

Firm A
There are certain exceptions according to the works, but the shift workers generally work according to the following methods:

First team, from 6.15 a.m. to 2.45 p.m., rest period of 30 minutes included.
Second team, from 2.15 p.m. to 10.45 p.m., » » »
Third team, from 10.15 p.m. to 6.45 a.m., » » »

The working hours of the shift workers are alternated every week. At the time of the change of shift the working hours per day may exceed 8 hours.

Firm B
Nothing special.

POLAND

Four Firms
The proportion of shift-workers working 7 days per week is, for one Martin furnace 90 per cent.; for the other Martin furnaces 25 and 2 per cent.; for an establishment which includes blast furnaces and rolling mills 80 per cent.; for a rolling mill 0 per cent.

ROUMANIA

Workers
No information available.

SERBO-CROAT-SLOVENE KINGDOM

Firm A
(b) 11 per cent.
(d) 3 per cent.
The wire mills have no workers employed 7 days a week.

SOUTH AFRICA

A Firm
Once or twice in 12 months.
Firm A
(a) All. (b) All. (c) Not answered. (d) 6 days.

Firm B
(a) All. (b) All. (c) Not answered. (d) Do not work on Sundays.

Firm D
(b) All work 7 days. (d) 50 per cent.

Firm E
(b) The 85 workers in the shift work 7 days.

Firm F
(a) Every Sunday one shift rests and one of the others works another shift.

Firm G
(d) The only employees who work on Sunday are two day-workers to keep the furnaces stoked.

Firm H
(b) 50 per cent. (d) Two men to keep the furnaces stoked.

Firm J
(a) Three shifts, one 7 days and the two others 6 days.
(d) They work 6 days.

Firm K
(d) Work 6 days per week, and on Sunday two workers remain to stoke the furnaces.

Firm L
(a) All those on shifts work 7 days in the week, but with a rest provided as indicated below.
(b) Idem.
(c) We have none.
(d) They work 6 days and rest Sunday, on which day they work only 1-2 hours to prepare work for following day.

SWEDEN

An Employers’ Association
(a) and (c) At the blast furnaces and the Bessemer converters all shift workers work seven days per week; (b) at the open hearth furnaces and the rolling mills they work 6 days only.
In no branch of the iron and steel industry mentioned above does the worker work more than 6 days or take part in more than 6 shifts per week. Except in the case of the gas plant for Siemens-Martin furnaces, which requires to be continuously operated, all work in factories is suspended on Sunday. As the Factory Law prescribes that men who work Sunday must be given a rest-day in the week before or the week after the Sunday worked, and that workers on night work must have at least 24 hours free on Sundays, the result is that, generally speaking, no man works in more than 6 shifts per week.

Each shift comes on duty only 6 times a week for a period of 8 hours. The effective working hours fall below 8 by amounts which vary according to the respective working programme of the shifts.
QUESTION XI

If the workers are granted one day’s rest each week, please give the schedule or arrangement of shifts in detail.

Austria

A Factory Inspector

This concerns blast furnaces alone. In these there are two 12-hour shifts on Sunday, and the rest period for the various sections of workers in the three shift system may be tabulated as follows:

<table>
<thead>
<tr>
<th>On week-days</th>
<th>each section 8 hours’ work, 16 hours’ rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundays:</td>
<td>first 12 20</td>
</tr>
<tr>
<td></td>
<td>second 12 20</td>
</tr>
<tr>
<td></td>
<td>third no work, 24</td>
</tr>
</tbody>
</table>

On the following Sunday section 1, and on the next Sunday but one section 2, has 24 hours’ rest.

Belgium

Ministry of Labour

Generally speaking, there is no rest-day in continuous processes.

Firm A

Blast furnaces and coke furnaces

Order of shifts

First week a, b, c,
Second week b, c, a.
Third week c, a, b.

Open hearth furnaces

First week a, b, c.
Second week c, a, b.
Third week b, c, a.

Bessemer converters

First week a, b, c.
Second week c, a, b.
Third week b, c, a.

Rolling mills

First week a, b, c.
Second week b, c, a.
Third week c, a, b.

Firm B

Our workers do not work on any such system as that indicated in the example given.
**Firm C**

We do not see how we could apply the arrangements of shifts indicated in the examples without considerably increasing the numbers of our workers, already too great as it is.

**Canada**

No data is available in answer to this question owing to lack of experience.

**Czechoslovakia**

* A Firm

Where necessary the workers work on Sunday. We have arranged for them to have every third Sunday free.

**Metal Workers’ Federation**

The few workers who work 7 shifts a week in our works have a weekly rest day, and this occurs at the change of shift.

**Finland**

* Firm A

Statement in the following tables.

The working hours at the *Martin furnaces* for three shifts:

<table>
<thead>
<tr>
<th>First week</th>
<th>Shift A</th>
<th>Shift B</th>
<th>Shift C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>7 p.m. to 3 a.m.</td>
<td>3 a.m. to 11 a.m.</td>
<td>11 a.m. to 7 p.m.</td>
</tr>
<tr>
<td>Monday</td>
<td>3 a.m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leisure time of shifts:
A. from Saturday 3 a.m. to Monday 3 a.m. = 48 hours.
B. from Saturday 11 a.m. to Monday 11 a.m. = 48 hours.
C. from Friday 7 p.m. to Sunday 7 p.m. = 48 hours.

<table>
<thead>
<tr>
<th>Second week</th>
<th>Shift C</th>
<th>Shift A</th>
<th>Shift B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>7 p.m. to 3 a.m.</td>
<td>3 a.m. to 11 a.m.</td>
<td>11 a.m. to 7 p.m.</td>
</tr>
<tr>
<td>Monday</td>
<td>3 a.m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leisure time of shifts:
A. from Saturday 11 a.m. to Monday 11 a.m. = 48 hours.
B. from Friday 7 p.m. to Sunday 7 p.m. = 48 hours.
C. from Saturday 3 a.m. to Monday 3 a.m. = 48 hours.
Third week

<table>
<thead>
<tr>
<th></th>
<th>Shift B</th>
<th>Shift C</th>
<th>Shift A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>7 p.m.</td>
<td>3 a.m.</td>
<td>3 a.m.</td>
</tr>
<tr>
<td>Monday</td>
<td>3 a.m.</td>
<td>3 a.m.</td>
<td>11 a.m.</td>
</tr>
<tr>
<td>Tuesday</td>
<td>11 a.m.</td>
<td>7 p.m.</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td>10 p.m.</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Working hours at the Rolling mill for three shifts:

First week

<table>
<thead>
<tr>
<th></th>
<th>Shift A</th>
<th>Shift B</th>
<th>Shift C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>6 a.m.</td>
<td>2 p.m.</td>
<td>10 p.m.</td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td>2 p.m.</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td>10 p.m.</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td>6 a.m.</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>6 a.m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leisure time of shifts:
A. from Saturday 1 p.m. to Monday 2 p.m. = 49 hours.
B. from Friday 10 p.m. to Monday 10 p.m. = 72 hours.
C. from Saturday 6 a.m. to Monday 6 a.m. = 48 hours.

Second week

<table>
<thead>
<tr>
<th></th>
<th>Shift C</th>
<th>Shift A</th>
<th>Shift B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>6 a.m.</td>
<td>2 p.m.</td>
<td>10 p.m.</td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td>2 p.m.</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td>10 p.m.</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td>6 a.m.</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>6 a.m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leisure time of shifts:
A. from Friday 10 p.m. to Monday 10 p.m. = 72 hours.
B. from Saturday 6 a.m. to Monday 6 a.m. = 48 hours.
C. from Saturday 1 p.m. to Monday 2 p.m. = 49 hours.

Third week

<table>
<thead>
<tr>
<th></th>
<th>Shift B</th>
<th>Shift C</th>
<th>Shift A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>6 a.m.</td>
<td>2 p.m.</td>
<td>10 p.m.</td>
</tr>
<tr>
<td>Tuesday</td>
<td></td>
<td>2 p.m.</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td>10 p.m.</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td>6 a.m.</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>6 a.m.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leisure time of shifts:
A. from Saturday 6 a.m. to Monday 6 a.m. = 48 hours.
B. from Friday 10 p.m. to Monday 2 p.m. = 49 hours.
C. from Friday 10 p.m. to Monday 10 p.m. = 72 hours.

Working hours

<table>
<thead>
<tr>
<th></th>
<th>First week</th>
<th>Second week</th>
<th>Third week</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>47 hours</td>
<td>40 hours</td>
<td>40 hours</td>
</tr>
<tr>
<td>B.</td>
<td>40</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>C.</td>
<td>40</td>
<td>47</td>
<td>40</td>
</tr>
</tbody>
</table>

Fourth week

<table>
<thead>
<tr>
<th></th>
<th>Shift A</th>
<th>Shift B</th>
<th>Shift C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>6 a.m.</td>
<td>2 p.m.</td>
<td>10 p.m.</td>
</tr>
<tr>
<td></td>
<td></td>
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</table>
Firm B

Table sanctioned by the Social Board.

Three-shift working hour arrangement, which may be broken off for holidays:

<table>
<thead>
<tr>
<th>First week</th>
<th>1st shift</th>
<th>2nd shift</th>
<th>3rd shift</th>
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<tbody>
<tr>
<td>Sunday</td>
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<th>1st shift</th>
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<tbody>
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<th>1st shift</th>
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<th>3rd shift</th>
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<tbody>
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<td>Sunday</td>
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<tr>
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</table>

1 The day begins at 6 a.m. and ends at 6 p.m.
2 The night begins at 6 p.m. and ends at 6 a.m.
Attempts to give workers employed on the three-shift system in continuous industries a regular rest day every week, and for this purpose to have work on Sundays done by a special relief squad, have, according to reports received, proved unsatisfactory in many places, for the members of the relief squad in many cases do not appear to possess the necessary experience of the work. In these industries, in most cases, there are therefore only three shifts, which change weekly on the following method: In each week one of them works 16 hours, while the second shift has 16 consecutive hours, and the third shift 24 consecutive hours, free. In many instances, instead of having a double or 16-hour shift, when shifts are changed, a 12-hour shift is worked, so that within a period of three weeks, every squad must work two shifts of 12 hours each, in order to give the third shift a rest period of 24 hours. Accordingly each worker therefore works 56 hours a week in an average of three weeks.

The arrangement of the shifts is as follows: One shift from 6 a.m. to 2 p.m. continuing daily until Saturday; on Sunday there is a double shift from 6 a.m. to 10 p.m.; then the shift begins again on Monday (second week) from 2 p.m. to 10 p.m. and so on every day until Saturday. On the second Sunday the shift begins at 10 p.m. and ends 6 a.m. In the third week the shift is from 10 p.m. to 6 a.m. and so on until the shift from Saturday 10 p.m. till Sunday 6 a.m.

The following table illustrates the arrangements of shifts.

(a = 1st shift, b = 2nd shift, c = 3rd shift.)

<table>
<thead>
<tr>
<th></th>
<th>First week</th>
<th>Second week</th>
<th>Third week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>6–2</td>
<td>a</td>
<td>c</td>
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<tr>
<td></td>
<td>2–10</td>
<td>b</td>
<td>a</td>
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<tr>
<td></td>
<td>10–6</td>
<td>c</td>
<td>b</td>
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<tr>
<td>Tuesday</td>
<td>6–2</td>
<td>a</td>
<td>c</td>
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<td>10–6</td>
<td>c</td>
<td>b</td>
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<td>Thursday</td>
<td>6–2</td>
<td>a</td>
<td>c</td>
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<td>b</td>
<td>a</td>
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<tr>
<td></td>
<td>10–6</td>
<td>c</td>
<td>b</td>
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<tr>
<td>Friday</td>
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<td>10–6</td>
<td>c</td>
<td>b</td>
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<tr>
<td>Sunday</td>
<td>6–2</td>
<td>a</td>
<td>c</td>
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<tr>
<td></td>
<td>2–10</td>
<td>b</td>
<td>a</td>
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<tr>
<td></td>
<td>10–6</td>
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<td>a</td>
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</tbody>
</table>
As will be seen from the above table every squad works a double shift once every three weeks. For this double shift they are paid 100 per cent. extra, i.e. the 2 shifts are paid as 4 shifts. Every three weeks the workers have a Sunday free.

**Christian Metal Workers**

There is no weekly day of rest; the workers work 7 shifts a week.

**Great Britain**

**Iron and Steel Trades Confederation**

Two examples attached.

**EXAMPLE OF ROTATION OF SHIFT AND REST DAY FOR GAS PRODUCER MEN, STEEL MELTING SHOPS, SOUTH WALES**

*Average of 49 3/4 hours per week.*

<table>
<thead>
<tr>
<th>FIRST WEEK</th>
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<tbody>
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<td></td>
<td></td>
<td>a</td>
<td>b</td>
<td>c</td>
<td></td>
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<tr>
<td>c</td>
<td>c</td>
<td>a</td>
<td>b</td>
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<table>
<thead>
<tr>
<th>SECOND WEEK</th>
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<tbody>
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<td>c</td>
<td>a</td>
<td>b</td>
<td>c</td>
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<td>b</td>
<td>b</td>
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<td>c</td>
<td>a</td>
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<td>c</td>
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<th>THIRD WEEK</th>
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<td>a</td>
<td>c</td>
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<td>a</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>a</td>
<td>c</td>
<td>b</td>
</tr>
</tbody>
</table>

Shifts: 10 p.m. to 6 a.m., 6 a.m. to 2 p.m., 2 p.m. to 10 p.m.
Time of commencing on Sunday 6 a.m.
Time of finishing on Saturday 1 p.m.

The 10 p.m. to 6 a.m. shift is shown as being wholly in the day following the starting time.
The number of shifts worked by each squad is:

<table>
<thead>
<tr>
<th></th>
<th>First week</th>
<th></th>
<th>Second week</th>
<th></th>
<th>Third week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A B C</td>
<td></td>
<td>A B C</td>
<td></td>
<td>A B C</td>
</tr>
<tr>
<td>Mon.</td>
<td>6 6 7</td>
<td>Oct.</td>
<td>6 7 6</td>
<td>Oct.</td>
<td>7 6 6</td>
</tr>
</tbody>
</table>

**Method of Changing Shifts at Week-End in Some Scotch Blast Furnace Yards**

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<tbody>
<tr>
<td><strong>First Week</strong></td>
<td>a</td>
<td>b</td>
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<td>b</td>
<td>a</td>
<td>A</td>
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<td>c</td>
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<td>A</td>
<td>c</td>
</tr>
<tr>
<td><strong>Second Week</strong></td>
<td>c</td>
<td>a</td>
<td>c</td>
<td>a</td>
<td>c</td>
<td>A</td>
<td>c</td>
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<td>A</td>
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<td>b</td>
<td>c</td>
<td>a</td>
<td>c</td>
<td>A</td>
<td>a</td>
<td>c</td>
</tr>
<tr>
<td><strong>Third Week</strong></td>
<td>b</td>
<td>c</td>
<td>a</td>
<td>c</td>
<td>b</td>
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<td>c</td>
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<td>c</td>
<td>a</td>
<td>c</td>
<td>A</td>
<td>c</td>
</tr>
</tbody>
</table>

a, b, c = Ordinary Shifts.
A = Spare men.

**India**

A Firm

In the blast furnace department no weekly rest day is given at present, and in the open hearth and rolling mills departments all employees, other than those who are required for repair work, take the same day off every week, viz. Sunday.

**Italy**

Government

The commencement of the working period and the change of shifts takes place at 7 a.m., 3 p.m. and 11 p.m. or at 6 a.m., 2 p.m. and 10 p.m. Some undertakings do not work on Sundays, or only
work partially in certain departments, suppressing one shift. Other undertakings, in order to allow of a weekly rest period prolong two of the shifts to twelve hours, thus leaving the third shift free, or employ extra workers ordinarily engaged in other work. Others, again, arrange the rotation of shifts in such a way as to leave each shift free in turns.

JAPAN

Firm A

The squads are changed around every week. The change is effected by giving 23 hours and 30 minutes rest period to two squads and 16 hours of consecutive work to the third squad. The squads are arranged as follows:

<table>
<thead>
<tr>
<th>Sunday</th>
<th>1st week</th>
<th>2nd week</th>
<th>3rd week</th>
<th>4th week</th>
</tr>
</thead>
<tbody>
<tr>
<td>First shift</td>
<td>a</td>
<td>c</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Second shift</td>
<td>b</td>
<td>a</td>
<td>c</td>
<td>b</td>
</tr>
<tr>
<td>Third shift</td>
<td>c</td>
<td>b</td>
<td>a</td>
<td>c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monday</th>
<th>Do.</th>
<th>Tuesday</th>
<th>Do.</th>
<th>Wednesday</th>
<th>Do.</th>
<th>Thursday</th>
<th>Do.</th>
<th>Friday</th>
<th>Do.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First shift</td>
<td>a</td>
<td>c</td>
<td>b</td>
<td>ac</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Second shift</td>
<td>b</td>
<td>a</td>
<td>c</td>
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<tr>
<td>Third shift</td>
<td>c</td>
<td>b</td>
<td>a</td>
<td>cb</td>
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Firm B

The three-shift system is effected according to the following method.

N. B. Each squad has a rest day each alternate Sunday. The work is continued on such rest days by the reserve squad.

(1) A, B, and C are reserve squads.
(2) The average working hours per week are 52.
(3) The total working hours per year are 2,728.

<table>
<thead>
<tr>
<th>First Week</th>
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<td>1</td>
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<tr>
<td>a</td>
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<tr>
<td>b</td>
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<tr>
<td>c</td>
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</tbody>
</table>
## Second Week

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</thead>
<tbody>
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<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
<td>1 2 3</td>
</tr>
<tr>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
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## Third Week

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<td>b  c  a</td>
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<td>b  c  a</td>
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## Fourth Week

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<tr>
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<td>a  b  c</td>
<td>a  b  c</td>
<td>a  b  c</td>
<td>a  b  c</td>
<td>a  b  c</td>
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</tbody>
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## Fifth Week

<table>
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<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>c  a  b</td>
<td>C  A  B</td>
</tr>
</tbody>
</table>
(1) In the first week squads a and b have 48 hours' rest including the rest period occurring due to the shift. Squad c has the regular 24 hours' rest and is shifted around in the next week.

(2) In the second week, while squads a and c have 24 hours' rest due to the shift, squad b works 16 hours consecutively, and is shifted around in the next week.

(3) In the third week squads b and c have altogether 48 hours' rest including the regular rest day and the rest period due to the shift. Squad a rests for 24 hours and is shifted around in the next week.

(4) In the fourth week squads a and b rest for 24 hours due to the shift. Squad c works for 16 hours, and is shifted around in the next week.

(5) In the fifth week squads a and c have 48 hours' rest including the regular rest day and the rest due to the shift. Squad b has 24 hours' regular rest period and is shifted around in the next week.

(6) In the sixth week squads b and c have 24 hours' rest due to the shift. Squad a works 16 hours consecutively, and is shifted around in the next week.

(7) In the blast furnaces, where the regular rest day occurs in the first and third week, the reserve squad comes in to work: but in the steel works, no reserve squad is put to work on the regular rest days. There is absolute cessation of work and the shift is resumed from the following week according to the above table.

Four Firms

In certain factories where the three-shift system is in force, each shift working 7 days per week has a rest of 32 hours once every three weeks, the other two shifts having only an 8-hour rest.
In certain other factories one shift works 16 hours without a stop at the change-over, thus making it possible for every worker employed in the factory to have two periods of 24 hours uninterrupted rest every three weeks.

/Roumania

Workers
The workers have no weekly rest day, as the technical organisation of the blast furnaces does not permit any such arrangement to be made.

/Serbo-Croat-Slovene Kingdom

Firm A
Our rest days are Sundays and public holidays.

/Spain

Firm B
The shift which starts at 6 a.m. and leaves off at 2 p.m. on Saturday does not return to work until 2 p.m. on Monday. The shift which starts at 2 p.m. on Saturday and leaves off at 10 p.m. does not return to work until 10 p.m. on Monday. The shift which works from 10 p.m. Saturday to 6 a.m. Sunday resumes work at 6 a.m. on Monday.

Firm E
Thirty workers in the screw department work 5 days per week, 9 hours a day.

Firm F
One shift only rests on Sunday, and consequently the shifts have not one day of rest per week, but one day every three weeks.

Firm G
Same arrangement as Firm B.

Firm H
First shift, Saturday 6 a.m. to 2 p.m., Sunday 10 p.m. to 6 a.m. Monday. Rest from 2 p.m. Saturday to 10 p.m. Sunday.
Second shift, Saturday 2 p.m. to 10 p.m., Monday 6 a.m. to 2 p.m. Rest from Saturday 10 p.m. to Monday 6 a.m.
Third shift, Saturday 10 p.m. to 6 a.m. Sunday, Monday 2 p.m. to 10 p.m. Rest from Sunday 6 a.m. to Monday 2 p.m.
As will be seen, the shifts relieve each other alternately each week.

Firm L.
Time table for 24 hours: 6 a.m. to 2 p.m., 2 p.m. to 10 p.m., 10 p.m. to 6 a.m.
At the request of the workers, one of the shifts rests, the other two shifts working a 12-hour day, in weekly turns.

The three-shift system.
Sweden

An Employers' Association

At the open hearth furnaces 24 hours is the Sunday rest; at the rolling mills under the three-shift system 18 hours, and with two shifts 39 hours.

Switzerland

Federal Factory Inspectors

The weekly rest day is in Switzerland prescribed by law. Generally it falls on Sunday. In the case of workers working on Sunday or on night work and on Sunday, each one has the right to have one Sunday free in two. It is only in factories where work is continuous that another distribution of the day of rest can be established. The summary of model time tables or arrangements of shifts annexed to the circular explaining the application of the Factory Law gives all the necessary information on the organisation of work and on rest times.⁽¹⁾

A Firm

Shift workers have no complete day of rest within the six working days of the week. Change of shifts is effected according to schedule A 3 of the Administrative Order under the general Factory Act.

According to our experience up to the present, there is no urgent necessity under the three-shift system to allow a full working day as a day of rest.

⁽¹⁾ See Appendix I.
QUESTION XII

What improvements in the technique for making the change from the two-shift to the three-shift system are suggested by recent experience?

Austria

A Factory Inspector

In the old iron works and rolling mills the blast furnaces were mostly charcoal furnaces, adapted to small-scale production for small output, but the coke blast furnaces have continued to grow, and most furnaces at the present time are large enough to produce 40 tons and more of pig iron in 24 hours. The charging of the furnaces is effected regularly by means of automatic charging apparatus, the discharge of slag is continuous. Whereas under the old systems there were often only five to six effective working hours for the workers serving the furnaces in a 12-hour shift on account of the more prolonged smelting period, with the new coke blast furnaces the working hours are fully occupied. Under the 12-hour shifts, and especially with the 18 to 24-hour turns at the changeover of shifts, the workers were frequently over-strained. Their duty entailed a great strain upon their physical powers, health suffered, and premature incapacity was often the result.

In the case of the open hearth furnaces, the modern charging apparatus has relieved the workers of much heavy work, but even here the strength of the workers was overtaxed as a result of the frequent charging during a 12-hour shift.

In the rolling mills in earlier times, with smaller furnaces and fewer of them to one train of rolls, there were often prolonged pauses in the heating, and the effective period of work amounted only to 6 or 7 hours at most out of the 12. With the modern trains of rolls there are only very short breaks in the heating of from 10 to 15 minutes, and even the midday rest is often little longer: The modern live roller gear beds and lifting tables, etc. have, of course, lightened the work, but in many instances the number of workers serving the furnaces has also been considerably reduced.

This modern development, which has largely increased the output per worker and decreased the total number of workers for one plant, has greatly facilitated the introduction of the three-shift system.

Belgium

Ministry of Labour

This question is too complicated to be answered. It is difficult to distinguish in the general progress made in the iron and steel industry any special progress due to the application of the 8-hour day.
Firm A

The improvement in the technique of the industry continuously develops, independently of the system of shifts employed. The progress recently made would have been made even if the previous system had been maintained.

With a view to facilitating the introduction of the three-shift system, experience does not suggest any particular improvement in the technique of the industry.

Firm B

This question is being studied, but we have not yet had sufficient experience to answer.

Firm C

This question is too complicated, and we cannot give any answer. We did not wait for the introduction of the three-shift system before equipping all our factories with the latest modern improvements.

Canada

Government

No data are available in answer to this question owing to lack of experience.

Czechoslovakia

Metal Workers' Federation

We know of no important technical improvements which might have facilitated the introduction of the three-shift system; the preliminary conditions necessary for the three-shift system already existed.

Finland

Firm B

Blast furnaces and Martin works. In changing from two shifts to three it must be seen to from a technical standpoint that no greater number of workers are required during any stage of the procedure.

Rolling mills. The greatest possible use of machinery.

Germany

Ministry of Labour

No special improvements were effected in order to make the change from the two-shift to the three-shift system.

Christian Metal Workers

No detailed reply can be given. It should also be mentioned that most of the technical improvements were introduced owing to the difficulty in procuring supplies of coal and raw material and owing to the general economic situation, and not because of the introduction of the three-shift system.
Government

The improvements introduced in equipment are generally dependent on the application of the 8-hour day or the three-shift system. Many establishments have been fitted with modern mechanical appliances capable of obtaining the maximum production with the minimum employment of labour. So, too, the use of electric furnaces in substitution for Martin-Siemens furnaces is continually extending, as the former lead to a greater economy in fuel. It must, however, be stated that in many undertakings no innovations have been introduced for facilitating the substitution of the new working day for the old.

Firm A
No new method has been discovered.

JAPAN

Four Firms
Technical improvements have only been reported by one of the factories investigated.

Poland

Workers
We know of none.

ROUMANIA

Firm A
It has not been possible to introduce improvements for lack of experience consequent on reduced working.

South Africa

A Firm
Not in a position to give any suggestions at present.

Spain

Firm A
The reforms and modifications suggested by technical experience to put factories in a condition to support the extra charges entailed by the 8-hour day are numerous and very costly.

Firm B
Radical alterations in the machinery in order to reduce the excessive number of workers.

Firm D
By improvements and additions to the machinery, especially in the interior and exterior transport service.
Firm E
Not known.

Firm F
Additional machinery in order to reduce labour.

Firm J
The substitution of machinery for men so far as is possible.

Firm L
Any improvements which economise manual labour and are comprised under the general head of “scientific management”.

Switzerland

Federal Factory Inspectors
We have already suggested that most of the annealing plant should be improved. At the moment we cannot give any other information.

A Firm
The increase in the number of workpeople necessitated by the introduction of the three-shift system combined with the fact that the output has remained the same as under the two-shift system, while the output per man has fallen noticeably, makes a considerable extension in the use of the machinery in substitution for man power essential.
QUESTION XIII

What has been the net effect of the change from two to three shifts on labour cost (a)? On total cost (b)? Please distinguish between pig iron, ingots, and rolled shapes.

Austria

A Factory Inspector

(a) and (b) In itself, the three-shift system would naturally lead to increased wages cost and increased total cost for a fixed quantity of product. But there is no doubt that the more intensive use of all installations as a result of the introduction of the 8-hour shift will entail a decrease in the amount of fuel required (for a fixed quantity of product), an advantage which might presumably outweigh the increase in wages cost for the third shift.

In view of the depressed conditions in the Austrian iron and steel industry, no statistical data in confirmation of these statements can be given.

There can be no question that the introduction of the 8-hour shift will not only involve a more intensive exploitation of all working equipment, but also a reduction in the amount of fuel required, with respect to which commodity both a shortage and a considerable increase in price have been experienced.

Employers' Federation

The reply to question 13 should run:

“(a) Since the 8-hour shift is to be paid at the same rates as the former 12-hour shift, labour costs have been increased by 50 per cent. by the introduction of the three-shift system.”

“(b) Total costs have been increased several times over. An exact estimate cannot be given as they are affected not only by labour costs, but also by the reduction in output, disinclination to work, and disputes.

Belgium

(a) and (b) The result has been an increase in the proportion of labour costs to cost prices, and also in the total cost of production.

Firm A

Pig iron, ingots, and rolled shapes.

(a) and (b) Increase in labour cost, 65 per cent. The number of workers has increased by 50 per cent. Since, in general, wages have
remained the same for the 8-hour day as for the 12-hour day, the increased labour cost has been 65 per cent.

_Firm B_

The substitution has increased labour costs very considerably and consequently has led to a considerable rise in the total cost of production for pig-iron, ingots, and rolled shapes.

_Firm C_

The result has been a great increase in the proportion of labour costs to cost prices, and also in the total cost of production.

_Canada_

_Government_

No data is available in answer to this questions owing to lack of experience.

_Czechoslovakia_

_A Firm_

The cost of labour and of production have risen because the capacity of three-shift workers has not risen in comparison with that of two-shift workers. On the other hand, we have had to guarantee the workers the same wages as they received when working in two shifts.

_Metal Workers' Federation_

Labour cost and also the total cost of production have fallen as a result of the introduction of the three-shift system. It has been possible to make better and fuller use of the plant as a whole, and thus to reduce cost, with the result that higher profits are earned, cost of production is reduced, and the whole plant worked to better advantage.

_Finland_

_Firm A_

The change to three shifts has increased the cost of labour, likewise all other costs (rolling mills and Martin furnaces).

_Firm B_

Working costs have increased.

_Firm C_

Labour costs have increased.

Other costs have also increased.
Ministry of Labour

On the introduction of the three-shift system, the workers were paid the same wage for 8 hours as for the previous longer working day. In Bavaria statutory regulations provided that when the 8-hour day was introduced, all time and piece rates must be raised, so that the workers should not earn less in the 48-hour week than in the previous ordinary working hours. Shortly afterwards, however, as a result of the general unsatisfactory economic position of the workers, and the depreciation in the value of money, considerable rises in wages became necessary. Accordingly no statistical information or estimates are available showing how far the introduction of the three-shift system has affected this rise in wages, and the corresponding increase in the total cost of production.

Christian Metal Workers

The effect of the change from two to three shifts on cost of labour is shown in the following table:

<table>
<thead>
<tr>
<th>Date of introduction of three-shift system</th>
<th>Blast furnaces</th>
<th>Open hearth furnaces II</th>
<th>Blooming mills</th>
</tr>
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<tr>
<td></td>
<td>Middle of January 1919</td>
<td>1 December 1918</td>
<td>5 December 1918</td>
</tr>
<tr>
<td><strong>Output in</strong></td>
<td><strong>Tons</strong></td>
<td><strong>Tons</strong></td>
<td><strong>Tons</strong></td>
</tr>
<tr>
<td>September 1918</td>
<td>42,001</td>
<td>11,051</td>
<td>28,589</td>
</tr>
<tr>
<td>October 1918</td>
<td>45,318</td>
<td>11,909</td>
<td>35,391</td>
</tr>
<tr>
<td>May 1919</td>
<td>23,807</td>
<td>10,629</td>
<td>20,219</td>
</tr>
<tr>
<td>July 1919</td>
<td>24,942</td>
<td>11,743</td>
<td>23,709</td>
</tr>
<tr>
<td>August 1919</td>
<td>25,775</td>
<td>11,045</td>
<td>23,229</td>
</tr>
<tr>
<td><strong>Cost of Wages in</strong></td>
<td><strong>Marks</strong></td>
<td><strong>Marks</strong></td>
<td><strong>Marks</strong></td>
</tr>
<tr>
<td>September 1918</td>
<td>131,640.69</td>
<td>120,414.88</td>
<td>169,931.75</td>
</tr>
<tr>
<td>October 1918</td>
<td>127,008.72</td>
<td>119,474.74</td>
<td>180,151.35</td>
</tr>
<tr>
<td>May 1919</td>
<td>250,208.81</td>
<td>149,068.67</td>
<td>188,253.24</td>
</tr>
<tr>
<td>July 1919</td>
<td>228,434.02</td>
<td>202,612.20</td>
<td>232,183.39</td>
</tr>
<tr>
<td>August 1919</td>
<td>231,455.50</td>
<td>191,271.41</td>
<td>222,147.61</td>
</tr>
<tr>
<td><strong>Cost of Labour per ton of ore in</strong></td>
<td><strong>Marks</strong></td>
<td><strong>Marks</strong></td>
<td><strong>Marks</strong></td>
</tr>
<tr>
<td>September 1918</td>
<td>2.13</td>
<td>10.90</td>
<td>5.95</td>
</tr>
<tr>
<td>October 1918</td>
<td>2.87</td>
<td>10.03</td>
<td>5.09</td>
</tr>
<tr>
<td>May 1919</td>
<td>10.55</td>
<td>14.02</td>
<td>9.31</td>
</tr>
<tr>
<td>July 1919</td>
<td>9.16</td>
<td>17.25</td>
<td>9.79</td>
</tr>
<tr>
<td>August 1919</td>
<td>8.98</td>
<td>17.32</td>
<td>9.56</td>
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</table>
The effect of the cost of labour on the total cost of production can only be seen from the table which compares the total wages with the total output of raw steel. As compared with October 1918, wages per ton of raw steel have risen as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>May</td>
<td>1919</td>
<td>154</td>
</tr>
<tr>
<td>July</td>
<td>1919</td>
<td>158</td>
</tr>
<tr>
<td>August</td>
<td>1919</td>
<td>170</td>
</tr>
</tbody>
</table>

**Iron and Steel Trades Confederation**

(a) Labour cost:
- Blast furnaces (Scotland), about 45 per cent.
- Open hearth furnaces, about 17 1/2 per cent. (')
- Bessemer converters, about 45 per cent. (')
- Rolling mills, about 35 per cent. (')

(b) Total cost: No information.

**Firm A**

The effect of the change was not uniform at the different works, but I do not think at any of the works the increased cost was more than 10 per cent. on the wages paid previously, and in some works it did not exceed 5 per cent.

In the particular case where I myself was interested, there were five furnaces in blast, and the effect of the change was to increase the wages bill by 6 1/2 per cent.

**Firm B**

The increased cost on hand-charged furnaces was 5.03 d. per ton, and on the mechanically charged furnaces 3.35 d. per ton, this increase being reckoned on our base rate of wages. The sliding scale at that time was about 20 per cent. over the base rate and the figures should be increased by that percentage to give the actual cost at that particular time.

**Italy**

Government

It is impossible to establish with precision the effect of the adoption of the three-shift system on the cost of labour, and still less on the cost of production, in view of the abnormal conditions of both factors. It may be roughly estimated that the cost of labour has increased by 35 per cent., and even by 50 per cent., and that the cost of production, as the result of the adoption of the three-shift system, in combination with other causes connected with the price of raw materials and railway transport, has increased by from 34 to 37 per cent.

**Japan**

**Firm A**

The following table has been prepared giving the value of 100 to the wages under the two-shift system. However, owing to the

(1) Selected cases.
increase of wages after the adoption of the three-shift system it cannot be held that the figures in the table are solely due to the adoption of the new system. It is rather difficult to calculate mathematically the effect of the system upon the total cost because of fluctuation of prices. The total output, the output per head per day, and the number of workers coming in and out of the works on the daily average indicated by index figures are given at the same time for the sake of comparison.

<table>
<thead>
<tr>
<th></th>
<th>Wages</th>
<th>Total Production</th>
<th>Production per head per day</th>
<th>Workers coming in and out of the works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast furnaces</td>
<td>148</td>
<td>93</td>
<td>83</td>
<td>93</td>
</tr>
<tr>
<td>Open hearth furnaces</td>
<td>148</td>
<td>106</td>
<td>82</td>
<td>127</td>
</tr>
<tr>
<td>Converters</td>
<td>147</td>
<td>104</td>
<td>—</td>
<td>111</td>
</tr>
<tr>
<td>Rolling mills:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small bar mills</td>
<td>178</td>
<td>150</td>
<td>127</td>
<td>227</td>
</tr>
<tr>
<td>Middle bar mills</td>
<td>231</td>
<td>104</td>
<td>94</td>
<td>108</td>
</tr>
<tr>
<td>Large bar mills</td>
<td>241</td>
<td>112</td>
<td>63</td>
<td>137</td>
</tr>
<tr>
<td>Rail mills</td>
<td>211</td>
<td>72</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>Plate mills</td>
<td>178</td>
<td>114</td>
<td>97</td>
<td>116</td>
</tr>
</tbody>
</table>

**Poland**

(a) Labour costs have increased by 50 per cent. as a result of the introduction of the third shift (in some factories 40 per cent., since certain classes of workers do not work in shifts).

(b) Most of the establishments are unable to supply exact figures. One establishment only, which includes one Martin furnace and one small rolling mill, has stated that the increase in total cost of production, attributable to the introduction of the three-shift system, is about 10 per cent.

**Roumania**

**Workers**

We do not know.

**Serbo-Croat-Slovene Kingdom**

(a) The open hearth furnaces shew an increase of 50 per cent. in staff without any increase in output; wages have not been altered. The rolling mills shew an increase in staff of 50 per cent.; wages have not been altered, whilst the production has only increased 15 per cent. The wire mills shew a 20 per cent. increase in production, while the substitution of the three-shift system for the two-shift system has necessitated an increase in labour of 50 per cent.

(b) The total cost of production has increased in proportion to the increase in number of workers.
Firm B
Labour costs have risen on an average 33 1/2 per cent.; the cost of production has therefore risen also, for wages are a considerable item in it, whilst production has not increased in consequence of the introduction of the three-shift system, but on the contrary working capacity has suffered a diminution.

South Africa
A Firm
Labour cost increased 25 per cent., and total cost 32 per cent.

Spain
Firm A
(a) Increased.  (b) Also increased.

Firm B
(a) 50 per cent. for blast furnaces and open hearth furnaces, 100 per cent. for rolling mills.
(b) Increase in the same proportion.

Firm D
(a) 266 per cent. increase for crude steel and 175 per cent. to 390 per cent. increase for rolled bars.

Firm E
(a) 25-30 per cent. increase.  (b) 50 per cent. at least (other influences must be taken into account in explaining this rise).

Firm F
(a) 400 per cent. (because of the increase in wages).
(b) 50 per cent.

Firm G
(a) 50 per cent.
(b) The cost of other factors in production has not changed.

Firm H
(a) 50 per cent.  (b) 30 per cent.

Firm J
(a) Increase in all shops.  (b) Idem.

Firm K
(a) 50 per cent.

Firm L
(a) Since we have, as before, an excess in the demand for labour, no effect has been produced.
(b) Increase of at least 25 per cent.
SWITZERLAND

Federal Factory Inspectors

The information hitherto available is not sufficient to allow of this question being answered. It should, however, be noted that other factors, notably the price of coal, have affected the cost of production possibly even more seriously than the introduction of the three shifts.

A Firm

The change from the two-shift to the three-shift system was accompanied by an adjustment in wages. This adjustment, the increase in the numbers of workers and the resulting increase in general expenses are the most important factors in the noticeable increase in the cost of production.
APPENDIX I

EXTRACTS FROM LAWS

This appendix contains extracts from those Acts, Decrees, etc. of countries which have specific provisions in their 8-hour laws relating to the application of the 8-hour day, especially in continuous industries. The English text is that of the Legislative Series of the International Labour Office. The full texts of the Acts, Decrees, etc. from which these extracts are taken will be found in the indicated numbers of the Legislative Series:

<table>
<thead>
<tr>
<th>State</th>
<th>Date of Act, Decree, etc.</th>
<th>Legislative Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>Act dated 14 June 1921</td>
<td>1921. Bel. 1</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>Act dated 19 Dec. 1918</td>
<td>1919. Cz. 1, 2 and 3</td>
</tr>
<tr>
<td>Denmark</td>
<td>Act dated 12 Feb. 1919</td>
<td>1919. Den. 1</td>
</tr>
<tr>
<td>Finland</td>
<td>Act dated 14 August 1918</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Resolution dated 20 Dec. 1919</td>
<td>1920. Fin. 3</td>
</tr>
<tr>
<td>France</td>
<td>Act dated 23 April 1919</td>
<td>1919. Fr. 3</td>
</tr>
<tr>
<td>Germany</td>
<td>Regulations dated 23 Nov. 1918</td>
<td>(1)</td>
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AUSTRIA

Act respecting the 8-Hour Day. Dated 17 December 1919.

1.— (1) The hours of work of wage-earning and salaried employees in undertakings subject to the Industrial Code shall not exceed 8 hours in 24, exclusive of breaks.
4.—(1) In addition, the political authority of first instance may authorise particular employers to extend the hours of work of wage-earning and salaried employees in their establishments to not more than 10 hours a day on not more than 30 days in a calendar year in order to meet increased requirements for work.

(2) If permission is applied for to extend the hours of work beyond the limits of one working week, the opinion of the industrial inspectorate and the trade associations of wage-earning and salaried employees concerned shall be ascertained before the authorisation is granted.

5.—(1) The provisions of § 1, subsection (1), shall not apply in any case where the hours of work in any working week are fixed by a collective agreement at not more than 48 hours.

8. Overtime, being an extension of the hours of work beyond the limits provided in §§ 1-5, shall entitle the wage-earning or salaried employees to a special rate of payment not less than 50 per cent. higher than that agreed upon for the normal hours of work. In the case of piece-work and task-work, the hourly rate shall be held to be the average amount earned in one hour, taken over the working week.

Administrative Instruction of the State Department for Social Welfare, authorising exceptions to the Act of 17 December 1919, respecting the 8-Hour Day (Exceptions Order No. 1 under the 8-Hour Day Act). Dated 28 July 1920.

PART I. REGULATIONS FOR ALL ESTABLISHMENTS SUBJECT TO THE ACT

1.—(5) In continuous industries, for the purpose of effecting the alternation of shifts, the hours of work may be so arranged that they shall not exceed 168 hours within three working weeks.

(6) The provisions of § 8 of the Act, respecting payment for overtime, may be varied by collective agreement.

PART II. SPECIAL REGULATIONS

8. In the continuous processes of iron smelting, hours of work beyond 144 hours in three working weeks (§ 1, subsection 5) shall be paid for as overtime.

BELGIUM

Act to provide for an 8-Hour Day and a 48-Hour Week. Dated 14 June 1921.

1. The following shall be subject to the provisions of this Act:
(2) industries in which goods are manufactured, raw materials or manufactured articles transformed, ornamented, finished, cleaned, or adapted for sale.

2. The actual working hours of persons employed in undertakings within the meaning of Section 1 of this Act shall not exceed 8 hours in the day and 48 hours in the week.

3. In undertakings in which work is organised in successive shifts, workpeople may be employed beyond the limitation fixed by the preceding Section, provided always that the duration of actual work, averaged over a period of three weeks or less, shall not exceed 8 hours in the day and 48 hours in the week.

4. The limitation of working hours provided for in Section 2 may be exceeded in those processes in which, by reason of their nature, work cannot be interrupted.
Nevertheless, in this case, the duration of actual work for each worker shall not exceed 56 hours in the week, averaged over a period of three weeks.

The King may authorise the taking of this average over a period other than three weeks.

Without prejudice to the rest periods prescribed by the provisions of the Act of 17 July 1905, an employer shall assure to workers obliged to work 56 hours a week one or more compensatory holidays in turn, the total duration of which shall not be less than 26 full days in the year.

6. It may be prescribed by Royal Order that the provisions of Sections 2 and 3 may be exceeded:
   (1) in industries or branches of industry in which the time necessary for the completion of the processes cannot, by reason of their nature, be precisely determined.

7. An authorisation to work hours in excess of the maximum prescribed by Sections 2 and 3 and of the limits prescribed by Sections 5 and 6, may be granted as a result of an agreement between the employer and the organisation or organisations to which the majority of his workers belong, or, in default of an organisation, the majority of his workers.

This authorisation may be granted by the Minister of Labour on the report of the labour inspector or competent mining engineer, in order to enable an employer to cope with unusual increases of orders occasioned by unforeseen events.

Such authorisation shall not be granted for more than three months in any one year. It shall specify the period by which the normal working day may be prolonged; such prolongation shall not exceed two hours in the day.

13. The shortening of the duration of working hours consequent upon the operation of this Act shall in no case involve a reduction of wages.

Moreover, in the cases provided for by Sections 5, 6 and 7, the work done in excess of the limits fixed by Sections 2 and 3 shall be paid for at a rate exceeding the normal remuneration by not less than 25 per cent. for the first two hours of overtime, and 50 per cent. for every succeeding hour.

Sunday overtime shall be paid at the rate of 100 per cent. in excess of the normal rates.

27. This Act shall come into operation on 1 October 1921.

CZECHOSLOVAKIA


   HOURS OF WORK

1.— (1) In undertakings subject to the Industrial Code or carried on as factories, the actual hours of work of workers shall, in principle, not exceed 8 hours within 24 hours or 48 hours in the week.

4.— (1) The worker must be allowed in every week an uninterrupted period of rest of at least 32 hours.

(2) In undertakings in which the processes can technically be interrupted without difficulty, this period of rest shall, as a rule, fall on Sundays, except in so far as exceptions are allowed in the Act relating to Sunday rest.
(3) Further exceptions to the 32 hours' rest shall be allowed for continuous undertakings when it would not be otherwise possible to alternate the shifts (alternation of the night and day shifts) and the work cannot be interrupted for technical reasons without considerable disturbance to the manufacturing process, and attention and supervision is necessary. In such cases the daily or weekly hours of work fixed in Section 1 shall be extended, provided that the shifts shall be so arranged that the 32 hours' period of rest of each worker falls on Sunday at least every third week.

(5) The exceptions designated in the preceding Sub-sections shall be allowed in particular groups of undertakings by the Minister for Social Welfare in agreement with the Ministers concerned.

OVERTIME

6.—(4) Overtime shall not extend altogether beyond 20 weeks or 240 hours in the year. This limitation shall not apply to emergency work, especially repairs, where danger to life, health and the public interest is involved, but only for a limited period unavoidably necessary for technical reasons, and if this work cannot be carried out within the usual hours of work.

14. In undertakings in which the hours of work are reduced in accordance with this Act the wages reckoned by time shall not be reduced for this reason.

15.—(1) This Act shall come into force on the 15th day from its notification.

(2) In the case of particular groups of continuous industries or parts of the same the Minister for Social Welfare, in agreement with the competent Ministers, may allow the operation of this Act to be postponed, if this seems necessary for technical reasons or on account of the lack of skilled workers.

2. Order in pursuance of the Act respecting the 8-Hour Day. Dated 11 January 1919.

11. In accordance with Section 4, Sub-section (5), I hereby grant permission to the following undertakings in which the process is continuous for the purpose of the alternation of shifts, to extend the daily or weekly hours fixed in Section 1, on condition that the employed persons shall have their 32 hours' weekly rest at least every third week on a Sunday, and that the hours by which the weekly total of 48 hours is exceeded when the shifts are alternated, shall be paid for as overtime. These undertakings are:

(1) Ironworks.
(2) Metal works.


The 32 hours' rest should in general fall on Sunday, but in exceptional cases it may be arranged for a week-day—e.g. in continuous processes; in agriculture, when urgent work is in hand (at ploughing, sowing, and harvest time); in printing works engaged on publications in the national interest; in the railway service, etc.

In undertakings running continuously, work has to be arranged in three shifts; so that in order to admit of a weekly alternation, it is desirable that a relief shift should be organised. If under the system of

The three-shift system.
weekly alternation of shifts it is impossible to ensure, by means of the employment of a relief shift, that everyone on each shift shall have a 32 hours' period of rest every week, it is permissible to extend the weekly hours of work, but only on condition that the 32 hours' period of rest of each worker shall fall on Sunday at least every third week, and that the hours by which the weekly 48 hours of work are exceeded shall be counted as overtime in reckoning wages. To allow of the 32 hours' period of rest falling on Sunday for each of the three shifts in turn, the alternation of shifts may be planned so that one shift is allowed the 32 hours' period of rest during Saturday and Sunday, while the other two shifts work 16 hours each without a break.

The period of rest for these two shifts is thus reduced to 24 hours in the week in question, and the working hours of all three shifts are extended from 48 to 56. The following schedule exemplifies the working of this system of alternating shifts during three weeks:

First Week

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<thead>
<tr>
<th>Monday to Friday</th>
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<th>Sunday</th>
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Third Week

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<td>Shift c a b</td>
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Act to introduce the 8-Hour Working Day in Factories working continuously day and night. Dated 12 February 1919.

1. The following sub-sections (2)-(4) shall be added to Section 24 of the Act, No. 143 of 29 April 1913, respecting work in factories, etc., and their inspection by the public authorities:

(2) In undertakings working continuously day and night (med Døgn-drift) no workers employed on the continuous process shall work more than 8 hours in the 24 hours; when the shifts are changed the period of employment may be extended to not more than 16 hours a day; but in this connection arrangements must be made to ensure that the total hours of work of any worker shall not exceed 160 hours in three consecutive weeks. Extensions of the period of employment arising from the necessity to transfer the work in a proper manner when a man is relieved, or necessitated by repairs, illness, the completion of a particular process and so forth, shall not be taken into account.

2. This Act must be carried out in all respects at latest six months after it comes into operation.
Act to amend §§ 3, 11, and 12 of the Act of 27 November 1918 respecting the 8-Hour Working Day. Dated 14 August 1918.

This Act shall apply to:

1. the undermentioned trades and undertakings in so far as persons other than the owner's husband, wife, or own children are employed in them:
   (a) handicrafts and factory work as well as other industrial occupations.

2. Workers in the industries and undertakings mentioned under (1) of Section 1, paragraph 1, shall, with the exceptions cited in this section, not be employed on regular work longer than 8 hours in a day or 96 hours in two weeks.

   If the technical character of the work or other compelling circumstances necessitate it, workers may work longer than 8 hours in a day, so long as the total of weekly hours is not increased.

3. Workers over eighteen years of age may be employed with their own consent on overtime beyond the limits fixed in paragraph 1 of Section 2 for a maximum period of 24 hours in two weeks, and beyond the limits fixed in paragraph 1 of Section 2 for a maximum period of 48 hours in four weeks; but in neither case shall a maximum of 200 hours in the year be exceeded; and, in addition to this, with the consent of the inspecting authorities, if the regular progress of the work absolutely demand it, for a maximum period of 150 hours in a year.

   Overtime, beyond the daily working time, must be paid for at the rate of at least 50 per cent. increase for the first two hours, and of at least 100 per cent. increase for each subsequent hour.

5. On Sundays workers shall be granted an uninterrupted holiday of at least 30 hours. If this is not possible, a corresponding rest shall be granted during the week.

6. If the work is organised in shifts of at most 8 hours changing regularly, the workers shall be granted a rest for meals of at least half an hour or opportunity shall be given them to take food during their working time.

12. More detailed regulations respecting the application of this Act shall be issued by the Senate.

If the practical application of this Act cannot be carried out owing to the technical nature of the work, the time of year or other compelling circumstances, the Senate may, on the advice of the inspecting authorities, authorise exemptions from the provisions of this Act, on each occasion for not more than one year.

Resolution of the Council of State respecting the Hours of Work in Continuous Industries. Dated 20 December 1919.

The following Order is issued by the Council of State on the proposal of the Minister of Social Welfare, in virtue of Section 12, paragraph 2, of the Act of 27 November 1917, respecting the 8-hour working day, as amended by the Act of 14 August 1918.

1. Contrary to the provisions of Section 2 of the above-mentioned Act, workers who have attained the age of eighteen years may be employed
regularly for 168 hours in three weeks, in the establishments specified in paragraph 4 or in parts thereof, for the performance of work which for technical reasons must be continued day and night and every day in the week, and which is organised in three shifts which relieve each other regularly and are changed every week.

A worker shall not be employed beyond the hours of work fixed above, on overtime allowed without the consent of the inspection authority under Section 3 of the Act respecting the 8 hour working day, for more than 50 hours during the period for which this Resolution is operative.

The provisions of Section 5, paragraph 1, of the aforesaid Act shall not apply to workers engaged in the work referred to in this section.

The work referred to in this section shall be permitted in connection with the furnace-rooms and power plant departments of factories, and also in industrial establishments or parts thereof which are engaged in or connected with:

(b) Metallurgical works, e.g. blast furnaces, Siemens-Martin furnaces, and electro-metallurgical smelting furnaces.

FRANCE

Act respecting the 8-Hour Day. Dated 23 April 1919.

1. Chapter II (Hours of Labour) of Part I of Book II of the Labour Code is amended as follows:

CHAPTER II. HOURS OF LABOUR

"6. The effective working time of workers or employees of either sex and of any age shall not exceed 8 hours per day or 48 hours per week, or an equivalent limitation based upon a period of time other than the week, in industrial and commercial establishments or in business premises of any kind connected with them, whatever their nature, whether public or private, secular or religious, even where they serve the purposes of trade instruction or are of a philanthropic nature."

2. In no case shall the reduction of the hours of labour serve as a determining reason for a reduction in wages. All stipulations to the contrary shall be null and void.

Decree issuing public administrative regulations under the Act of 23 April 1919, respecting the 8-Hour Day in the metallurgical and metal-working trades. Dated 9 August 1920.

1. This Decree shall apply to all undertakings or parts thereof in which the following industries are carried on:

Metalurgy;
Blast furnaces, steel works;
Rolling mills, forging works, metal drawing, stamping, drop forging, edge tool manufacture, wire drawing.

2. The undertakings or parts thereof specified in § 1 shall adopt one of the following methods for carrying out the Act of 23 April 1919:

(1) Limitation of work to a maximum of 8 hours per working day in each week;

(2) The distribution of the 48 weekly working hours unequally between the working days, subject to a maximum daily limit of 9 hours, in such a way as to admit of a Saturday afternoon rest.
When work is organised in successive shifts, the work of each shift shall be continuous except in so far as it is interrupted by breaks.

5. Daily working hours may be extended beyond the limits fixed under § 2 of this Decree, for the occupations specified in the following schedule and in accordance with the conditions indicated therein:

(7) Work of persons employed specially in metallurgical operations (first and second smelting, forging, rolling of metals, and operations connected therewith), or in other operations which for technical reasons cannot be stopped at will, when they have not been completed within the period fixed by regulation, on account of their nature or of exceptional circumstances.

In the case of skilled workers employed in works where continuous furnaces are used, and belonging to classes specified in the Decree of 31 August 1910(1), the average weekly hours of work shall not exceed 56.

6. Working hours may be temporarily extended beyond the limits fixed under § 2, in the following cases:

(1) Urgent work which must be carried out immediately in order to prevent impending accidents, for salvage purposes, or to repair injuries to the machinery or plant or buildings of the undertaking; unlimited extension on any one day chosen by the employer, and on subsequent days not more than two hours beyond the limits fixed for the majority of the workers in the undertaking;

(2) Work carried out in the interests of national safety or defence, or for the public service under an order from the Government certifying the necessity for extension; the limit to be fixed in each case by agreement between the Minister of Labour and the Department which has ordered the work;

(3) Urgent work with which the undertaking has to deal (exceptional influx of work), up to 100 hours a year. In addition, the Minister of Labour may authorise an additional 50 hours if it is certified by the Minister within whose competence the work falls that the said work is being carried on in the national interest.

(1) Those classes of workers specified in the Decree of 31 August 1910 who come within the scope of the questionnaire are as follows:

(1) Blast furnaces and appliances connected therewith. Superintendents and foremen controlling the working of the apparatus; tippers; gaugers; furnace-chargers; furnace-rollers; loaders of the bottom; foundrymen; stokers and feeders of boilers heated by blast-furnace gases; workmen employed in the purification of gas; engineers for blastfans and lifts; foundrymen working cupolas for dephosphoration and desulphurisation.

(2) Pig-iron mixers. Superintending and working staff.

(3) Continuous furnaces for making steel. Superintendents and foremen in charge of the working of appliances; chargers; foundrymen; gas-men; tampmen; and cleaners; men employed in the castings; in the work of the pig-iron moulds; in the founding pits; ingot-strippers.

(4) Shafts and furnaces for re-heating steel ingots. Superintendents in charge of the working of the appliances, and stokers.

(5) Sundry blister or cement steel and continuous furnaces for the manufacture of crucible steel. Foremen in charge of the working of appliances, and stokers.

(English translation in the Bulletin of the International Labour Office (Basle), Vol. VI, 1911, p. 166.)
This may be extended up to 100 hours during the years 1920, 1921, and 1922.

The daily duration of work shall not in any case exceed 10 hours.

8. The hours worked under exemptions, provided for in § 6, subhead (3), shall be reckoned as overtime, and paid for in accordance with the custom in force in respect of overtime.

GERMANY

Regulations respecting the Hours of Work of Industrial Workers. Dated 23 November 1918.

II. The regular daily hours of work exclusive of breaks shall not exceed 8 hours. Where, by agreement, a reduction of hours on Saturdays and the eves of festivals is introduced, the residue of the hours of work on those days may be distributed amongst the remaining days of the week.

IV. In undertakings where, from their nature, the work cannot be interrupted or in which continuous Sunday work is at present necessary in the public interest, for the purpose of effecting a regular weekly change of shift, male workers over 16 years of age may be employed once in a period of three weeks on a shift not exceeding 16 hours inclusive of breaks, provided that they are allowed twice in those three weeks an uninterrupted rest of 24 hours on each occasion.

VII. In undertakings where, from their nature, the work cannot be interrupted or which must, in the public interest, be kept in operation without limitation, arrangements deviating from the preceding provisions and subject to revocation may be allowed by the competent industrial inspectors or in the case of mining undertakings by the district mining officials, if the necessary number of suitable workers is not available. For this purpose it shall be necessary for the employer to make application, and for the workers' committee (or in the absence of such committee the workers of the undertaking) to declare their approval, unless agreements have been come to between the employers' and workers' associations concerned. Where, in the case of the said undertakings, more far-reaching agreements respecting exceptions to the limitations upon the employment of industrial workers have been concluded by contracts between employers' and workers' associations, the industrial inspectors of the district mining officials, as the case may be, may allow, subject to revocation, further exceptions corresponding to these contracts. The said officials, after issuing their permits, shall notify the workers' employment office competent to act for the undertaking immediately of the shortage of workers for the undertaking in question. Permits issued shall be notified to the competent demobilisation commissioner.

The latter shall have power to require the said officials to revoke their permits.

VIII. The beginning and end of the hours of work and of the breaks shall, in the absence of any collective agreement on the matter, be fixed in accordance with the preceding provisions by the employer in agreement with the workers' committee, or in the absence of any such committee with the workers of the undertaking, and shall be published by being posted up in the works.
Act respecting Hours of work. Dated 24 March 1922.

1. In all private, municipal, public, and State establishments the hours of work of wage-earners (manual work) shall be fixed at 8 hours a day for paid workers (manual work), except in the cases specially mentioned in this Act.

3. The weekly Sunday rest shall consist of not less than 42 consecutive hours.

Note 1. In undertakings where work is organised in shifts, a weekly rest of not less than 40 hours shall be granted.

Note 2. If non-manual or manual workers cannot have their Sunday rest, for technical reasons connected with their work, this rest shall be granted to them on another day of the week.

4. On Saturday, work shall cease two hours earlier than on other days. Work shall begin at the usual hour and shall cease at midday on the eve of the following festivals: New Year's Day, Easter, Christmas Day, Whitsunday, and 24th June.

5. For very arduous or unhealthy occupations, the Ministry of Labour in agreement with the Health Department may fix the hours of work at less than 8 hours a day.

6. The normal hours of work fixed in the foregoing sections may be exceeded by not more than 2 hours a day on the basis of an agreement between employers and workers, subject to the consent of the Labour Inspectorate.

7. Compulsory overtime may be worked in the following cases:
   (1) When required as an absolute necessity in the public interest;
   (2) When indispensable repairs have to be carried out;
   (3) In order to finish urgent work by the time specified.

If such overtime work lasts for more than 6 days, the employer shall apply to the Labour Inspectorate for a permit for the same, except in cases when the recurrence of such cannot be anticipated.

13. In undertakings where for technical reasons work is carried on in shifts over the whole 24 hours, women workers may be employed at night for not more than 48 hours in a period of three weeks. In other undertakings they may be employed 6 hours a night or 36 hours a week.

Note. Work between 10 p.m. and 6 a.m. shall be deemed to be night work.

14. Each period of 8 hours' work shall be interrupted by a break of 1 hour, during which the worker shall have the right to leave his work. This break shall not be included in the hours of work; time for dinner shall be granted after 4 consecutive hours of work.

15. Exceptions to the provisions of section 14 respecting breaks and their length shall be authorised on the basis of an agreement between employers and workers, provided that breaks shall be included in the hours of work if the worker has not the right to leave the place where he works.

17. Payment for overtime shall be made at the following rates: the first two hours, at least 50 per cent. higher than normal hours; subsequent hours and the dinner hour, at least 100 per cent. higher; work on Sundays and festivals, at least 75 per cent. higher. In calculating the rate per hour for workers paid by the month or fortnight, the month shall be reckoned as 25 days.
LITHUANIA

Act respecting Daily Hours of Work. Dated 30 November 1919.

4. The hours of work shall not exceed 8 hours daily and 48 hours weekly after deduction of the regular breaks.

7. Overtime shall be authorised for any undertaking, a department or considerable group of workers thereof, only in extraordinary and urgent cases, and only after first procuring a permit from the inspector of labour.

12. In undertakings working continuously, adult workers, i.e. workers who have attained the age of seventeen years, may be employed for 16 consecutive hours once in three weeks, in default of any agreement to the contrary, but in this case the rest period of 24 hours shall be granted them twice during the same three weeks.

NORWAY

Act to amend and supplement the Act of 18 September 1915, respecting the Protection of Industrial Workers. Dated 11 July 1919.

23. — Ordinary Period of Employment

(1) The ordinary period of employment of a worker shall not exceed 8 1/2 hours a day or 48 hours a week. In mines the hours of work shall include the time taken in descending into and leaving the mine.

In the case of workers in mines and smelting works who have a regular holiday on Saturdays, a worker's ordinary period of employment may be extended to 9 1/2 hours a day, but shall not exceed 48 hours a week.

24. — Maximum Period of Employment (Overtime)

(1) Overtime may be worked up to 10 hours a week.

The inspecting authority may, for a particular occasion or for a period not exceeding 6 months at a time, give permission for overtime to be worked by particular workers up to 15 hours a week.

(2) Overtime shall not in any case exceed 30 hours for any worker in four consecutive weeks.

31. — Exceptions to the Regulations respecting Overtime

(1) For undertakings carried on day and night throughout the week, the King may consent to an arrangement which in the course of one shift period will allow to each worker an average working time of 48 hours a week, and an average rest period of 24 consecutive hours a week. In coming to a decision special consideration shall be paid to what the majority of the workers wish.

II.

If the reduction of hours of work under this Act gives rise to disputes as regards the raising of rates of wages fixed by collective agreements, an attempt shall not be made to settle such disputes by strikes or lock-outs. If such disputes cannot be settled by negotiation between the organisations concerned they shall be submitted to a wages board of five members nominated by the King. The decision of a wages board shall not extend beyond the scope of the collective agreement in question.
III

A. — This Act shall come into operation on 1 January 1920.

B. — If the putting into operation of this Act makes it entirely or in great measure impossible to carry on an undertaking, the King may grant exemption from the provisions of the Act after consulting the Labour Council.

POLAND

Act relating to Hours of Work in Industry and Commerce. Dated 18 December 1919.

1. The hours of work of persons employed under a contract of work in industrial and commercial establishments, mines, communication and transport undertakings, and any other industrial establishments of whatever kind, whether public or private, even those not carried on for purposes of gain, shall not exceed 8 hours per day, exclusive of rest periods, and on Saturday 6 hours, so that the total working week shall not exceed 46 hours.

6. Hours of work may be extended in the following cases:
   (c) in establishments working continuously, in so far as extension is absolutely necessary for the working of the establishment. The Minister of Labour in agreement with the Minister of Industry and Commerce, on the advice of the trade associations of workers and employers, may authorise the extension of the hours of work in the said establishments for particular groups of workers, and in particular may authorise an extension to not more than 56 hours per week on an average. The period of 8 hours of work per day fixed in Section 4 may be extended in these establishments on one day in each week for one shift or for two successive shifts; provided that in this case work shall be so distributed that each worker shall have a rest period of not less than 24 hours at least twice in every three weeks.

8. In establishments working continuously, workers may be employed regularly and continuously on Saturdays in shifts of 8 hours each. In case of such employment the workers shall be entitled to special pay for two hours' overtime, in accordance with the scale fixed in Section 16.

10. Work shall be prohibited on Sundays and statutory public holidays in establishments to which this Act applies, except in the cases specified in Section 11.

11. Work shall be permitted on Sundays and public holidays:
   (b) in establishments working continuously, for the performance of work which cannot be suspended on account of the technical nature of the processes.

16. The overtime provided for in Sections 6 and 8 shall be paid for at a rate not less than 50 per cent. above the normal wage. In the case of overtime worked in excess of two hours on any one day, or at night or on Sunday, the rate of wages shall be increased by not less than 100 per cent. In the case of piece-work, the increase shall be reckoned on the basis of the time rate, except where an agreement to the contrary has been concluded in any particular establishments.

TEMPORARY PROVISIONS

III. The adoption of the hours of work specified in this Act, in establishments where longer hours have hitherto been worked, shall in no case involve a reduction in wages.
PORTUGAL

Decree limiting the Hours of Work of Workers and Employees in Commercial and Industrial Establishments. Dated 7 May 1919.

1. The maximum hours of work, whether carried on by day, by night, or partly by day and partly by night, of workers and employees of the State, of administrative authorities and of commercial and industrial undertakings, with the exception of agriculture and domestic service, in the continental territory of the Republic and the adjacent islands, shall not exceed 8 in any one day, and 48 in any one week.

6. Extension of the working hours shall be permitted in cases of urgent public necessity, mobilisation, fire, flood, landslips, explosion, grave disaster, in all cases of force majeure (including those expressly indicated in this Decree) and also in special cases in accordance with the provisions of official regulations and instructions.

7. In industries carried on by continuous processes, or whenever in cases of force majeure an industry cannot suspend its operations, work shall be organised in shifts.

11. When work is organised in shifts, no shift shall be employed for a greater number of hours than those fixed by this Decree.

12. Overtime shall be paid for at double the normal rate.

13. The salaries, wages or other remuneration in force in respect of the present normal hours of work shall not be reduced by virtue of the provisions of this Decree, but this provision shall not affect bonuses, which shall be separately considered.

SERBO-CROAT-SLOVENE KINGDOM

Order respecting Hours of Work in Industrial Undertakings, Handicrafts, Mining, Commerce and Transport. Dated 12 September 1919.

1. In establishments and undertakings in industry, handicrafts, mining, commerce, and transport in the territory of the Serbo-Croat-Slovene kingdom, irrespective of whether they are owned by private persons or by the State, a province or a commune, and in general also in all similar work carried on as a subsidiary industry in any other public or private undertaking, the hours of work shall not exceed 8 hours a day or 48 hours a week.

4. The hours of work may be extended by way of exception, as follows:

(1) in undertakings where continuous work is necessary on account of the nature of the processes or in the public interest. In this case male workers above the age of eighteen years may be employed not more than once in three weeks for 16 hours beyond the usual period (fixed by Act, Order or agreement), solely for the purpose of ensuring the regular changing of shifts. Once in three weeks these workers shall be granted an uninterrupted rest period of 24 hours, which shall not include the weekly rest period already fixed by law or agreement.

6. Work in excess of the hours specified in Section 1, or of 48 hours a week (Sections 4, 5, and 6), shall be remunerated at a rate not less than 60 per cent. higher than work done during the normal hours.

In the case of piece-work, 1/48th part of the total weekly earnings shall be deemed to be the wages for a normal hour's work.

7. The employer shall not, on account of the operation of this Order, reduce the wages agreed upon.
Royal Decree fixing the Maximum Working Hours at 8 hours a day or 48 hours a week in all work, from 1 October of the present year. Dated 3 April 1919.

1. From 1 October 1919 the maximum legal day for all labour shall be fixed at 8 hours a day or 48 hours a week.

2. Joint Industrial Councils shall be set up before 1 July and shall present, before 1 October, to the Institute of Social Reform, the list of industries or special cases in which the application of the 8-hour day is not possible, and for which exceptions ought to be made.

Royal Order issuing general rules for the Adoption of the Maximum Working Day of Eight Hours. Dated 15 January 1920.

1. From the date of publication of this Order in the Gazette, the maximum legal day for all workers, employees and officials, in industries, occupations, and paid employments of all kinds, who are engaged under the direction or supervision of another, shall amount to 8 hours, except in the case of domestic service and other cases in which the Institute of Social Reform grants an exception for substantial reasons. In the said cases the Institute shall decide whether the exception shall be total or partial, temporary or permanent, and shall fix the limits of the working day in the excepted employments.

Directors, managers, and other higher officials of undertakings, who owing to the nature of their duties cannot be subjected to a strict limitation of their hours of work, shall be exempt from this provision.

Working hours may be reckoned on a weekly basis, at the rate of 48 hours per week of six working days, in cases in which the nature of the work does not permit a uniform distribution of hours or in which a special agreement has been made for the mutual convenience of employers and workers.

3. The reduction of the working day shall not be a ground for a corresponding reduction of salary or wages.

An exception to the above shall be permitted only when salaries or wages have been increased during the last two years and when it is clearly proved that the increase was given in return for an increased number of hours of work.

4. The workers in each establishment may make an agreement with the employer for overtime in case of urgent necessity, provided that such overtime does not exceed 50 hours a month or 120 hours a year.

When such an agreement does not apply to one establishment only but to several, including all similar establishments in the locality or district in question, provided it is signed by the duly organised employers' and workers' associations, and is based upon the lack of suitable employees or on any special and indisputable necessity which affects the whole industry or occupation, the annual number of overtime hours may be increased, provided that the total shall not exceed a maximum of 240 hours.

Copies of all agreements respecting the arrangement of working hours shall be transmitted to the inspector of labour, who shall forward them to the Institute of Social Reform.

5. The employer shall have the right to propose overtime, and the worker shall be free to accept or refuse it.
6. Overtime shall be paid for separately, subject to the increase agreed upon, which shall not be less than 20 per cent. For overtime beyond the first ten hours of any day and for overtime at night and on Sunday, the increase shall not be less than 40 per cent.


8. In the industry of forging, founding, assembling, and repairing of machinery and requisites for railways, for operations which on account of their nature require to be continued uninterruptedly until completed or until a particular stage is reached, employers and workers may come to an agreement on the basis of a 48-hour week, and work in excess of this amount shall be paid for as overtime and the total amount shall not exceed 60 hours.

SWEDEN

Act concerning Hours of Work. Dated 22 June 1921.

1. This Act shall apply to every undertaking, industrial or otherwise, and likewise to the building of houses, road construction, hydraulic engineering, drainage and any other similar special undertaking, provided that more than 4 workers are ordinarily employed in the undertaking on account of an employer.

4. An employer shall not employ any worker for more than 8 hours in the day or 48 hours in the week, exclusive of breaks; provided that if the foregoing weekly limitation of working hours is not thereby exceeded, the working hours may be extended on one or more days of the week to not more than 9.

Where work is organised in a regular succession of shifts, working hours may be arranged in a manner different from that mentioned above, provided that the aggregate working hours over a period not exceeding three weeks shall not in any such case amount to more than the number of hours corresponding to 48 hours per week.

5.— (2) If it is absolutely necessary that any work organised in three shifts should be continued during Sundays and holidays, the Labour Council may authorise the requisite exception wherever necessary.

7.— (2) If an employer requires, in view of special circumstances, to employ any worker beyond the working hours prescribed by Section 4 or fixed by virtue of Section 5, in any case other than those mentioned in Section 6, he shall be entitled to do so as regards any worker who has attained the age of 18 years, for not more than 30 hours in one calendar month or 200 hours in one calendar year.

(3) If a further exemption is urgently required, the same may be granted by the Labour Council, but not for more than 20 hours in one calendar month or 120 hours in one calendar year.

This Act shall come into operation on July 1921, and shall remain in force till 31 December 1923-inclusive.
Act relating to Working Hours in Factories. Dated 27 June 1919.

§ 40. The working hours in undertakings employing a single shift shall not exceed 48 per week for each individual worker.

When working hours on Saturday are less than 8, and the weekly working hours would in consequence be less than those provided for in the previous paragraph, the remainder of the 48 hours may be distributed over the other working days.

§ 51. Night work and Sunday work shall only be allowed by way of exception and by permission of the competent authority.

Workers may not be employed thereon without their consent.

§ 53. In those industries in which for reasons of a technical or economic nature night or Sunday work is a permanent or periodical necessity, it may be authorised by the Federal Council. The applicant shall prove that night or Sunday work is indispensable to his business, and shall present a time-table or table of shifts showing the working hours for each worker.

The Federal Council may establish the principle that, for certain industries, night or Sunday work is recognised as an absolute necessity.

The duration of work of an individual worker shall not exceed 8 hours, and the duration of a shift shall not exceed 9 hours in 24.

§ 54. In factories in which night work is authorised a holiday of at least 24 hours shall be granted to the workers every Sunday.

In factories in which Sunday work or night work and Sunday work is authorised, each worker shall be off duty every other Sunday, and in the week preceding or following the Sunday on duty shall be entitled to a day's holiday by way of compensation. Holidays must be of at least 24 hours' duration.

In undertakings working continuously the 52 holidays may be distributed otherwise than as provided for in paragraph 2, and a certain number of these holidays may be reduced to 20 hours; provided always that the 52 holidays shall include at least 26 Sundays.

An undertaking shall be considered to be organised in three shifts even when the Sunday work is divided between two shifts; provided that the working hours of a shift do not exceed an average of 56 a week.

§ 55. In factories in which work is carried on at night, the shifts shall alternate at least every 14 days, in such manner that each worker shall be equally employed on day and night work.

The Federal Council may grant exceptions to this rule in favour of particular factories.

§ 56. The holidays prescribed in case of night work or Sunday work shall be uninterrupted.


PERMANENT NIGHT WORK AND SUNDAY WORK

163. Applications for permits for permanent or regularly recurring night work and Sunday work shall be duly substantiated, and shall be accompanied by time-tables or tables of shifts showing for each worker, including workers on relief shifts, the times for beginning and ending work, and rest days, as well as breaks.
Applications shall state whether the workers concerned have been consulted as to the proposed organisation of work, and what their opinion was.

In Appendices VI to XX will be found specimen time-tables and tables of shifts for the different arrangements of work. A reference to the specimen corresponding to the arrangement desired may be given in the application instead of detailed plans.

172. Night work or Sunday work shall be recognised as an absolute necessity in the following industries to the extent herein-after specified and subject to the provisions of § 173.

(46) Manufacture of iron and steel: night work and Sunday work connected with blast furnaces and gas generators; night work connected with tempering, steel smelting, and Siemens-Martin furnaces; Sunday work connected with feeding the furnaces.

(47) Hot iron rolling: night work connected with furnaces, rolling, shearing, bundling; Sunday work connected with the furnaces.

173. Any occupier who wishes to benefit by the provisions of the preceding article shall send an application to the Industrial Division accompanied by the time-table and the table of shifts prescribed in § 163.

### APPENDICES VI TO XX: MODEL TIME TABLES AND TABLES OF SHIFTS (*)

**A. Continuous Industries interrupted at Week-ends**

*(Summary of Appendices VI to IX)*

In all four cases 3 shifts of 8 hours are worked; the order in which squads work is changed weekly and over a period of 3 weeks; conditions of work are equalised for all squads.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Relief of squads</th>
<th>Interruption</th>
<th>Weekly hours of work</th>
<th>Average weekly hours of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>6 a.m., 2 p.m., 10 p.m.</td>
<td>5 p.m. Sat. to 6 a.m. Mon.</td>
<td>48, 43, 40</td>
<td>43 2/3</td>
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<tr>
<td>A 2</td>
<td>4 a.m., midday, 8 p.m.</td>
<td>5 p.m. Sat. to 4 a.m. Mon.</td>
<td>48, 45, 40</td>
<td>44 1/3</td>
</tr>
<tr>
<td>A 3</td>
<td>6 a.m., 2 p.m., 10 p.m.</td>
<td>6 a.m. Sun. to 6 a.m. Mon.</td>
<td>54, 48, 42</td>
<td>48</td>
</tr>
<tr>
<td>A 4</td>
<td>Midnight, 8 a.m., 4 p.m.</td>
<td>Midnight Sat. to midnight Sun</td>
<td>48, 48, 48</td>
<td>48</td>
</tr>
</tbody>
</table>

(*) The method of presentation of the tables is different from that adopted in the Administrative Order. In particular, the different shifts, shown in the Order by lines of different colours, are here denoted by letters a, b, c. The hours in the day have been numbered 1 to 24, counting from midnight to midnight.
### B. Continuous Industries not interrupted at Week-ends

*(Summary of Appendices X to XX)*

In all cases 8-hour shifts only are worked from Monday to Friday. The order in which squads work is changed weekly and over a period of 3 weeks. Conditions of work are equalised for all squads in every case except that of B 7, where the order is changed fortnightly, and the conditions of work are equalised over a period of 6 weeks.

In the following tables aaa..., bbb..., ccc... represent ordinary squads; and xxx..., yyy..., represent auxiliary squads.

<table>
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<tr>
<th>Plan</th>
<th>Number of auxiliary squads</th>
<th>Length of week-end shift</th>
<th>Relief of shifts (Monday to Friday)</th>
<th>Weekly hours of work of ordinary shifts</th>
<th>Average weekly hours of work</th>
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<td>6 a.m., 2 p.m., 10 p.m.</td>
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<td>12</td>
<td>4 a.m., midday, 8 p.m.</td>
<td>56, 60, 52</td>
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<td>12</td>
<td>12</td>
<td>Midnight, 8 a.m., 4 p.m.</td>
<td>56, 52, 60</td>
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<td>B 4</td>
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<td>12</td>
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<td>6 a.m., 2 p.m., 10 p.m.</td>
<td>54, 54, 60</td>
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<td>B 5</td>
<td>1</td>
<td>8</td>
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### Plan A 1. Saturday and Sunday nights excluded (Appendix VI)

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| Saturday | a | a | a | a | a |   | b | b | b | b | b | b | b | c | c | c | c | c |   | a | a |   |   |   |
| Sunday  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Monday  |   |   |   |   |   |   | a | a | a | a | a | a | a | b | b | b | b | b | b | c | c | c | c | c | c |
| Tuesday |   |   |   |   |   |   | c | c | c | c | c | c | a | a | a | a | a | a | c | c | c | c | c | c |

### Plan A 2. Saturday and Sunday nights excluded (Appendix VII)

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Plan A 3. Saturday night included, Sunday night excluded  
(Appendix VIII)

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<tr>
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<th>1 2 3 4 5 6</th>
<th>7 8 9 10 11 12 13 14</th>
<th>15 16 17 18 19 20 21 22</th>
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Plan A 4. Half Saturday and Sunday nights excluded  
(Appendix IX)

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Plan B 1 (Appendix X)

Four 12-hour shifts are worked from 6 a.m. Saturday to 6 a.m. Monday. One squad has a Sunday of 24 hours from 6 p.m. Saturday to 6 p.m. Sunday and another squad has a Sunday of 32 hours from 6 a.m. Sunday to 2 p.m. Monday. The squad which works 12 hours on Sunday has 32 hours' compensatory rest beforehand, from 10 p.m. Friday to 6 a.m. Sunday.

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Plan B 2 (Appendix XI)

Four 12-hour shifts are worked from 4 a.m. Saturday to 4 a.m. Monday. One squad has a Sunday of 24 hours from 4 p.m. Saturday to 4 p.m. Sunday, and another squad has a Sunday of 32 hours from 4 a.m. Sunday to midday Monday. The squad which works 12 hours on Sunday has 32 hours' compensatory rest beforehand, from 8 p.m. Friday to 4 a.m. Sunday.

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<td>Monday to Friday</td>
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<td>a a a a a a a a</td>
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Plan B 3 (Appendix XII)

One squad has a Sunday of 24 hours from 8 p.m. Saturday to 8 p.m. Sunday, and another squad has a Sunday of 32 hours from 8 a.m. Sunday to 4 p.m. Monday. The squad which works 12 hours on Sunday has 32 hours' compensatory rest beforehand, from midnight Friday to 8 a.m. Sunday.

| Monday | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Friday | a a a a a a a | b b b b b b b | c c c c c c c |
| Saturday| a a a a a a a | b b b b b b b | b b b a a a a |
| Sunday | a a a a a a a | b b b b b b b | c c c b b b b |
| Monday to | b b b b b b b | c c c c c c c | a a a a a a a |
| Friday | b b b b b b b | c c c c c c c | c c c b b b b |
| Saturday | b b b b b b b | c c c c c c c | e c c b b b b |
| Sunday | b b b b b b b | a a a a a a a | a a a c c c c |
| Monday to | c c c c c c c | a a a a a a a | b b b b b b b |
| Friday | c c c c c c c | a a a a a a a | a a a c c c c |
| Saturday | c c c c c c c | b b b b b b b | b b b a a a a |
| Sunday | a a a a a a a | b b b b b b b | c c c c c c c |

Plan B 4 (Appendix XIII)

Two 12-hour shifts from 6 a.m. Sunday to 6 a.m. Monday. One squad has a Sunday of 24 hours from 6 a.m. Sunday to 6 a.m. Monday, and another squad has a Sunday of 20 hours from 10 p.m. Saturday to 6 p.m. Sunday. The squad which works 12 hours on Sunday has 20 hours' compensatory rest afterwards, from 6 p.m. Sunday to 2 p.m. Monday.

| Monday | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Saturday | a a a a a a a | b b b b b b b | c c c c c c c | a a |
| Sunday | a a a a a a a | b b b b b b b | b b b c c c c | c c |
| Monday to | c c c c c c c | a a a a a a a | b b b b b b b | e c |
| Saturday | c c c c c c c | a a a a a a a | a a a b b b b | b b |
| Sunday | b b b b b b b | c c c c c c c | a a a a a a a | b b |
| Monday to | b b b b b b b | c c c c c c c | c c c a a a a | a a |
| Saturday | b b b b b b b | c c c c c c c | c c c a a a a | a a |
| Sunday | a a a a a a a | b b b b b b b | c c c c c c c | a a |
Plan B 5 (Appendix XIV)

Two 12-hour shifts from 6 a.m. Sunday to 6 a.m. Monday. Ordinary squads have, over a period of 3 weeks, 2 Sundays, one of 20 hours from 10 p.m. Saturday to 6 p.m. Sunday, and the other of 32 hours from 6 a.m. Sunday to 2 p.m. Monday. The squad which works 12 hours on Sunday has 28 hours' compensatory rest afterwards, from 6 p.m. Sunday to 10 p.m. Monday. The auxiliary squad works on Mondays from 6 a.m. to 2 p.m. and on the remaining week-days is employed on other work.

|         | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Monday  | a | a | a | a | a |   | x | x | x | x | x | x | x | x | b | b | b | b | b | b | b | b | c |   |
| Tuesday | c | c | c | c | c |   | a | a | a | a | a | a | a | a | a | b | b | b | b | b | b | b | c | c |
| Sunday  | c | c | c | c | c |   | a | a | a | a | a | a | a | a | a | b | b | b | b | b | b | b | c | c |
| Monday  | b | b | b | b | b | b | x | x | x | x | x | x | x | x | x | c | c | c | c | c | c | c | c | a |
| Tuesday | a | a | a | a | a | a | b | b | b | b | b | b | b | b | b | c | c | c | c | c | c | c | c | a |
| Sunday  | a | a | a | a | a | a | b | b | b | b | b | b | b | b | b | c | c | c | c | c | c | c | c | a |
| Monday  | c | c | c | c | c | c | a | a | a | a | a | a | a | a | a | b | b | b | b | b | b | b | c | c |
| Tuesday | b | b | b | b | b | b | c | c | c | c | c | c | c | c | c | a | a | a | a | a | a | a | a | b |
| Sunday  | b | b | b | b | b | b | c | c | c | c | c | c | c | c | c | a | a | a | a | a | a | a | a | b |
| Monday  | a | a | a | a | a | a | x | x | x | x | x | x | x | x | x | b | b | b | b | b | b | b | c | c |

Plan B 6 (Appendix XV)

Two 12-hour shifts from 6 a.m. Sunday to 6 a.m. Monday. Ordinary squads have, over a period of 3 weeks, 2 Sundays, one of 20 hours from 8 p.m. Saturday to 4 p.m. Sunday, and the other of 32 hours from 4 a.m. Sunday to midday Monday. The squad which works 12 hours on Sunday has 28 hours' compensatory rest afterwards, from 4 p.m. Sunday to 8 p.m. Monday. The auxiliary squad works on Mondays from 4 a.m. to midday.

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</tbody>
</table>
Two 12-hour shifts from 6 a.m. Sunday to 6 a.m. Monday. Ordinary squads have, over a period of 6 weeks, 5 Sundays as follows: one of 28 hours from 2 p.m. Saturday to 6 p.m. Sunday; two of 32 hours from 10 p.m. Saturday to 6 a.m. Monday, and from 6 a.m. Sunday to 2 p.m. Monday; and two of 40 hours from 10 p.m. Saturday to 2 p.m. Monday, and from 6 a.m. Sunday to 10 p.m. Monday. The squad which works 12 hours on Sunday has 28 hours' compensatory rest afterwards, from 6 p.m. Sunday to 10 p.m. Monday. The auxiliary squad works a 12-hour shift every other Sunday, and an 8-hour shift on the following Monday; it should have its compensatory rest beforehand on Saturday.

<table>
<thead>
<tr>
<th></th>
<th>1 2 3 4 5 6</th>
<th>7 8 9 to 14</th>
<th>15 16 17 18 19 20 21 22</th>
<th>23 24</th>
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<tr>
<td>Monday</td>
<td>x x x x x x</td>
<td>a a a a a a</td>
<td>b b b b b b b b c c</td>
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<td>Tuesday to Saturday</td>
<td>c c c c c c</td>
<td>a a a a a a a a</td>
<td>b b b b b b b c c</td>
<td></td>
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<tr>
<td>Sunday</td>
<td>c c c c c c</td>
<td>x x x x x x x x x x x a a a a a a a</td>
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<td>Monday</td>
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<td>Sunday</td>
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<td>a a a a x x x x x x</td>
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<td>Tuesday to Saturday</td>
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<td>Sunday</td>
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<td>Tuesday to Saturday</td>
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<td>Sunday</td>
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<td>Tuesday to Saturday</td>
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<tr>
<td>Tuesday to Saturday</td>
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<tr>
<td>Sunday</td>
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<td>Monday</td>
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<td>a a a a a a a a</td>
<td>b b b b b b b b c c</td>
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</tbody>
</table>
Ordinary squads have, over a period of 3 weeks, 2 Sundays of 24 hours, one from 6 a.m. Sunday to 6 a.m. Monday, and another from 10 p.m. Saturday to 10 p.m. Sunday. The squad which works 8 hours on Sunday has 24 hours' compensatory rest beforehand, from 2 p.m. Saturday to 2 p.m. Sunday. The auxiliary squads have a compensatory rest-day before or after their Sunday shift, i.e. either on Saturday or Monday.

<table>
<thead>
<tr>
<th>Monday to Saturday</th>
<th>1 2 3 4 5 6</th>
<th>7 8 9 10 11 12 13 14</th>
<th>15 16 17 18 19 20 21 22</th>
<th>23 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary Squads</td>
<td>a a a a a a</td>
<td>b b b b b b b b</td>
<td>c c c c c c c c a a</td>
<td></td>
</tr>
<tr>
<td>Auxiliary Squads</td>
<td>a a a a a a</td>
<td>x x x x x x x x</td>
<td>b b b b b b b b c c</td>
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</tbody>
</table>

Ordinary squads have, over a period of 3 weeks, 2 Mondays of 24 hours from 8 a.m. Sunday to 8 a.m. Monday, and from midnight Saturday to midnight Sunday. The squad which works Sunday from 4 p.m. to midnight has 24 hours' compensatory rest beforehand, from 4 p.m. Saturday to 4 p.m. Sunday. The auxiliary squads have a compensatory rest-day before or after their Sunday shift, i.e. either Saturday or Monday. This system is particularly suited to those operations which can be interrupted from 8 a.m. to 4 p.m. Sunday, as the auxiliary squads can then be dispensed with.

<table>
<thead>
<tr>
<th>Monday to Saturday</th>
<th>1 2 3 4 5 6 7 8</th>
<th>9 10 11 12 13 14 15 16</th>
<th>17 18 19 20 21 22 23 24</th>
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<tbody>
<tr>
<td>Ordinary Squads</td>
<td>a a a a a a a a</td>
<td>b b b b b b b b b b b b</td>
<td>c c c c c c c c c c c c</td>
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<tr>
<td>Auxiliary Squads</td>
<td>a a a a a a a a</td>
<td>x x x x x x x x x x x</td>
<td>b b b b b b b b b b b b</td>
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</tbody>
</table>
Plan B 10 (Appendix XIX)

Ordinary squads have, over a period of 3 weeks, 2 Sundays of 32 hours from 6 a.m. Sunday to 2 p.m. Monday, and from 10 p.m. Saturday to 6 a.m. Monday. The squad which works 8 hours on Sunday has 32 hours' compensatory rest afterwards, from 2 p.m. Sunday to 10 p.m. Monday. The auxiliary squads have a compensatory rest-day on Monday after their Sunday shift.

Plan B 11 (Appendix XX)

Ordinary squads have, over a period of 3 weeks, 2 Sundays of 32 hours from 4 a.m. Sunday to midday Monday, and from 8 p.m. Saturday to 4 a.m. Monday. The squad which works 8 hours on Sunday has 32 hours' compensatory rest afterwards, from midday Sunday to 8 p.m. Monday. The auxiliary squads have a compensatory rest-day on Monday after their Sunday shift.
APPENDIX II

COLLECTIVE AGREEMENTS (GREAT BRITAIN AND NEW ZEALAND)

Extracts are appended from three British collective agreements concluded in 1919 between employers and workers in the iron and steel industry and from an award of the New Zealand Court of Arbitration in 1920, settling a dispute between the Green Island Iron-rolling Mill employees' Industrial Union of Workers and the Otago Iron-rolling Mills Company (Limited).

The peculiarity of the agreements in the British iron and steel industry is that they are all based on the principle, admitted by both parties, that the cost of providing the third shift necessitated by the introduction of the 8-hour day should be borne partly by the workers. The agreements define the percentage of his wage to be contributed by each wage-earner. Those whose base rates (1914) were less than 50 shillings or whose gross earnings (1919) were less than £4 19s. 6d. paid nothing; above 50 shillings and £4 19s. 6d. respectively, however, the percentage rose to a maximum of 33 1/3 at 120 shillings and £11 11s. 6d., the increase in the percentage being in both cases directly proportional to the increase in the wage. At 33 1/3 per cent, the whole cost of the third shift is borne by the worker. Extracts are given of the scales adopted for the Newcastle and the Midlands Agreements: the scale of the latter was also adopted for the South Wales Agreement.

The New Zealand Agreement indicates that two shifts of 10 hours is the rule there, and the introduction of the three-shift system is prevented by the insufficiency of skilled labour.

[Great Britain]

APPLICATION OF PRINCIPLES
governing the introduction of eight-hour shifts in the Iron and Steel Trades as agreed to by Joint Committee representing the Steel Ingot Makers' Association, the North of England Iron and Steel Manufacturers' Association, the Iron and Steel Trades Confederation, and the Amalgamated
Society of Steel and Iron Workers, at a Conference held at Bolbee Hall, Newcastle-on-Tyne, on 19 February 1919.

I. General Principles

The following to be the general principles to be applied in arranging 8-hour schemes in the different works, due regard to be paid to local conditions. Committees shall be set up as follows:

(a) A central committee consisting of representatives of the above-named organisations.

(b) District committees consisting of a representation comprising employers and employed of each of the works in the various districts.

(c) A joint committee at each works.

IV. Methods of Adjusting Rates of Higher Paid Workmen

The average base earnings for the normal working week shall be ascertained over an average of the two periods of six months each ending 30 June 1913, and 30 June 1918, and, starting with an average base earning of £2 10s. 0d. per week, a graduated percentage reduction of the rate will be arranged until such rate reaches £6 per week base, at which point the reduction will have reached the maximum agreed of thirty-three and one-third per cent. In the case of melting furnaces, those of the same nominal capacity in the same works shall be averaged. The gradations referred to are shown in the accompanying table.

The definition of a normal week shall be the period between the recognised hour of starting on Sunday night or Monday morning and the recognised hour of finishing on Saturday before overtime rates come into operation, i.e. no overtime to be included in a normal week’s work.

V

In all cases where the average base earnings are 50 shillings or under per week, the employer shall pay the full cost of the third shift.

VI. Arrangement as to Period for Application

In respect of any works or department of a works where it has not been possible to put the 8-hour shift into operation by 30 March 1919, the workmen shall, during the period the 12-hour shift continues in force, thereafter be paid at the rate of time and one quarter and/or tonnage and one quarter until 29 June 1919, and subsequent to that date time and one half and/or tonnage and one half, as the case may be, in respect of the 4 hours worked in excess of the 8 hours.

IX. Arrangements of Shifts

The arrangement of the working shifts shall be as follows: 6 a.m. till 2 p.m.; 2 p.m. till 10 p.m.; 10 p.m. till 6 a.m.; provided that where at any works other arrangements are found to be necessary these may be mutually agreed to between the employer and the workmen. In cases where 6 shifts for 5 are paid under the 12-hour shift, this is to be discontinued under the 8-hours arrangement.
X. Meal Times

For mills a break of half-hour to be allowed for meals to be taken at a convenient time and to include oiling.

For melting shops, meals (not exceeding one half-hour) to be taken as convenient without interruption of operations.

XI

At change of shifts there shall be no stoppage of work, and men to continue at work until relieved by their mates or a spare hand.

XII

It shall be open to the employers and the workmen at any works to make adjustments with the object of reducing the number of men per shift employed at particular occupations where this is practicable.

<table>
<thead>
<tr>
<th>Shillings</th>
<th>Per cent. decrease of base rate</th>
<th>Shillings</th>
<th>Per cent. decrease of base rate</th>
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</thead>
<tbody>
<tr>
<td>over</td>
<td>up to and including</td>
<td>over</td>
<td>up to and including</td>
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<td>56</td>
<td>57</td>
<td>120</td>
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</tbody>
</table>

Method of Applying the above Table

When the weekly base earnings of a job have been ascertained for the agreed period, the base rate of that job is to be reduced by the percentage shown in Column 2 hereof and the reduced figure will become the new base rate.

MIDLAND IRON AND STEEL WAGES BOARD

Eight-Hour Shifts

28th February 1919.

Where necessity has arisen to adjust rates owing to a smaller output in 8 hours than obtained when the long shift was being worked, the following scale, subject to approval and confirmation by the Wages Board, shows the amount by which the ascertained average earnings shall be reduced, and the new rate on an 8-hour output on the capacity of the mill should be fixed to produce such decreased earnings.
All new rates fixed should be base rates plus percentage increase on sliding scale since 4 August 1914, which today is 107 1/2 per cent.

<table>
<thead>
<tr>
<th>Ascertained average earnings up to and including</th>
<th>Reduction</th>
<th>Ascertained average earnings up to and including</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per week</td>
<td>Per shift</td>
<td>Per cent.</td>
<td>Per week</td>
</tr>
<tr>
<td>£ s. d.</td>
<td>£ s. d.</td>
<td>Nil</td>
<td>£ s. d.</td>
</tr>
<tr>
<td>4 17 6</td>
<td>0 18 3</td>
<td>0.5</td>
<td>8 5 6</td>
</tr>
<tr>
<td>4 19 6</td>
<td>0 18 8</td>
<td>1.0</td>
<td>8 7 6</td>
</tr>
<tr>
<td>5 1 6</td>
<td>0 19 0</td>
<td>1.5</td>
<td>8 9 6</td>
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<tr>
<td>5 5 6</td>
<td>0 19 10</td>
<td>2.0</td>
<td>11 7 6</td>
</tr>
<tr>
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<td>11 9 6</td>
</tr>
<tr>
<td>5 9 6</td>
<td>1 0 6</td>
<td>3.0</td>
<td>11 11 6</td>
</tr>
</tbody>
</table>

THE SOUTH WALES AND MONMOUTHSHIRE IRON AND STEEL MAKERS’ ASSOCIATION
AND THE IRON AND STEEL TRADES CONFEDERATION

Award

(3) The terms of reference in the case were:
To decide the two points of a graduated scale and the gradations between the two points as the basis of applying an 8-hour shift to workpeople governed by the South Wales and Monmouthshire Iron and Steel Workers Sliding Scale Agreement.

(4) The questions at issue between the parties arose out of the reduction in working hours to 8 hours, involving in the work of continuous production the employment of three shifts in the 24 hours instead of two, and were as to the points at which, according to the wages of the workers, part contribution towards the expenses of providing the third shift should begin, and full contribution commence, as well as the gradations between these points. The parties were not at issue as to the general principle of contribution by the workers towards the expense of such third shift, and it was common ground between them that the lower paid workers should not be asked to contribute; but they were at issue (inter alia) as to the point at which the workers should cease to be regarded as lower paid workers and their contributions commence.

(10) The Finding, Determination, and Award of the Court on the reference before it, after careful consideration of such evidence as has been adduced, of the contentsions of the parties, and of the circumstances of the case is as follows:

(1) That the wages point at which the workers parties to the present proceedings, that is to say the members of the Workers’ Confederation, shall be asked to contribute to the cost of the third shift shall be based on gross earnings, that is to say, on their gross wages or earnings at the rates at which they stood on 17 February 1919, and commencing over and above £ 4 17s. 6d. per week, as per
the scale attached to (2) hereof, and so that when such gross earnings amount to £ 11 11s. 6d. per week, the whole cost of the third shift will fall upon the workers whose gross earnings shall equal or exceed such amount of £ 11 11s. 6d.

(3) That this shall operate as from 17 February 1919.

Dated 20 August 1919.

(Signed) W. H. STOKER,
Chairman

[New Zealand]

In the Court of Arbitration of New Zealand, Otago and Southland Industrial District. In the matter of the Industrial Conciliation and Arbitration Act 1908, and its amendments; and in the matter of an industrial dispute between the Green Island Iron-rolling Mill Employees' Industrial Union of Workers (hereinafter called “the Union”) and the Otago Iron-rolling Mills Company (Limited) (hereinafter called “the employer”):

The Court of Arbitration of New Zealand (hereinafter called “the Court”), having taken into consideration the matter of the above-mentioned dispute, and having heard the Union by its representatives duly appointed, and having also heard the employer by its representatives duly appointed, and having heard the witnesses called and examined and cross-examined by and on behalf of the said parties respectively, doth hereby order and award:

(SCHEDULE)

<table>
<thead>
<tr>
<th>Class I, Day-Shift Workers (Finished Iron)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hours of Work</strong></td>
</tr>
<tr>
<td>(1) Shift from 6 a.m. to 4 p.m. daily, except on Saturdays, when the shift shall be from 6 a.m. to (approximately) 11 a.m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class II, Night-Shift Workers (Forge Iron)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hours of Work</strong></td>
</tr>
<tr>
<td>(3) Shift from 4 p.m. to (approximately) 2 a.m. daily, except on Saturdays, when work shall cease (approximately) at 2 a.m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class III, General Hands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hours of Work</strong></td>
</tr>
<tr>
<td>(5) A week’s work shall consist of 48 hours.</td>
</tr>
</tbody>
</table>

**Overtime**

(7) All time worked in excess of the above hours of work shall be considered overtime, and shall be paid for at the rate (exclusive of the above-mentioned bonuses) of time and a half for the first 3 hours and thereafter double time.

(*) The scale is the same as that fixed by the Midland Iron and Steel-Wages Board (above).
Term of Award

This award shall come into force on the thirty-first day of May 1920, and shall continue in force until the thirty-first day of May 1921.

In witness whereof the seal of the Court of Arbitration hath hereto been put and affixed, and the Judge of the said Court hath hereunto set his hand, this eighteenth day of May 1920.

T. W. Stringer, Judge.

Memorandum

The above award embodies the unanimous decision of the Court on all questions raised in the dispute except two — namely, first, the request of the Union for 8-hour shifts, ........ as to both of which questions there were differences of opinion. The determination of these questions as embodied in the award is that of the majority of the Court, consisting of Mr. Scott and myself, the dissent of Mr. McCullough being noted in a separate memorandum of his own setting out his views on these matters.

We — that is, Mr. Scott and myself — are satisfied from the evidence given at the hearing that in the present circumstances it is impracticable to obtain the additional number of the higher classes of workers in the industry which would be necessary in order to enable three shifts of 8 hours each to be worked. If it were practicable it would obviously be to the interests of the employers to do so, as they would thereby be enabled to substantially increase the output of their works without any increase in the permanent overhead charges, and thus to increase their profit by reducing the percentage of cost of production. As a general rule we recognise that the ordinary working-hours should not exceed 8 per day, especially where the work is of a continuous character. In the present case, however, the work of the men on shifts is of a special character; it is strenuous while it is being done, but it is intermittent; there are many opportunities for rest — in which reading, smoking, and conversation can take place — opportunities of which the workers availed themselves fully, as we observed when making an inspection of the works while they were in full operation. We are satisfied that if the Court were to impose 8-hour shifts the effect would be that the number of shifts would remain as at present, but would each be reduced by 2 hours. This would result in a lessened production of the mill, with a consequent loss to the employer and lessened earnings to the workers, who are paid on a tonnage basis. It would therefore, in our opinion, be detrimental to the interests of both employer and workers to reduce the length of the shifts as requested by the Union, and we therefore decline to do so.

T. W. Stringer, Judge.

Memorandum by Workers' Representative

I desire to dissent from the decision of the Court in refusing the Union's request for an 8-hour shift, as in my opinion the time is long overdue for so necessary and desirable a concession.

J. A. McCullough
APPENDIX III

EXTRACTS FROM PUBLICATIONS

The extracts are all from Reports Nos. 5 and 6 of the British Industrial Fatigue Research Board, published in 1920. The primary object of the enquiry to which these Reports relate was to compare the effects of the two systems of shifts. Both employers' and workers' organisations in Great Britain refer to these Reports as authorities.

EFFECTS OF REDUCING SHIFTS FROM TWELVE TO EIGHT HOURS

1. Blast Furnaces

It is scarcely possible to obtain reliable evidence as to the effect of reducing the hours of work on the output of blast furnaces, because the conditions of production are very seldom constant for any length of time. It is customary to charge the furnaces with various proportions of several kinds of ore, each of which may vary to some extent in its iron content. Hence any increase or decrease of iron production may be entirely the result of a change in the composition of the ores used. Again, it may be due to changes in the composition of the fuel. At one works, I was told that during the war the coal used had so greatly deteriorated in quality that 15 per cent. more was needed to produce a ton of iron than shortly before the war. Also 70 per cent. more limestone had to be added to flux the extra ash in the coal. In consequence of the increased bulk of material required and of its inferior quality, the output of pig iron from the furnaces had fallen 19 per cent.

At one works, where the conditions of production were very steady, and where the hours of work were reduced several years before the war, the output for two years before and two years after the change showed no appreciable alternation.

At one works, where the blast-furnace men were on 12-hour shifts, it was found that during a ten-week interval the coke fillers lost 12.8 per cent. of their time, whilst the ore fillers, who, it will be remembered, have a much heavier job, lost no less than 21.2 per cent. of their time, nearly half of it by sickness. The other men connected with the furnaces, such as the keepers, slagers, boilermen, and enginemen, lost 14.3 per cent. of their time. Men engaged at the same works on Bessemer steel production, rolling mills, and on the boilers and engines relating thereto lost, on an average, only 5.3 to 7.0 per cent. of their time, though they were likewise on 12-hour shifts. Still, they had the great advantage of


The tables reproduced are numbered as in the Reports.
not working a Sunday shift. At another iron works the blast-furnace men, who were on 8-hour shifts, lost on an average 9.2 per cent. of their time, whilst the steel furnace men and rolling mill men who were on 12-hour shifts, lost 12.8 per cent. of their time, i.e. the longer hours seemed to induce worse time-keeping, although there was no Sunday shift, as a rule, except for the blast furnace men. Hence, in the light of these incomplete data, it seems probable that a reduction of the 12-hour shifts to 8-hour shifts will lead to an improvement of time-keeping and thereby increase the efficiency with which the blast furnaces are run...(*)

Mechanically-charged Blast Furnaces. At one iron works I found that, apart from the engine room staff, only nine men per shift were required to charge three furnaces, which together produced over 4,000 tons of iron per week...(*)

Hand-charged Blast Furnaces. The number of men employed on one of the 950-ton furnaces was generally 12, consisting of 4 ore fillers, 4 coke fillers, 1 man working the hoist, 2 men discharging the barrows into the furnace, and 1 helper. The men were on 8-hour shifts, or 36 men were needed altogether. Hence they produced 26 tons of iron per man per week. In two other furnaces, which together produced 1,500 tons of iron a week, 18 men were employed on each of two 12-hour shifts, so each man produced 42 tons of iron. Now that 8-hour shifts have been adopted, however, only 14 men per shift are employed, so that the average production of iron per man is 36 tons. At a group of seven small furnaces each producing 300 tons of iron a week the average production of iron per man when they were on 12-hour shifts was only 20 tons. When they went on the 8-hour shifts the number of men per shift employed was reduced, but not proportionately, so the output per man fell to 18 tons. As compared with these outputs from hand-charged furnaces, the mechanically charged furnaces above mentioned produced 230 tons per man per week when the men were on 12-hour shifts. As far as I know, the number of men employed per shift was not diminished when 8-hour shifts came into force, so that output fell to 150 tons per man, but even this figure shows that the efficiency of mechanical charging is from four to eight times greater than that of hand-charging...(*3)

The reduction of hours will not, in many cases, mean a corresponding increase in the total number of men employed. An instance has already been quoted in which the 18 fillers required to charge a furnace were replaced by 21 men and not by 27 men when the shorter hours were adopted. In another instance the 90 men of various categories required to run six small furnaces were replaced by 102 men and not by 135 men. In still another instance it was found possible to save a few men, chiefly by reducing the number of spare hands and helpers, but not to the extent indicated by these figures. On the other hand, in one or two cases I was told that no saving of men whatever could be effected, so that the total number required would have to be increased by 50 per cent.(*4)

(*) Report No. 5, p. 20.
(2) Ibid., p. 9.
(3) Ibid., p. 11.
(4) Ibid., p. 21.
II. Open Hearth Furnaces

Reduction of shifts from 12 hours to 8 hours has been introduced in a number of works within recent years, and at two of them I obtained output data which afforded a fair index of the effect of the change. At one (works J) I obtained the output of ten 40-ton acid-steel furnaces for every week between 1 August 1910 and 1 August 1914. During the whole of this time there was no change in the quality of steel produced and in the conditions of production, though such a change did ensue with the advent of the war.

At the beginning of June 1912, or in the middle of the statistical period, the men changed over from 12-hour to 8-hour shifts, so I obtained the output for two years of 12-hour shifts, and two years of 8-hour shifts. Only those weeks were reckoned in which the furnaces were in full working order, and the weekly output of each furnace was averaged over six-monthly periods. The average of all these six-monthly values during the first two years was taken as 100, and from Table IX it will be seen that the production of all the furnaces was very similar, and was fairly steady, the extremes ranging only from 91 to 108. With the advent of the 8-hour shifts, the output showed an appreciable rise during the first six months, but it did not attain its full value until the next six months, when it showed a 10 per cent. increase. This average was almost maintained during the next year, so one may say that the reduction of hours caused an increase in output of about 9 per cent. (')

The increase affected all the furnaces, though not to the same extent, for the data on the right of Table IX show improvements varying from 1 per cent. to 13 per cent.

<table>
<thead>
<tr>
<th>Furnace</th>
<th>12-hour shift period</th>
<th>8-hour shift period</th>
<th>Increase per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>106 97 103 92 100</td>
<td>97 107 106 103</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>99 96 99 91 96</td>
<td>96 109 104 103</td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>104 99 99 92 99</td>
<td>99 108 105 108</td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>108 97 97 97 102</td>
<td>101 104 103 103</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>105 97 97 97 99</td>
<td>105 110 110 101</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>92 104 109 99 101</td>
<td>101 104 105 100</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>101 99 99 91 98</td>
<td>99 112 110 110</td>
<td>7</td>
</tr>
<tr>
<td>H</td>
<td>107 102 104 106 105</td>
<td>113 118 119 115</td>
<td>11</td>
</tr>
<tr>
<td>I</td>
<td>106 99 98 99 100</td>
<td>114 112 115 112</td>
<td>13</td>
</tr>
<tr>
<td>J</td>
<td>104 96 100 100 100</td>
<td>106 113 118 115</td>
<td>13</td>
</tr>
<tr>
<td>Mean</td>
<td>103 99 101 97 100</td>
<td>103 110 110 107</td>
<td>7</td>
</tr>
</tbody>
</table>

(') It is shown in the extract quoted below from Report No. 6 of the Industrial Fatigue Research Board that the real increase amounts to 14-18 per cent.
The total hours worked each week by the men were exactly the same under the two systems of shift, so the improvement of output must have been effected by some slight quickening in fettling and charging the furnaces, or by the gas-producer men providing a better supply of gas. The men, who were on piece-rates, did not receive any extra rate of pay when the shorter hours were adopted. Hence there was a strong inducement for them to increase their rate of production to the maximum possible.

At works C the output of six 30-ton acid furnaces was obtained for two years, during the first of which the men were on 12-hour shifts, and during the second on 8-hour shifts. The data are not so reliable as those just recorded, as I was able to obtain only the total steel production per month (reckoned for 4 or 5 weeks as the case might be), with no information as to how many of the furnaces were in working order. Consequently the output values which are recorded in Table X are rather irregular. They show that on an average the output increased only 2 per cent. when the shifts were shortened.

| TABLE X. INDEX NUMBERS OF OUTPUT AT WORKS C SHOWING EFFECT OF SEASON |
|--------------------------|--------------------------|--------------------------|
| Month       | 12-hour shifts (1904-1905) | 8-hour shifts (1905-1906) | Mean |
| Summer      |                          |                          |      |
| June        | 100                      | 94                       | 97   |
| July        | 94                       | 94                       | 94   |
| Aug.        | 94                       | 90                       | 92   |
| Sept.       | 103                      | 101                      | 102  |
| Intermediate |                          |                          |      |
| Oct.        | 94(97.0)                 | 106(106.7)               | 100(102.0) |
| Nov.        | 103                     | 99                       | 101  |
| Dec.        | 85                      | 81                       | 83   |
| Winter      |                          |                          |      |
| Jan.        | 98                      | 101                      | 100  |
| Feb.        | 117(107.0)              | 120(108.3)               | 118(107.7) |
| Mar.        | 106                     | 104                      | 105  |
| Intermediate |                          |                          |      |
| Apr.        | 100(97.0)               | 110(106.7)               | 105(102.0) |
| May         | 91                       | 112                      | 102  |
| Mean        | 98.8                    | 101.0                    | 99.9 |

In the production of steel by the open hearth process the shifts used to be of 12 hours' duration, but within recent years they have been gradually replaced by 8-hour shifts, and these shortened shifts are now universally adopted. At one steel works I was able to obtain the weekly output of ten 40-ton acid-steel furnaces for two years (1910-1912) when 12-hour shifts were worked, and for the subsequent two years when 8-hour shifts were worked. The results were averaged over

(1) Works J, referred to in previous extract.
monthly periods for the whole ten furnaces, and these relative monthly values, in the form of hourly output, are reproduced in Fig. 1. It will be seen that, while they are rather irregular, there was a gradual fall of output during the 12-hour shift period. The dotted line drawn in the figure is meant to represent a rough average, and in the present instance it shows a gradual fall of output from 104 to 96. In June 1912 the men went on to 8-hour shifts, and for the first two months there was no definite improvement of output. Then it began to mount up rather irregularly, but it did not attain its maximum until July 1913, or thirteen months after the reduction of hours. During the next twelve months it fell away again considerably, and then, with the advent of the war, the conditions of production were changed, and comparable output data were no longer obtainable. The fall of output noted during the 12-hour shift period and the latter half of the 8-hour period is possibly due to the same cause, though I am ignorant as to its nature. It is not likely to be due to a conscious restriction of output, for the steel melters were paid at a piece-rate which was not increased when the shifts were shortened, i.e. the men earned only two-thirds their previous wages so long as they did not improve output. The fall may have had some other psychological cause, such as labour unrest, or a physical one, such as a gradual deterioration of the plant, but whatever its origin, it could not mask the substantial increase of output produced by the shortened hours. If the dotted line in Fig. 1 be taken as a fair criterion, this change of shift caused the output to increase from 96 to 113, or by 18 per cent., but if the output be averaged from June 1913 onwards, it comes only to 109, or it shows an increase of 14 per cent. on the 1912 output.\(^{(1)}\)

\(^{(1)}\) Report No. 6, pp. 4-5.
III. Rolling mills

Before the general reduction of working hours occurred it was much more usual for the rolling mill men to be on 12-hour shifts than for the steel furnace men, as their work was, in most cases, distinctly lighter, and they did not put in quite so many shifts. They stop at 1 or 2 p.m. on Saturday, like the steel men, but they do not start again till 6 a.m. on Monday, i.e. they put in either 5 or 5 1/2 twelve-hour shifts per week: or 5 1/2 and 6 eight-hour shifts. Now that they have all gone on to 8-hour shifts, it is important to know whether the reduction of hours will lead to any compensating improvement of output. It is difficult to get the desired information, as alterations and improvements of rolling mill plant are frequently made, which invalidate deductions concerning the effects of reduced hours. However, at one works I obtained the output for a year of 12-hour shifts, and during the whole of this period there was no alteration of plant whatever. The same products (tin plate bars) were rolled throughout out of 14 cwt. ingots. The total output per three months' period was given me, but I was able to make appropriate corrections for the holidays, and calculate the output per working week. These data have been reduced to relative values in Table XX, and we see that in the first year of 8-hour shifts the output was 0.5 per cent. less than in the year of 12-hour shifts, whilst in the second year it was 2.0 per cent. more. However, the weekly hours of actual work were 2.1 per cent. longer under the 8-hour shift system, so the hourly output was slightly diminished. In any case the change was so small as to be negligible.

<table>
<thead>
<tr>
<th>Statistical period</th>
<th>12-hour shifts</th>
<th>8-hour shifts</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1906-1907</td>
<td>1907-1908</td>
<td>1908-1909</td>
</tr>
<tr>
<td>1 Oct. to 31 Dec.</td>
<td>100</td>
<td>104</td>
<td>103</td>
</tr>
<tr>
<td>1 Jan. to 31 Mar.</td>
<td>100</td>
<td>100</td>
<td>102</td>
</tr>
<tr>
<td>1 April to 30 June</td>
<td>100</td>
<td>97</td>
<td>104</td>
</tr>
<tr>
<td>1 July to 30 Sept.</td>
<td>98</td>
<td>95</td>
<td>97</td>
</tr>
<tr>
<td>Mean</td>
<td>99.5</td>
<td>99.0</td>
<td>101.5</td>
</tr>
</tbody>
</table>

A result such as this is not conclusive, unless one can be sure that there was always an adequate supply of ingots available. A foreman told me that this was the case, whilst the works managers merely told me that in their experience the reductions of hours — which they themselves were quite in favour of — had not had any effect upon output, and they proved their point by producing the data recorded. Hence the evidence appears satisfactory, but it seems to me that in any case the men cannot, on their own initiative, do much to improve output. The adequate
supply of hot ingots is not under their control, but that of the manage­ment. Once an ingot is transmitted to the rolls they have to pass it through them as quickly as possible, whether they feel fatigued or not, for any delay would spoil the process. The efficient running of the mills needs an adequate steam pressure and this depends largely on good stoking of the boiler furnaces. Hence, in this indirect manner, the men can to some extent control output. Again, carelessness and slackness may lead to increased breakdowns of machinery, but investigation did not indicate that this factor exerted any appreciable influence.

At another works the total output was obtained every day for two years, during the first 8 1/2 months of which the men worked 6 twelve-hour shifts by day and 5 1/2 twelve-hour shifts by night; and during the next 15 1/2 months, 5 2/3 twelve-hour shifts by day and 5 by night. They had 80 minutes’ meal breaks in each shift, so they were nominally working for 64 and 58 2/3 hours per week during the first period, and for 60 2/3 and 53 1/3 hours during the second period. As can be seen from Table XXI, the delays in the running of the mill amounted to 11.5-17.7 hours per week in the first period, or the actual hours of work averaged only 41 to 52 per week.

The relative output for each hour the mill was running was consistently lower by day than by night, and averaged 95 as compared with 105. Probably this was due partly to the longer day-shift hours, and partly to more of the boiler power being required to drive accessory plant, other than the mill, by day than by night.

When the hours of work were reduced by allowing the men to stop at 2 p.m. on Saturday instead of 6 p.m., and by cutting out their Sunday night half-shift (12 to 6 a.m.), the hourly output immediately rose considerably, and for the 15 months’ period averaged 15 per cent. more by day, and 19 per cent. more by night, than the mean output of the first 8 months. Moreover, the delays in the running of the mill were so much reduced that the average number of hours for which the mill ran was practically as great as before. In other words, the total output of the mill was increased by 12 to 21 per cent., as can be seen from the following figures:

<table>
<thead>
<tr>
<th>Total day-shift output</th>
<th>Total night-shift output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. to Aug. 1917</td>
<td>50.0 × 95 = 4750</td>
</tr>
<tr>
<td>Oct. 1917 to Dec. 1918</td>
<td>50.0 × 115 = 5750</td>
</tr>
</tbody>
</table>

= 21 % increase.  
= 12 % increase.

This striking result cannot, however, be attributed wholly to the effects of shorter hours. It was due in large part, perhaps in chief part, to the advent of a new manager, who started work in June 1917. He investigated the causes of delay in the running of the mill very carefully, and constructed charts showing the daily stoppages, and by these and other means he was able to track down some of the causes of delay and reduce them. In the first few months there was very little improvement, but it will be seen that from March 1918 onwards the weekly delays were reduced by several hours. This result was not achieved by any alteration or improvement of plant, but solely by greater attention to details of its running. The improvement of hourly output occurred to a slight extent directly the new manager came on and before the
<table>
<thead>
<tr>
<th>Month</th>
<th>Weekly hours of work</th>
<th>Hours for which mill ran</th>
<th>Hours of delay</th>
<th>Relative output per hour worked (*)</th>
<th>Weekly hours of work</th>
<th>Hours for which mill ran</th>
<th>Hours of delay</th>
<th>Relative output per hour worked (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 1917</td>
<td>64</td>
<td>51.6</td>
<td>12.4</td>
<td>82</td>
<td>58 1/2</td>
<td>47.1</td>
<td>11.6</td>
<td>95</td>
</tr>
<tr>
<td>Feb. »</td>
<td>»</td>
<td>50.4</td>
<td>13.6</td>
<td>95</td>
<td>»</td>
<td>47.2</td>
<td>11.5</td>
<td>101</td>
</tr>
<tr>
<td>March »</td>
<td>»</td>
<td>48.7</td>
<td>15.3</td>
<td>95</td>
<td>»</td>
<td>43.7</td>
<td>15.0</td>
<td>104</td>
</tr>
<tr>
<td>April »</td>
<td>»</td>
<td>52.1</td>
<td>11.9</td>
<td>96</td>
<td>»</td>
<td>42.0</td>
<td>16.7</td>
<td>114</td>
</tr>
<tr>
<td>May »</td>
<td>»</td>
<td>50.4</td>
<td>13.9</td>
<td>96</td>
<td>»</td>
<td>45.7</td>
<td>14.8</td>
<td>105</td>
</tr>
<tr>
<td>June »</td>
<td>»</td>
<td>54.5</td>
<td>12.5</td>
<td>103</td>
<td>»</td>
<td>46.5</td>
<td>12.2</td>
<td>107</td>
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<tr>
<td>July »</td>
<td>»</td>
<td>48.9</td>
<td>15.4</td>
<td>102</td>
<td>»</td>
<td>45.2</td>
<td>13.5</td>
<td>104</td>
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<tr>
<td>Aug. »</td>
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<td>46.5</td>
<td>17.5</td>
<td>94</td>
<td>»</td>
<td>41.0</td>
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<td>55 1/2</td>
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<td>»</td>
<td>60 7/8</td>
<td>48.0</td>
<td>12.7</td>
<td>»</td>
<td>53 1/2</td>
<td>41.5</td>
<td>11.8</td>
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<td>44.5</td>
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<td>39.6</td>
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<td>50.5</td>
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<td>»</td>
<td>42.9</td>
<td>10.4</td>
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<td>Jan. 1918</td>
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<td>17.2</td>
<td>124</td>
<td>»</td>
<td>41.2</td>
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<td>7.7</td>
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<td>»</td>
<td>47.7</td>
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<td>118</td>
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<td>»</td>
<td>53.0</td>
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<td>108</td>
<td>»</td>
<td>46.9</td>
<td>6.4</td>
<td>113</td>
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(1) Editorial Note. Average hourly output Feb. to May 1917 = 100.
hours were reduced, for it averaged 104 during June to August 1917, as compared with 100 in the four preceding months. After the reduction of hours it immediately rose to 114, and subsequently to a higher value still, but it was rather erratic, so it is unsafe to draw further conclusions...

The system of constructing charts of delays and output regularly every week is a most valuable one, as it enables the manager to judge at a glance how the mill is running in comparison with preceding weeks, and see if it is working above or below its average. The mere fact that such records are being kept must act as a stimulus to the foremen and tend to increase their alertness. Yet as far as I am aware, charts are very seldom made systematically. I saw them only in two of the works I visited.

At one works, where the men were on 12-hour shifts, a manager informed me that the output would probably remain as great or nearly as great if the men worked two 8-hour shifts per 24 hours, and allowed the mills to remain idle for 4-hour periods in between the shifts. The reason of this was that the available supply of steel ingots was insufficient to keep the mills fully occupied, and they ran, on an average, for only about 7 ½ hours per 12-hour shift (1).

APPENDIX IV

QUESTIONNAIRE OF THE INTERNATIONAL LABOUR OFFICE

Note: This enquiry is limited to blast furnaces (including coke works), open hearth furnaces, Bessemer converters, and rolling mills (including plate mills, tube works, wire works, etc.). It does not include foundry work, forging, fabricating or any of the more refined manufacturing processes.

1. To what extent has the three-shift system displaced the two-shift system in the iron and steel industry?

2. Where such a change has taken place—
   (a) When was the three-shift system introduced?
   (b) On whose initiative was the change made?
   (c) Was the change finally brought about
      1. By law?
      2. By trade union agreements?
      3. By the action of employers' associations or individual employers?
      4. By other means?

   (In replying to (c) please give details, supplying copies of laws or agreements.)

3. Is any portion of the steel industry now contemplating
   (a) Changing from two to three shifts?
   (b) Changing from three to two shifts?

   (Please state if any body of employers or employees is known to desire to change from three to two shifts.)

4. Were a change has been made from the two to the three-shift system, how much greater has been the number of men required to run three shifts, as compared with two shifts? Please give separate percentages for
   (a) blast furnaces;
   (b) open hearth furnaces;
   (c) Bessemer converters;
   (d) rolling mills.

Include in the calculation only the men actually working on shifts.
5. How does the output per man per day under three shifts compare with the output per man per day on two shifts in the case of:
   (a) blast furnaces?
   (b) open hearth furnaces?
   (c) Bessemer converters?
   (d) rolling mills?

6. Has the change from two to three shifts been attended by:
   (a) any changes in the quality or uniformity of product?
   (b) any saving (or waste) of materials?
   (c) any lessening (or increase) in the cost of repairs, or life of equipment?
   (d) any reduction (or increase) in accident frequency rates?

   In answering (a), (b), (c), and (d), please distinguish so far as possible between blast furnaces, open hearth furnaces, Bessemer converters, rolling mills.

7. (a) What has been the effect of the three-shift system on the interest and energy which employees put into their work?
   (b) What has been its effect on absence and tardiness?
   (c) What seems to be the effect on the employee of his greater leisure?
   (d) Has there been any noticeable effect on health?

8. Under the three-shift system about what proportion of the workers in the different branches or departments of the steel industry are on the shift basis, and what proportion on day work?

9. What are the hours of employees on day work?

10. To what extent do the individual shift workers work seven days per week around
    (a) blast furnaces?
    (b) open hearth furnaces?
    (c) Bessemer converters?
    (d) rolling mills?

11. If the workers are granted one day’s rest each week, please give the schedule or arrangement of shifts in detail, in the manner indicated in the example given.

   (See attached statement for examples of arranging shifts to give the workers one day’s rest per week.)

12. What improvements in the technique for making the change from the two-shift to the three-shift system are suggested by recent experience?

13. What has been the net effect of the change from two to three shifts on labour cost? On total cost? Please distinguish between pig iron, ingots, and rolled shapes.
MODEL SHIFT SCHEDULES

It is very difficult to devise a satisfactory schedule of shifts in continuous industries, so as to provide an 8-hour day and a full day of rest each week.

Examples of the almost infinite number of schemes that may be worked out theoretically are submitted herewith in order to indicate what is desired by the International Labour Office as to the degree of detail in the information furnished and the manner of showing it. (See Questionnaire on three-shift system, question eleven.)

In Schedule I the number of extra workers allowed is the minimum required to relieve the regular workers. An adaptation of this schedule might be used in a small establishment. The different positions are indicated by the letters a, b, c, d, e, f; the different regular workers by the numerals 1, 2, 3, etc., and the relief workers by A, B, C. The workers work 8 hours and rest 16 hours ordinarily. When shifts are changed, the men on the first and second shifts have 48 hours off, while the men going from the third shift to the first shift have only 24 hours off. At the end of the three weeks the shifts have been completely rotated.

Schedule II provides for changing the day of rest without changing the squads of workers on the shifts. In order to rotate the day of rest and also to provide "one full day's rest in seven", it is necessary to give one full day's rest after five shifts for a period of 6 weeks, followed by one full day's rest after seven shifts for a period of 8 weeks. This gives an average of 48 hours of work per week for the fourteen weeks. Schedule II is adapted to large plants employing many shifts of workers. The shifts are represented by 1, 2, 3; the regular squads of workers by the letters a, b, c, and the extra or relief squads of workers by A, B, C. In a large plant the relief workers would find full time employment. The rest periods are 16 hours ordinarily and 40 hours (16 hours + 24 hours) when the day off occurs.

Schedule III gives one method by which the shifts as well as the day of rest may be rotated. The shifts, regular squads, and extra or relief squads are indicated as in Schedule II. The average of 48 hours per week is attained at the end of 14 weeks as in Schedule II, but the complete rotation of shifts is secured only at the end of 28 weeks. The rest periods are 16 hours ordinarily, and 48 hours for the first and second shift squads and 24 hours for the third shift squads when the shifts are changed.

It is very desirable to ascertain the different schemes of applying the three-shift system in continuous industries. Please give the schedule of shifts in operation in your plant, indicating the actual time when each shift goes on and comes off.
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### Total Possible Working Hours per Year

2504 hours

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I. No Rotation of Rest Day. Rotation of Shift. 48-Hour Week.
I. Rotation of Rest Day. No Rotation of Shift. Average of 48 Hours per Week.

Total possible working hours per year, 2504.

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III. Rotation of Rest Day. Rotation of Shift. Average of 48 Hours per Week.

Total possible working hours per year, 2504.

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