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WAGES AND LABOUR
CONDITIONS IN BRITISH
ENGINEERING

WAGES AND LABOUR CONDITIONS IN BRITISH ENGINEERING

BY

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FOREWORD

FROM time to time comprehensive studies have been made of various trades—their history, structure, working conditions and wages rates—but hitherto no such study has appeared of the British Engineering Industry. This is perhaps due largely to the complexity of the industry and to the immense range of its products and of the raw materials with which it works. One has only to think of the differences that characterise such branches of engineering as agricultural machinery, cycles, boilers, electric motors, aircraft, machine tools, motor cars—to mention only a few—to realise the diversity of the industry. Indeed, one might be tempted to say that there is no such entity at all as the “Engineering Industry.”

Yet all these branches have something in common: they are all based on craftsmen who have skills of a kind sufficiently similar to enable them to associate together to negotiate working conditions with employers. Despite the great variety of product, process and material, engineering skilled workers and engineering employers have respectively found sufficient common ground for association, and it is mainly this fact which justifies the claim of engineering to be considered an industry. Engineering is, however, undergoing rapid and far-reaching developments which may well destroy even that amount of cohesion which it now has. On the one hand, the products, processes and materials are becoming so specialised that the skilled craftsmen on which all engineering was based are no longer interchangeable, but are becoming almost as specialised as the products. On the other hand, the introduction of automatic machinery, operated by semi-skilled workers—men or women—whose interests are not specifically bound up with engineering, is tending to destroy that basis of craft skill which, as already mentioned, was the real common denominator of the “industry.”

Under these circumstances, and at a time when its structure is in a state of flux, it is of the greatest interest to have a study of the British Engineering Industry such as is here presented. The author is well qualified for the work he

has undertaken, since he possesses that rare but essential combination—both practical and academic experience. That Mr. Yates has spent several years in various branches of engineering is evident from the sense of reality which pervades his description of processes, payment by results schemes and shop conditions. It is evident throughout that he is writing of things with which he has come into personal contact. His academic training is no less obvious in the objectivity with which the subject is presented and the sense of perspective which is evident throughout.

The book should find a wide range of usefulness. To the student of engineering it will provide a survey which hitherto has not been available. To the economist it should provide a warning against too simple generalisations, and to those engaged in the management of engineering establishments it will furnish a most useful compendium of information. In this connection the account of the various agreements between the Engineering Employers' organisations and the Trade Unions will be much appreciated.

C. G. RENOOLD.

Manchester,
June 30, 1937.

PREFACE

THE aim of this book is to show the conditions of employment of the principal classes of engineering workpeople, the systems of remuneration and the wages obtained. It is confined to a factual treatment of these questions, with special emphasis on their development since 1914.

So expansive a term is Engineering that it is considered necessary at the commencement to define the limits of the industry, and to show the extent of the labour force in each of the main branches. This is followed by a brief account of the work done in the chief occupations, with some reference to the effect of changes in methods of production. Comparisons made later of the wages of the different classes of workers at various times are thereby made more informative.

The extent of organisation on the part of employers and workpeople, and trade union policy in connection with wages questions and general labour conditions, are briefly described, because of their important bearing on the main subject-matter.

The agreements which have been negotiated relating to wages and conditions of employment are presented in a form which, it is hoped, shows up clearly their tenor, and enables the decisions reached on each of the principal questions to be followed in correct sequence.

The chapter on wages systems is intended to show the chief features and—in a general way—the extent and application of each of the different systems employed. Although there is some assessment of the suitability of the systems for various conditions of manufacturing, the material is presented more as a supplement to the wages and earnings data than as a serious attempt to show the merits and demerits of the systems of remuneration for different classes of engineering work.

Wages rates and earnings have been given detailed treatment, and an attempt has been made to show the incidence of the several factors which mitigate against wages rates being used as criteria from which to judge the earnings of the workpeople.

The final chapter is devoted to the wages and employment of female labour in engineering. Female labour is considered separately because it differs in many respects from male labour. It is almost wholly semi-skilled or unskilled, and it is not evenly distributed over the main branches of the industry. The War period was one of special significance to women workers, and has been dealt with at somewhat greater length on this account.

It is hoped that this book will gain in value from the fact that, notwithstanding the acknowledged importance of Engineering, there is a scarcity of collected and published material relating to its wages and labour questions. As far as the author is aware, there is no other book which covers the same ground, and no comprehensive record available elsewhere of the position of women in engineering.

The author has attempted to acknowledge his indebtedness to other writers by references in the text, and by the inclusion of a bibliography.

He wishes, however, specially to thank Mr. J. W. F. Rowe, M.A., for permission to use certain material and statistics, and Mr. R. S. Spicer for a similar privilege.

For assistance in obtaining material and information the author desires to record his indebtedness to Mr. H. Pearce, Chairman, Manchester District Engineering Employers' Association, Mr. W. Sherwood, National Industrial Officer of the National Union of General and Municipal Workers, and Mr. J. Gorman, J.P., Manchester District Organiser for the Amalgamated Engineering Union.

He wishes also to thank Professor Dempster Smith, M.B.E., M.Sc.Tech., M.I.Mech.E., for useful advice, Dr. K. G. Fenelon, M.A., for helpful criticism and reading the proof-sheets, Mr. H. Champion, M.A.(Com.), for much useful criticism of the matter, and Mr. G. Mohn, M.Sc.Tech., for ready help and valuable suggestions for the improvement of certain chapters.

M. L. Y.

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May, 1937.

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CHAPTER I

MAIN SECTIONS OF THE ENGINEERING INDUSTRY; NUMBERS ENGAGED AND THE COURSE OF EMPLOYMENT DURING THE POST-WAR PERIOD

The Main Branches of the Industry

IN a general way Engineering can be considered as embracing all the industries making finished articles from the products of the iron and steel and other metal industries. These industries, though exhibiting considerable contrast in products, are linked by basic metal-working operations which are substantially the same.

The boundaries of the separate industries are seldom easy to fix, neither can the outlying edges of the industry as a whole be closely defined. There are many sections of comparatively light work on metals which are commonly classed in official statistics as part of the iron and steel industries—*e.g.*, wire manufactures, metal smallwares, needle, pin, nail and screw-making, hand tools and cutlery, etc.—and others included with the smaller non-ferrous metals group of industries. Also, the boundary between the iron and steel industries and engineering is difficult to define in connection with certain branches of heavier but relatively simple metal work.

In "The Survey of the Metal Industries"* it is stated that for practical purposes the engineering industry is concerned with the production of machinery, prime movers, mechanically propelled vehicles, implements and tools. This restricted definition is considered adequate for the present purposes, except in the chapter dealing specially with the employment and wages of females in engineering, where reference is also made to certain other lighter branches of engineering work.

Although some of the larger organisations in engineering are concerned with a range of products, the great majority of firms specialise in the production of machinery of one general class. It is, therefore, possible to divide the industry

* Part IV of a Survey of Industries.—H.M.S.O., 1928.

into a number of reasonably self-contained groups. The following are main divisions within which the manufacture of many of the important machines and appliances is carried out :—

- / Locomotive Building.
- Agricultural Engineering.
- Textile Machinery Making.
- Machine Tool Making.
- Printing and Bookbinding Machinery Making.
- Motor Car, Commercial Vehicle and Motor Cycle Manufacturing.
- Aircraft Manufacturing.
- Electrical Engineering.
- Marine Engineering.
- Boiler Making.

Included in the large amount of other engineering work is the manufacture of those prime movers not covered in the above list, a variety of special products, and much work of a general character. Some of the sections given above are very specialised, but of relatively small dimensions. Electrical Engineering and the manufacture of motor vehicles are both sections of considerable size and importance.

The expanding Electrical Engineering industry has a wide range of products, many of which do not come within the above circumscribed definition of engineering. This definition refers principally to the heavier sections of Electrical Engineering work—viz., the manufacture of electrical machinery of all kinds, including generating plant, motors, transformers and switchgear, etc.—where the character of the work and methods of manufacture are similar to what is found in the other main divisions of the engineering industry.

There is a variety of electrical domestic appliances, which increase in importance as electricity comes more into general use. Most of these are quite different in character from the machinery produced in the main branches of electrical engineering. One or two, such as refrigerators and washing machines, are comparable with certain products included in the main classes of electrical machinery.

These domestic appliances, together with wireless, telephones and telegraphic apparatus, lamps, accumulators and batteries, scientific instruments, medical appliances, etc., now give employment to a greater number of persons than is

found engaged in the heavier electrical manufactures. The making of cables, flex and wire is another section of electrical work of important dimensions, which is not included in the above interpretation of "Electrical Engineering."

Total Numbers Engaged in Engineering and Allied Industries

There are different sources of information regarding the numbers engaged in engineering and allied industries, but the only figures available for comparison over a long period include workpeople engaged in the iron and steel and ship-building industries with those employed in engineering in its widest interpretation. In view of the inter-connection between these industries, such figures may be taken as affording a broad indication of the rate of development of engineering work.

The figures in Table 1 are taken from Census Tables for Great Britain from 1881 onwards, to show in a very general manner the fluctuations in the aggregate number of males and females engaged in the manufacture of metals, machines, implements and conveyances (including ships) during the last fifty years.

TABLE 1

Numbers Engaged in Great Britain in the Manufacture of Metals, Machines, Implements and Conveyances (including ships). Population Census Tables

Year.	Numbers Engaged.	
	Males.	Females.
1881 . . .	889,000	38,000
1891 . . .	1,049,000	45,000
1901 . . .	1,384,000	63,000
1911 . . .	1,670,000	103,000
1921 . . .	2,251,000	240,000
1931 . . .	2,119,000	293,000

Owing to changes in the methods of classification comparison is vitiated, but the figures do show a real growth in numbers which was accelerated between 1911 and 1921. Since 1921 the rate of development has been checked. In the post-War period the number of females engaged has shown a substantial increase. In 1931 female numbers were 22% greater than those recorded in 1921. This increase has

made no serious difference to the total number of persons engaged, since the females in 1921 represented only 10% of the total number.

Relative Numerical Importance of the Principal Sections of Engineering in England and Wales in 1921 and 1931

A comparison between the Industry Tables of the 1921 and 1931 Censuses for England and Wales discloses the principal changes which have taken place in the post-War period. The 1931 figures relate to persons 14 years and over, those for 1921 to persons 12 years and over. Both sets are inclusive of persons out of work. In the sub-group of the Manufacture of Metals, Machines, Implements and Conveyances, designated Engineering, a substantial reduction (12%) has taken place in the total number of persons engaged. The male figures fell from 497,312 to 431,747. This decrease of 13.2% was the result of reductions of varying amounts in all the principal branches of the industry included within this sub-group.

These branches and the figures for males engaged in 1921 and 1931 are given in Table 2, so that the relative importance of each and the changes in numbers can be appreciated.

Whereas in Table 1, which is intended to show the general trend in development in British Engineering, the figures refer to Great Britain, in Table 2 the figures relate only to England and Wales. The importance of engineering in Scotland is, however, well recognised, and, as an indication of the size of the industry there, it may be stated that it accounts for some 10% to 12% of the total numbers employed in British Engineering. These workers are not distributed over the main sections of engineering in the same proportion as are the workers in England and Wales, but the general course of employment in the separate branches of the industry in England, Wales and Scotland is similar.

It will be noticed, from Table 2, that the decline in agricultural engineering is the most pronounced. "Other Engineering" covers a wide range of work, including some which is new and does not appear in the 1921 figures. This general heading includes the making of printing and book-binding machinery, figures for which were not separately stated in 1921. In 1931 there were about 10,000 males on this work. There were also, at this time, nearly 12,000 males engaged in the manufacture of cranes, hoists and

other lifting machinery, another section which was not separately stated at the 1921 Census.

TABLE 2

Males Engaged in England and Wales in the Engineering Sub-Group of the Manufacture of Metals, Machines, Implements and Conveyances. Population Census Tables

Engineering (not Marine or Electrical).	Males Engaged.	
	1921.	1931.
Stationary Engines and Power Transmission Plant	24,120	17,734
Steam Locomotives, Road and Rail and Railway Plant	81,332	65,533
Agricultural Engineering	35,126	16,219
Textile Machinery and Accessories	69,888	52,642
Machine Tools	18,465	15,842
Other Engineering	259,065	248,297

The total female numbers in those sections of engineering listed in Table 2 were 32,514 in 1921, and had risen to 35,906 in 1931. The number of females in 1931 was equivalent to 8·3% of the males engaged. There was a decline in the numbers of women engaged in each of the branches enumerated except in the batch of manufactures grouped together in "Other Engineering." Here there was an increase in the number of females of 26%, their numbers rising from 20,946 to 26,231.

Although it may be considered unfortunate that exigencies of space presumably prevent a more detailed record of the work performed by those engaged in "Other Engineering," which includes nearly 50% of the persons engaged in the whole section, it should be mentioned that these workers are spread over a wide range of engineering trades, many of which are comparatively small.

The figures relating to motor-car, commercial vehicle and motor-cycle manufactures are given in the sub-group of the Manufacture of Metals, Machines, Implements and Conveyances, dealing with the Construction and Repair of Vehicles. Unfortunately the figures are not presented there in the most suitable form for the present purpose of showing clearly the numbers engaged in each branch of the work. In 1921 there were approximately 183,000 males engaged in the construc-

tion of motor road vehicles and cycles. This number increased to 196,000 by 1931. During the same period the number of females grew from 16,000 to 21,000. Cycle and motor accessories showed an increase in male numbers from 12,647 to 15,627, and females increased from 8,829 to 12,255. Bodywork connected with lorries, coaches and motor-cars has been responsible for increases in the numbers of both males and females. The full extent of these increases is not easily determined from the official figures shown, as these include also bodywork in connection with other vehicles.

Nearly 6,000 males were engaged in private establishments in the manufacture of aircraft in 1921. By 1931 the number had increased to nearly 20,000. Over the same period female numbers advanced from 828 to 1,970. This class of work is rapidly increasing at the present time as a result of the Government's policy, and the natural growth of this new means of transport.

The manufacture of generators, motors, transformers, switchgear, etc., was responsible for the employment of 33,176 males in 1921 and 29,663 in 1931. Whilst this decline was in progress female numbers increased from 7,159 to 8,597. Of the other sections of electrical work, which are included in this sub-group, dealing with Electrical Installations, Cables and Apparatus, all show increases since 1921 in the total numbers engaged. There has also been a considerable amount of new light electrical work since 1921. The net result of the expansion which is taking place is that this sub-group shows an inter-censal increase of 62% for all persons engaged. Male numbers grew from 127,176 to 199,961. This represents an increase of 57%. Female numbers rose from 38,652 to 68,263—an advance of 72%. In 1931 the number of females recorded was equal to 34% of the total for males.

More than one-quarter of the total number of persons in this sub-group for Electrical Installations, Cables and Apparatus, are engaged on manufactures which come within the classification "Other Electrical Manufactures." This section includes, among many other things, the manufacture of electrical domestic apparatus of all kinds. Certain of the products—e.g., refrigerators, cookers and vacuum cleaners—are assuming an importance which must soon justify their separate or partially combined treatment in statistical records of this character.

Marine Engineering, which appears in the foregoing list of principal branches of the engineering industry, is included

with Shipbuilding and Repairing in the Industrial Tables of the Population Census in such a way that it is not possible to obtain any impression of its numerical importance. Of all the sub-groups of the manufacture of Metals, Machines, Implements and Conveyances, this one which includes Shipbuilding, Ship Repairing and Marine Engineering, etc., shows the least proportion of females.

This section has suffered severely for several years, and there has been migration from the industry. Each branch of work shows a decrease for both males and females from the 1921 standard. Males have declined in numbers from 278,348 to 197,643, and whereas in 1921 slightly more than 5,000 females were engaged, there are now just over 3,000.

Figures relating to boiler-making, one of the old-established branches of engineering work, appear in the final sub-group of metal manufactures. This sub-group consists of a large number of the smaller metal industries which show individual variations since 1921 with a general advance of 16% from the 1921 total of 269,607 persons. It is interesting to discover that in work of this diversity, although more females are engaged than formerly, the increase in their numbers is less in proportion to that of male persons. The employment of males and females on this work is roughly in the proportion of 3 to 1.

The making of boilers and tanks has resulted in an increase in male numbers from 19,308 to 21,367, and female figures have grown from 833 to 1,191. The whole extent of boiler-making work is not disclosed by these figures. Some of this work is included with the records for other classes of engineering in such a way as to make it impossible to obtain the desired figures.

In this large group of miscellaneous metal industries, two other sections of engineering work stand out prominently, on account of the relatively large numbers engaged. They are Constructional Engineering, and Sheet Metal Working, Press Work and Stampings. In each about 25,000 males were engaged in 1921, and the figures had grown to more than 31,000 in 1931. Constructional Engineering finds employment for about 1,000 females, but in Sheet Metal, Stamping and Press Work there were 9,000 females in 1921 and nearly 12,000 in 1931. The making of tin boxes, canisters and containers of all kinds, which is another form of sheet-metal working, has grown considerably since 1921. This work is largely in the hands of females, and their number grew from 8,479 to 13,475 between the two Censuses.

On account of developments in plant and machinery, the use of power, etc., the growth or decline in the numbers engaged in the several branches of engineering to which reference has been made, cannot with safety be used as a measure of the increasing or decreasing productive capacity of the industry.

Changes in the Labour Forces of the Main Branches of Engineering during the Post-War Years

The foregoing figures have shown the relative importance of the suggested main divisions of the engineering industry at two points in the post-War period, ten years apart, as far as can be ascertained from the Industry Tables of the 1921 and 1931 Censuses. From the Ministry of Labour statistics relating to the numbers insured under the Unemployment Insurance Acts, and the extent of unemployment, the picture of the labour force in the main branches of the industry during the post-War years can be made more complete.

The Ministry of Labour classification of Engineering consists of five main divisions :—

- General Engineering; Engineers' Iron and Steel Founding.
- Electrical Engineering.
- Marine Engineering.
- Constructional Engineering.
- Motor Vehicles, Cycles and Aircraft.

The first of these is a comprehensive collection of engineering work in which by far the greatest number of engineering workpeople is included. Electrical Engineering relates only to the heavier and certain general sections of electrical work. Electric wiring and contracting, cables, apparatus, lamps, etc., are excluded. Marine Engineering is in these statistics separately stated from shipbuilding work, and the numbers involved in this section can, therefore, be ascertained. Constructional Engineering, which is the smallest division, consists of work similar to that appearing under the same heading in the Industry Tables of the Censuses which have just been mentioned, and is the smallest division. This work, which falls outside the general definition of Engineering, does not include such a representative range of engineering workpeople as is found in the other main divisions. Motor vehicles, cycles and aircraft are next in numerical importance to General Engineering. Combined figures for

these manufactures are given. In the Industry Tables of the Census, aircraft was separately stated, as were also motor and cycle accessories. In both the census and Ministry of Labour statistics, cycles are included with the figures for motor vehicles. The Ministry of Labour figures for the construction and repair of motor vehicles, cycles and aircraft, include body-work connected with these manufactures.

TABLE 3

Estimated Number of Workpeople in Great Britain and Northern Ireland Insured Under Unemployment Insurance Acts in July of Each Year, 1923-1936 (Compiled by Ministry of Labour)

Year.	General Engineering, Iron and Steel Founding.	Electrical Engineering.	Marine Engineering, etc.	Constructional Engineering	Motor Vehicles, Cycles and Aircraft.
1923	666,950	60,960	65,540	23,230	191,830
1924	628,360	71,350	65,930	23,990	203,510
1925	623,270	75,990	61,220	25,880	214,220
1926	612,340	76,460	58,030	27,110	223,570
1927	600,390	79,300	57,130	27,460	232,860
1928 *	582,130	79,770	55,030	27,290	234,830
1929 *	586,750	84,430	58,450	28,240	245,410
1930 *	592,260	89,860	60,070	27,970	247,140
1931 *	576,380	92,470	55,240	29,580	251,320
1932 *	551,200	94,080	50,530	29,300	252,080
1933 *	528,190	90,590	46,220	29,200	261,720
1934 *	522,620	91,190	46,760	31,650	271,530
1935 *	527,420	93,410	45,650	33,410	285,830
1936 *	559,720	101,700	49,960	36,120	314,000

* Age 16-64 inclusive. For earlier years the figures relate to persons aged 16 and over.

The estimated number of workpeople in Great Britain and Northern Ireland in each of the principal divisions of Engineering, insured under the Unemployment Acts in July of each year from 1923 to 1936, is given in Table 3. • 1923 is the earliest date with which comparison may be made.

From this table can be seen the decline in the numbers of insured workpeople in General and Marine Engineering, and the expansion of the insured labour force attached to Electrical Engineering, Constructional Engineering, Motor Vehicles, Cycles and Aircraft. In these three sections in which growth has taken place the increases between 1923 and 1936

in the numbers of insured workpeople are 67%, 56% and 64% respectively. In General Engineering and Marine Engineering the insured workers in 1936 were 84% and 76%, respectively, of the totals shown for 1923.

Interesting as these figures are, they do not show the numbers actually employed in the different engineering divisions at the periods stated. To obtain this information the numbers of insured workers recorded as unemployed need to be subtracted from the figures in Table 3.

Table 4 shows the percentages of insured workpeople in the engineering divisions recorded as unemployed at the end of July of each year from 1923 to 1936, and in conjunction with Table 3 enables the changes in the size of the labour forces employed in the main sections of the engineering industry to be approximately ascertained.

TABLE 4

Percentage Numbers of Insured Workpeople in Great Britain and Northern Ireland Recorded as Unemployed at the End of July of Each Year, 1923-1936 (Compiled by Ministry of Labour)*

Year.	General Engineering; Engineers; Iron and Steel Founding.	Electrical Engineering.	Marine Engineering, etc.	Construc-tional Engineering.	Motor Vehicles, Cycles and Aircraft.
1923	20.5	7.3	22.6	10.1	9.7
1924	14.5	4.9	16.3	11.8	7.9
1925	12.5	5.6	22.0	11.8	6.0
1926	17.6	8.5	23.9	23.1	9.7
1927	9.2	4.8	13.2	7.6	7.9
1928	9.7	5.0	13.4	9.7	9.4
1929	8.9	3.8	8.9	10.0	7.2
1930	16.7	7.9	15.6	17.5	16.4
1931	29.1	14.3	47.5	24.0	22.9
1932	30.1	16.1	55.1	34.5	22.1
1933	24.6	14.4	47.2	34.3	16.9
1934	14.5	7.4	29.1	21.8	10.6
1935	12.5	6.1	26.4	17.2	9.3
1936	8.4	4.1	13.2	13.1	6.9

* Figures in this table include, in addition to workpeople wholly unemployed, those who were not at work on the dates to which the figures relate because they were suspended, stood off or on short-time, and those whose unemployment books were lodged at Employment Exchanges. From 1928 the figures relate to those aged 16-64 inclusive. For earlier years the figures are for all persons 16 years of age and over.

These changes are shown in Table 5 by index numbers based on July 1923 = 100. The percentages for July 1926 are unreliable for purposes of comparison, as the employment figures at this time were seriously affected by the general stoppage of work which took place in the preceding May.

TABLE 5

Changes in the Industrial Distribution of Insured Persons, Aged 16-64, in Employment in Great Britain and Northern Ireland, 1923-1936 (Index Numbers for July of Each Year; 1923=100)

Year.	General Engineering, Engineers' Iron and Steel Founding	Electrical Engineering.	Marine Engineering, etc.	Constructional Engineering.	Motor Vehicles, Cycles and Aircraft.
1923	100	100	100	100	100
1924	101	120	109	101	108
1925	103	127	94	109	116
(1926	95	124	81	100	116)
1927	103	133	98	121	124
1928	100	134	94	118	123
1929	101	144	105	122	131
1930	93	140	100	110	119
1931	77	140	57	108	112
1932	73	140	45	92	113
1933	75	137	48	92	125
1934	84	149	65	118	140
1935	87	155	66	132	150
1936	97	172	85	150	169

The table shows that the volume of employment for insured workpeople in General Engineering, the largest section of the industry, was undiminished between 1923 and 1929. After this point the number of persons employed dropped quickly until 1932, when the total was only 72% of that recorded in 1929. Since then an upward movement has taken place, accelerated from 1936 by a rearmament programme, and the volume of employment is again approaching the 1923 level.

In Constructional Engineering the number of persons employed increased substantially between 1923 and 1929. Then, in common with most other branches of Engineering, a serious decline took place, and by 1932 the number employed was only three-quarters of the peak figure reached in 1929. Since then employment has shown steady improve-

ment, and is now considerably higher than it has ever previously been.

Marine Engineering has exhibited more serious fluctuations in employment figures. A sharp fall in numbers occurred in 1925, and after a period at this reduced level employment showed a marked improvement in 1929. In 1931 numbers suffered a most serious decrease, and the decline continued in 1932, when, in July, only 43% of the 1929 labour force was employed. Recovery is now being made from that depressingly low level.

In Electrical Engineering a quick advance in the volume of employment was made from 1923. Numbers increased even into 1930, by which time the labour force was nearly 50% greater than it was only seven years earlier. Some falling off in numbers was then experienced, but by comparison with other main branches of engineering the total decline was small. Recovery quickly took place from 1933, and the level of employment is now much higher than ever before.

Employment among those concerned with the manufacture of motor vehicles, cycles and aircraft follows a course fairly similar in character to that in Electrical Engineering. The rate of development was not quite so rapid in the early part of the period, and the advance in numbers terminated in 1929. The contraction in employment which then took place was checked more quickly in this group of manufactures than in any of the other engineering divisions. During the last few years the numbers employed have quickly increased, and the total number in these manufactures at present is very much greater than has ever previously been recorded.

Tables 3, 4 and 5 relate to all persons, male or female, insured within the different sections of the industry. It may be mentioned that the percentage of insured females unemployed in engineering is consistently below the percentage for male workers in the same branch of the industry. The course of female unemployment in each section of the industry is in reasonable accordance with that for male workers. In Electrical Engineering and the Construction of Motor Vehicles, Cycles and Aircraft, the female unemployment percentages lie closest to those for male workers. There are wider differences between the male and female unemployment percentages in General Engineering and Constructional Engineering. In Marine Engineering, where the fewest females are found, the percentage of female unemployment,

as might perhaps be expected, shows the greatest difference from the percentage for the insured male workers.

Summary

It is considered that the British engineering industry is chiefly concerned with the production of machinery, prime movers, mechanically propelled vehicles, implements and tools. This definition of Engineering includes most of the heavier as well as the old-established sections, but disregards certain lighter branches of work, much of which is very different in character from that performed in the main divisions chosen. Of the lighter sections of the industry in its broadest aspect, many are comparatively new, and among these the manufacture of electrical apparatus in a variety of forms is conspicuous. Repetitive production is a usual feature of these light electrical and other engineering trades, and a higher proportion of females and youths is found.

In most of the main divisions chosen there is a fair degree of similarity in the character of the work and the general methods of manufacturing. There is greater opportunity for product standardisation and repetitive conditions of manufacturing in some sections than in others, but in all divisions there is a noticeable tendency to take advantage of batch or quantity production.

Increased attention to specialisation is resulting in further sectionalisation within the main selected sections of the industry. There is a marked growth of firms specialising in particular manufacturing processes, as distinct from firms making each part of the finished product which they sell. This development is accentuating the differences already existing between the work done in engineering factories in different sections of the industry.

In the Ministry of Labour classification, General Engineering is combined with Engineers' Iron and Steel Founding, and in this section the number of insured workpeople is greater than the combined total for the other main divisions of the industry. In 1936 the insured workpeople in Motor Vehicles, Cycles and Aircraft manufactures, which is the next largest section, numbered more than half as many as those in General Engineering, etc., whereas in 1923 they were less than one-third of this number. This changed proportion is the result of a 16% decline since 1923 in the number of insured workers attached to General Engineering, etc., and an expansion of 64% during the period in the

insured workpeople in the Motor Vehicle, Cycle and Aircraft section. Electrical Engineering has also expanded during the post-war period by 67%. Of the other special branches of the industry, Marine Engineering, Agricultural Engineering, Locomotive Building, Textile Machinery Making and Machine Tool Manufacturing have all contracted by varying amounts. The most pronounced shrinkages have taken place in the Marine and Agricultural Sections.

CHAPTER II

THE PRINCIPAL CLASSES OF ENGINEERING WORKERS AND THE EFFECT OF CHANGES IN METHODS OF PRODUCTION ON THE CHARACTER OF THEIR WORK

The Principal Occupations of Engineering Workpeople

THERE is a very large number of occupations followed in the main branches of the engineering industry, in spite of the fact that the character of much of the work done in the various branches is the same.

An elaborate table of the different classes of workpeople employed will be avoided, and a short list of occupations chosen within the compass of which at least 80 % of the adult male labour force in the main divisions of engineering is to be found.

The chief classes of manual workers are :—

Turners.

Machine-men.

Fitters and Erectors.

Pattern-makers.

Moulders.

Smiths.

Platers.

Riveters and Caulkers.

Tinsmiths and Sheet Metal Workers.

Labourers.

The old term "machine-men," which is seldom encountered to-day, is retained and considered serviceable to con-
note—as originally intended—the difficult classes of semi-skilled machine workers. Such workers are often collectively referred to at present as "machinists" although on occasions this term is used to cover both skilled and semi-skilled machine workers.

Most of the classes of labour mentioned in the list above have long been established in the industry. Comparison over an extended period is thus made possible.

The shortcomings of the above list as being wholly representative of the occupations carried out are readily admitted. Several new occupations have appeared in recent years, and references are made to some of the more important of these which have characteristics very different from those displayed by the main vocations.

The Work Done by Engineering Workers and the Effect of Changes in Methods

During the first half of the nineteenth century many important mechanical changes took place in the engineering industry. A period followed during which alterations in production methods were of comparatively minor character, and few machines incorporating radical improvements were introduced. Towards the end of the century there was a noticeable development in machine tools, which played a profound part in changing all sections of the industry, not merely the machining departments.

During the first decade of this century progress in the range and design of machine tools continued, if at a somewhat slower pace. Then came the War and the opportunity for large-scale repetitive production. Far-reaching changes in methods of production were made in this period, when experiment was encouraged and an unlimited market existed. The post-War years have been marked by an increase in mass-production methods generally, encouraged by, and in turn giving further impetus to, improvements in machine tools and workshop equipment. New techniques have vastly altered the way in which certain engineering products are made. In addition, greater attention has been paid to planning and production control, and to the question of sub-division of operations.

One result of the changes in methods of production has been to alter from time to time the degree of skill required of engineering workers in different sections of the industry. The subject of skill is closely bound up with that of remuneration, and is one of great complexity. A constantly revised interpretation is required of the terms "skilled," "semi-skilled" and "unskilled" as applied to engineering work-people.

It is now proposed to explain the work done by the different classes of manual workers to which reference has been made, and to show the effect of the changes in production methods which have taken place.

Turners

More than eighty years ago, metal-turning lathes were introduced into engineering factories, and work of a most varied character was produced by skilled workmen called "turners." Since that time big strides have been made in machine-tool development, and a large variety of lathes exists for different purposes. The term "turner" has persisted, and has been associated principally with the workers engaged on centre lathes, which represent the natural development of the earlier types of self-acting and screw-cutting lathes. In short, general purpose lathes are the machines mainly operated by those skilled workers designated "turners."

Until the last century was drawing to a close, specialised machines were few, and the lathe worker had perforce to exhibit all-round ability in metal machining operations. In addition to plain turning of all kinds, proficiency in boring, reamering, broaching, screw-cutting, tapping and drilling, etc.—all operations performed on the lathe—was expected of the turner. In many cases the turner marked out the work preparatory to placing it in the lathe; copied a sample which he "calipered" or measured in some other way if a drawing was not supplied, made certain of the tools which he used, carried out minor repairs to his lathe, and received little assistance from anyone regarding how best to proceed with the work. There was also some hand-turning practised, in which the craftsman worked with tools held in the hand instead of rigidly fixed in a rest attached to the machine.

Improvements in the lathe slide-rest quickly resulted in the discontinuance of hand tool-turning. Screw-cutting was made easier, and the train of wheels no longer required to be set by hand. The design of the lathe was modified to permit faster cutting speeds, made possible by the high-speed tool-steels introduced at the beginning of the present century. Continual improvement both in lathe design and workshop organisation was made, and a range of special machines gradually appeared. These machines form the subject of the following section relating to the work carried out in engineering by "machine-men." Much work which was previously done by turners in ordinary lathes is now done in an alternative and simpler way in another class of machine.

Since the War, increased attention has been paid to planning production. Through the existence of an improved internal organisation, the turner, like other factory workers,

is provided in a more satisfactory way with working instructions, tools, drawings, etc., which facilitate the work and also enable more of the worker's total time to be spent in actual production.

Machine-tool manufacturers now supply more data about the capabilities of their products, and have incorporated numerous devices which reduce the effort and range of skill required from the worker. The recent introduction of cemented tungsten carbide tools is being followed up by machines of suitable rigidity and construction to make full use of these new cutting alloys. In few factories is the grinding of these tools to suitable cutting angles and rakes part of the turner's work, and the grinding of ordinary high-speed steel tools has been taken from the turner's hands in several factories.

Special attention has been paid to the non-cutting time on all machine work. This is frequently a considerable proportion of the total production time. Improvements in this direction are of greater importance on repetitive work, which is carried out usually in automatic or semi-automatic machines, to which reference is made when describing the work performed by machine workers other than turners. Even for work of a general character, however, a considerable saving in production time is obtained by the employment of the latest equipment.

Of these time- and fatigue-saving devices there may be mentioned self-centring or three-jaw chucks, pneumatic, hydraulic and magnetic work holding "contrivances" which may also reduce the skill necessary for setting up certain classes of work; pre-selective mechanism for speeds and feeds, operated while a cut is in progress, and push-button control for starting, stopping and delicate movements.

This brief account of changes in lathe practice, workshop conditions and the character of the work performed by turners is sufficient to emphasise that considerable alterations have taken place in the turner's work. The range of skill required has been generally lessened, and the variety of lathe operations has been reduced.

It is difficult to assess the degree of skill required of the turner at the present time compared with that of his predecessor in pre-War days. Less all-round ability is demanded, as some of the most delicate lathe operations have been transferred to other machines, which from their design make the work easier of accomplishment. This does not necessarily imply that the demands made on the turner are materially

less. The complexity of modern machinery, increased production speeds and improved organisation, mean that the worker is kept closely to his tasks. These still require in many cases for their satisfactory completion close concentration on the part of an intelligent man who has spent years in acquiring the necessary skill.

In the tool-room—those departments making and repairing tools, generally of special character, such as jigs, gauges, dies, cutters, etc.—the turner's work to-day perhaps more closely approximates to that done before the War, although the tendency to specialisation is noticeable. The range of work may be varied and the quality very high, but the work can often be divided into certain distinct classes, and workers are kept as much as possible on one section. The range of machines is greater, and especially is grinding used more for finishing operations previously carried out in the lathe.

In ordinary machine shops the work of the turner varies to a great extent in different firms. Changes in practice are such that the word "turner" does not tell by any means as much as it did formerly what work the person so classified is carrying out. By comparison with other classes of machine labour dating back a considerable time—*e.g.*, machinists on planing, shaping or slotting machines—it appears that there are wider variations in work done by turners than there are within these other grades. Broadly speaking, the craftsmanship required of turners is less in proportion to that still needed in these other occupations.

As specialised machinery has developed, certain of the new machine work has been appropriated by turners and classed as skilled. This applies, for example, to work done on universal grinding machines, some boring machines and a section of milling machinery. Workers in these categories were from the beginning considered by organised labour to require apprenticeships or extensive periods of training, and were eligible for full membership of the different craft unions. Much other machine work has been regarded as comparable with that done on planers, slotters, shapers, and drillers, *i.e.*, semi-skilled work. This extension of the range of machine work carried out by men classed as turners should be remembered when examining the wages data of the different grades of engineering workers.

Machine-men

This term, as has been pointed out, is less commonly encountered to-day than in pre-War years, when the number

of specialised machines was fewer and fair similarity existed in the degree of skill required for the operation of each. With the rapid increase in the number of machine tools and the very different degrees of skill required by their operators, there has been a tendency to refer more specifically to the class of machine work actually carried out.

There is even more variation in the work done and skill required by different grades of machine workers classed together as "machine-men" than there is within the term "turner," to which reference has just been made. Semi-skilled machine workers range from the planer who sets up the material on the machine table, grinds and fixes the tools—frequently cutting with two tools at once—and machines the work to gauge, to the operator of a semi-automatic machine for whom most, if not all, of the setting-up is done by someone else. The work of this operator may consist simply in bringing up the tool head, in correct tool rotation, against the revolving stock; continuing its travel each time until checked by the stops provided; "parting off" the finished article and repeating the set of movements. Machine workers on presses and similar equipment are also included in the classification "machine-men," but they are of an even lower order in skill, and might be considered by comparison as unskilled workers. The term "machine-minder," often applied to such workers, is indicative of the small degree of individual skill required.

For many years the term "machine-men" applied to workers engaged principally on planing, shaping, slotting and drilling machines. Towards the end of the last century the industry developed rapidly and in directions which encouraged designers to produce more machines of a special character, as well as to improve the efficiency of those types already in use.

On planing and shaping machines the practice of making "cutting" and "return" strokes at the same speed was altered, and a much quicker return travel arranged, reducing the non-cutting time. In drilling, radical alterations were made, and for large work radial drills quickly superseded the old pillar type. Improvements on the machines have continued, each contributing to a reduced overall time for the completion of satisfactory work, and calling for no extra skill, but perhaps an increased amount of care, on the part of the machine operator.

The new machines introduced at the end of the last century included capstan and turret lathes, boring, grinding and milling machines, as well as pressing and stamping machinery.

These machines have been in the course of development ever since. A lively appreciation of the advantages accruing from specialising in a limited range of products, using batch or mass-production methods with the sub-division of processes, has stimulated the design of special machinery, particularly in the post-war years.

Turret and capstan lathes are perhaps responsible, more than any other machines, for the use of the term "revolution" in connection with machining methods in the twentieth century. These semi-automatic machines stand to-day as remarkable testimony to the achievements of the machine designer. They incorporate the improvements already referred to for reducing non-cutting time on lathe work, and a variety of devices for sizing work in progress, so that it is made to pattern and the machine automatically stopped when the prescribed dimensions have been reached. Their production capabilities are amazing and the attention required from the operator is definitely of a semi-skilled order. The machine is generally set up in readiness for production by a skilled tool-setter who is in charge of a number of machines, but during the actual production time it is close attention, and not any high degree of skill, which is demanded from the worker.

Boring machines exist in various forms, and the essential character of the machine has not altered to any great extent for many years. Milling machines, though improved in design from the early types, owe no small part of their increased use to the quality and range of the "cutters" now available. In the same way the quality of the dies used for pressing and stamping machines has much extended their range of work, without materially affecting the level of skill required from the operatives.

A number of other special machines with more limited application is available. Some are used for work previously done in a more general type of machine, but their rate of output is much greater, others replace hand labour, whilst yet a third class marks a new technique entirely.

The development of all these specialised machines has seen the turner dispossessed of much work previously done by him. In many cases the border line between skilled and semi-skilled machine work is drawn with difficulty, and improvements in machine tools are from time to time complicating the distinction. The changes which have taken place have resulted in a steadily increasing number of process workers, both male and female, and at the present day semi-

skilled machine workers far outnumber the skilled operatives who retain the title of "turners."

Fitters

A fitter is one who adjusts or puts together the parts of a machine. The term indicates a skilled workman principally occupied fitting machined parts together, and making the assemblies leading to a finished product. Hand machines of various kinds are now supplied to the fitter to facilitate production, but the principal changes which have taken place in the course of time are the result of improved accuracy of machining, the quality of finish of machined parts, and the tendency to specialisation of product. Accuracy of machine work means less real "fitting," and the policy of interchangeability of parts has been responsible for close attention to machining limits to make this possible without subsequent work on the part of fitters. Specialisation has limited the experience a fitter obtains inside a factory, and frequently, as the result of batch or repetitive methods of manufacture, the range of work undertaken by the individual is further restricted.

The fitter's counterpart on the machine side is the turner, and, as with this class of worker, the proportion of fitters who still have to possess a wide range of ability is less than formerly. A high degree of skill and a delicacy of touch requiring for its acquisition long years of experience are not so commonly required. Even in tool-rooms, where perhaps the fitter has to exhibit the highest degree of skill, specialisation is on the increase, and the range of work encountered by the individual is less.

Within this classification there are many workers nowadays who do little or no real "fitting" in the old-established sense of the word, and there are very wide differences in the work carried out by those graded as fitters. These differences are much more obvious now than in the pre-War days of the industry's development.

As a result of changes in methods of manufacture, there has become necessary a large number of workers who are chiefly assemblers of parts. Should the parts which they handle fail to go together at once as expected, the work of removing burrs, filing and scraping unsatisfactory surfaces, chipping away projections, etc., may be performed by them or delegated to other workers.

Both sections of assembly workers may be classed as

fitters, although one set is engaged simply with erection, without the rectification of inaccuracies which are discovered. Generally erectors have a limited amount of "fitting" to perform, and the term is applied to male workers engaged in building up the heavier and larger engineering products. To those males or females putting parts together on work of small dimensions, frequently carried out on a repetitive scale, the term "assembler" is increasingly applied. Such workers are semi-skilled, and as a class are quite distinct from "fitters."

Pattern-makers and Moulders

Pattern-makers and moulders are two important classes of skilled workers. The wooden patterns required for castings are made by pattern-makers, and the general run of iron, brass and aluminium castings is the work of the moulder.

In the pattern shops and foundries more machinery is in evidence than formerly, but its inclusion has not altered the methods of production to the extent noticeable in machine shops.

Mechanical aids have been supplied, increasing productivity, but these have been used by the pattern-makers and moulders, or their assistants, without the development of new classes of workers to any appreciable extent. This may be qualified by remarking that in foundries the opportunity for repetitive work on light castings has led to the rise of plate or machine moulders as a new class of foundry workers. These operatives are soon proficient and are a class of semi-skilled men which is on the increase. The other and well-established classes of moulders, together with core-makers and pattern-makers, can be considered as displaying at least equivalent skill to that shown by similar grades of workers in the past, and the character of their work is essentially the same. The greater use of aluminium and a wider range of alloys have extended the scope of the moulder's work. On the other hand, "fabrication" is tending to reduce the amount of moulding carried out. By this means pieces of machinery are built up from steel sections welded together and castings are not required.

Smiths

The work of the smith is to beat metals into shape, and, in doing this, it is usually necessary to heat the material before working on it with hammers and other tools. In the

smithy—a usual attachment to an engineering works,—a limited amount of forging is done, which results in the employment of skilled smiths and strikers. These strikers are a comparatively low grade of semi-skilled workers. In boiler-making, a special branch of engineering, more smiths and helpers are found, whilst in factorics specialising in forge-work there are several grades of skilled forge-workers employed.

The character of the work which the smith performs is substantially the same as that which he has carried out for many years, and the degree of skill demanded is much the same as it was in pre-War days. Power-hammers and other machine aids have been improved in precision and ease of handling, thus rendering greater assistance to the operative. To this extent the work can be said to require less exertion and physical strength on the part of the worker, but closer application is perhaps needed to the work in progress.

Platers and Riveters

Platers and riveters are found principally engaged on boiler-making and shipbuilding work. There are, however, some of these workers employed in most general engineering establishments. Boiler-makers' platers are a skilled grade of workmen who cut, shape and otherwise prepare metal plates and sections in readiness to make boilers, tanks and pressure vessels of all kinds. The actual joints are usually completed by riveters and caulkers, a class of semi-skilled workers. Considerable variation is found in the skill required on different classes of riveting, and some of those employed are regarded as skilled men. As in other engineering occupations, mechanical aids have been provided to platers and riveters. These have altered from time to time the range of skill required from these two related classes of workers, although there have been no revolutionary changes in the character of the work done. Changed industrial requirements have reduced the available quantity of work, and it would seem likely that alternative methods of construction, chiefly connected with the application of welding, will cause further shrinkage in this class of work, particularly with respect to the employment of riveters and holders-up.

Tinsmiths and Sheet-Metal Workers

The term "tinsmith" has a long association with the engineering industry, and it does not refer simply to smiths

working in tin. The usual interpretation is a skilled metal worker whose tasks consist of making all kinds of comparatively light metal containers, bending and shaping sheets and metal sections. Brass, copper, steel, etc., are the metals chiefly worked in, and joints are made by brazing, soldering, welding or riveting.

In addition to the recognised tinsmiths there is a large number of other metal workers, skilled and semi-skilled, employed in cutting and bending metal sheets, tubes, and other sections to make a variety of engineering products.

Metal work of this kind is growing in volume. Specialisation and the introduction of new machines have made it possible for work previously done by skilled men to be produced by semi-skilled workers. This class of metal worker has grown most in numbers.

As the result of changes in methods of production the degree of skill required from tinsmiths and skilled sheet-metal workers has been reduced and the range of their work lessened. As mentioned above, there has been a transference of certain sections of metal work from the skilled workers to semi-skilled labour.

In connection with changes which have taken place in metal work of this kind, the advance of welding deserves mention. Welding was in the past part of the tinsmith's work. Oxy-coal gas, oxy-hydrogen and oxy-acetylene processes were used. The welding was confined to small work and was a comparatively unimportant process by which metal surfaces were joined together. There were few men wholly occupied as welders.

The application of welding to the manufacture of engineering products has spread rapidly during the post-War years. The tinsmith may still be called on to do a certain amount of welding in the course of his work, but as the result of advances in welding technique, and a recognition of its potentialities in connection with the manufacture—by “fabrication” or otherwise—of a wide range of engineering products, there is now a large body of workers employed solely as welders.

In addition to high- and low-pressure acetylene welding, there are several processes in which electricity is used. Of these the metallic-arc process and the various forms of resistance welding—butt or flash, spot, and seam—are best known. Thus, welding, as practised to-day, is not one process, but many, each having advantages for different kinds of work, and each requiring a special type of machine or piece of equipment.

Recruitment for welding work has taken place principally from the ranks of semi-skilled labour, and by up-grading unskilled workers. Certain sections of this work have been recognised by employers as skilled in character, but most welding is considered by them as semi-skilled work. There are several cases in different branches of the industry where organised labour and employers are not in agreement regarding the level of skill and training period required by welders.

Labourers

In all sections of engineering work, but to different numerical extents, labourers are needed to assist other work-people in the efficient performance of their tasks. The foundry requires more labourers to craftsmen than other departments, the pattern shop probably fewest, and machine work and fitting varying proportions, mainly in accordance with the heaviness of the work done. This unskilled work has varied little in its nature in the course of time.

The Number of Workpeople in the Main Occupations in Engineering in England and Wales

Some indication of the numbers in the different occupations in engineering can be obtained from the Occupation Tables of the Population Census.

In England and Wales in 1931 there were nearly one and a quarter million males and females 14 years and over recorded in the several occupations carried on in engineering and other metal work. This figure, which applies to manual workers only, is exclusive of puddlers, shinglers, other furnace-men, rollers, and the skilled and unskilled assistants to these classes of workpeople. The total is substantially the same as that recorded at the 1921 Census, when the lower age limit was 12 years.

The figures relating to metal workers in the Occupation Tables of the Census are not confined to the stated principal branches of the industry, nor is the classification of occupations used for the Census one which makes it possible to give the exact numbers in the main engineering occupations to which reference has been made. For example, in the Occupation Tables of the Census, the section "Metal Machinists" includes turners as well as semi-skilled machine workers such as turret and capstan operators, millers, drillers, etc., who have been referred to collectively as "machine-men" in the list of the chief classes of manual workers in the in-

dustry. Also, there is in the Occupation Tables a very large body of persons with occupations not stated in a sufficiently defined way to make their inclusion possible in the correct classes.

The figures which follow are, therefore, approximate. They are related as far as possible to the selected list of engineering occupations as followed throughout the industry, but no attempt is made to include workers whose occupations are completely unspecified in the Census Tables.

In 1931 there were 170,000 turners and other machinemen and 50,000 female metal machinists. At the previous Census male numbers were about 10,000 higher and those for females nearly 10,000 less. In arriving at these figures half the tool-makers, for want of more precise information, have been considered as on machine work.

The above totals include press workers and stampers. These are a relatively low grade of semi-skilled workers, of whom there were more than 30,000 females in 1931. In 1921 these female workers numbered 22,000. There were 8,500 males occupied with this work in 1931 and only 5,000 in 1921.

In addition to the above metal machinists, nearly 170,000 male workers were recorded in 1931 as mechanical engineers, engineers, mechanics and motor mechanics. These workers appear under the heading "Fitters," but it is considered that some of them were partly, or wholly, machine workers, although it has not been possible to ascertain how many. In 1921 in this small group of occupations there were about 164,000 males recorded. The number of motor mechanics has grown considerably since 1921, and this increase has more than compensated for the shrinkage in the numbers of those males classed as "Mechanical Engineers" and "Engineers." The female numbers in this small group of occupations are of no importance. It may be mentioned that there were more than 66,000 skilled male metal workers in 1921 and 1931 with occupations unspecified.

In 1931 there were 420,000 males in the group of occupations included under the general term "Fitters." To arrive at the true number of fitters, however, this figure needs to be reduced, as it includes fitters' and erectors' labourers, the 170,000 workers entered as mechanical engineers, engineers, mechanics and motor mechanics, and 16,000 labourers helping these workers. At the previous Census there were about 450,000 males in this group of occupations. The number of females is relatively insignificant—1,000 in 1931 and 2,000 in 1921.

The numbers shown definitely as fitters and erectors declined from 196,000 in 1921 to 177,000 in 1931. To this number can be added the tool-setters and millwrights. Their combined total in 1921 was less than 18,000, and had grown to nearly 21,000 in 1931. Also there were 10,000 steel erectors in 1931, as compared with a Census return of 6,000 in 1921. This is a special class of erection, and the numbers include certain other structural iron workers.

Pipe fitters form a separate class. In the 1931 Census nearly 10,000 were recorded, whereas in 1921 the number was only 5,000. Female numbers in this occupation are insignificant.

In the 1931 Census there were 110,000 males occupied as electrical engineers, fitters, electricians and wiremen. It has not been possible to ascertain how many of this number were fitters, but it is considered that at least half can be included in that category. It is estimated that in 1921 there were less than 90,000 males recorded in this group of occupations. At both Censuses the number of females occupied with this work was less than 1% of the male total.

There are other classes of fitters shown in the Occupation Tables relating to metal workers, but their work is not carried out to any great extent in the principal branches of the engineering industry.

When deductions are made from the 1931 total of 420,000 males classed as "Fitters," for the number of labourers included, and additions made to take account of pipe fitters, steel erectors and electrical fitters, the total for males occupied as fitters and erectors is about 445,000. This figure, however, is inclusive of the 170,000 engineers, mechanics and motor mechanics, some of whom, as it has been previously pointed out, are machine workers. In 1921 the corresponding figure for fitters and erectors, inclusive of the 164,000 engineers and mechanics then returned, was approximately 435,000.

Pattern-making is another occupation in which the proportion of female labour is negligible. In 1931 nearly 14,000 male pattern-makers appeared in the Census Table, but only 11 females were shown. In 1921 there were 15,500 male pattern-makers and less than a hundred females occupied with work of this kind.

In foundry work there were 70,000 iron and brass, etc., moulders in 1931, compared with 79,000 at the previous Census. The number of women moulders was approximately the same each time—viz., 3,000. In addition to the moulders,

there were about 6,000 furnace and cupola men, etc., in 1931, and a slightly less number in 1921. No women are engaged on this work.

Smiths and other skilled forge workers are not separated in the Occupation Tables. This combined body of workers was made up of 100,000 males and less than 1,000 females in 1931. In 1921 there were nearly 128,000 males and 1,600 females.

The figures for platers are included with those for iron shipwrights and boiler-makers. The total for these related occupations was 35,000 males in 1931 and 48,000 in 1921. No females are found in these occupations.

The figures in the Occupation Tables for riveters were 18,000 males in 1931, and nearly 25,000 at the previous Census. Female numbers were insignificant. A good portion of the riveting with which these men are occupied is outside the chosen range of engineering work.

There were nearly 39,000 tinsmiths and other male sheet-metal workers recorded in 1931, and 34,000 in 1921. Female workers in these occupations decreased from 2,900 to 2,200. Coppersmiths, another class of skilled metal workers, show no inter-censal change in the Occupation Tables. Their number is 5,000. Females occupied on this work are of no numerical importance.

The figures for those occupied as labourers are given here with some reference to the sections of the industry in which the work is performed. In fitting, erecting and machine-shop work, 44,000 male labourers are shown in the Occupation Table for the 1931 Census and 65,000 at the previous Census. Foundry labourers numbered nearly 37,000 in 1931, and 45,000 in 1921. There were 10,000 boiler-makers' and platers' labourers in 1931, and nearly 15,000 at the previous Census. The special class of riveters' labourers has not been taken into account. The numbers of female labourers in the different sections are of no consequence.

In view of the reference made to the development of oxy-acetylene and electric welding and cutting, it is interesting to notice that whereas in 1921 there were 5,000 males occupied in this work, the number in 1931 had grown to 11,500. Female numbers show an inter-censal increase from 600 to 1,200.

In comparing the foregoing figures for the two censuses in the post-war period, it will be remembered that in 1921 conditions had hardly returned to normal after the War. During the War total numbers in engineering increased

owing to the large amount of munitions work done in the various branches of the industry.

The figures which are given show the approximate numbers in the various occupations sufficiently well for the relative importance of each, and the changes in the post-war period, to be appreciated.

Changes in the Proportions of Skilled, Semi-skilled and Unskilled Labour

The account of changes in the character of the work performed by the main classes of labour, given earlier in this chapter, showed that a reduction in the proportion of skilled to semi-skilled workers has taken place.

In "The Survey of the Metal Industries" in reference to this question, the following statement appears: "Statistics relative to the proportion which exists between the number of skilled and unskilled workers are subject to the consideration that in recent years a considerable change has taken place in the nature of the skill required in the industry. The demand for interchangeability in the finished products and the development of machining processes have led to an intensification of specialisation. In essence the machine operator has taken over part of the work previously falling to the old-style fitter, but the necessity of working to small limits of error has necessitated the exercise of a greater measure of skilled control during the work of machining. While there is now much more assembly (as distinguished from fitting) than previously, yet the fitting work which has to be done still requires (perhaps to an increasing extent) the skill of the high-grade mechanic; and the nature of fitting work, properly so called, in the future will probably continue to demand such skill" (p. 152).

Whatever the degree of skill required from the skilled worker may be, the percentage number of such workers is diminishing. The figures in the Occupation Tables of the Population Censuses in 1921 and 1931 are not in sufficient detail to bring out fully the growth of semi-skilled work in the engineering industry, and to show the changes in the proportions of skilled, semi-skilled and unskilled workers.

From the Occupation Tables relating to engineering and other metal workers, the development of certain semi-skilled occupations, such as drilling, welding, press work and stamping, is noticeable. The figures for workers in several other semi-skilled machine occupations are combined with those for skilled machinists, and the increase in the proportion of

semi-skilled workers is not evident. It is interesting to notice the big increase in the number of tool-setters—8,000 in 1921, and 12,000 in 1931—since this is a pointer to the wide extension taking place in semi-skilled machine work.

The Census figures enable the decline in the number of engineering labourers since 1921 to be clearly seen. More effective control of work in progress is now practised, methods of production have been improved, and the labouring force in 1921 appears to have been unduly high in proportion to the number of skilled and semi-skilled operatives.

The Engineering and Allied Employers' National Federation has made estimates of the changes which have taken place in the proportions of skilled, semi-skilled and unskilled workers in firms within the Federation. Table 6 is based on data supplied by the Employers' Federation for 1914, 1921 and 1926.

TABLE 6

The Proportions of Skilled, Semi-skilled and Unskilled Engineering Workers in Firms Belonging to the Engineering and Allied Employers' National Federation

Year.	Approximate Percentage of :		
	Skilled.	Semi-skilled.	Unskilled.
1914 . . .	60	20	20
1921 . . .	50	30	20
1926 . . .	40	45	15

Allowing for a rather liberal interpretation of the term "approximate percentage," the figures in Table 6 are in need of further explanation—which is not forthcoming in "The Survey of the Metal Industries," from which they have been extracted—if their true import is to be understood.

The percentages presumably relate to all classes of labour employed by the Federation, including apprentices, youths and females. The percentage for the semi-skilled workers is arrived at by combining the percentages of those male adults who are classed as semi-skilled, with the total percentages for females, apprentices, youths and any other workers neither skilled nor in the labouring or unskilled class. The unskilled section is composed of adult males.

The supposition that such a procedure has been followed

in obtaining the percentages given in Table 6 is supported by the data in Table 7, which have been taken from "Unemployment: Its Realities and Problems" (Appendix H, p. 85), a publication issued by the Engineering Employers' Federation. This table shows up the increase in female employment which has taken place since 1928.

TABLE 7

The Numbers in Different Classes of Engineering Work, in Firms Belonging to the Engineering and Allied Employers' National Federation, Expressed as Percentages of the Total Numbers Employed

Class of Labour.	1928.	1933.
Skilled . . .	34.1	31.6
Semi-skilled . . .	20.7	20.9
Labourers . . .	13.0	10.7
Apprentices . . .	7.8	7.5
Youths . . .	9.0	9.3
Females . . .	7.7	11.4
Others . . .	7.7	8.6

In Table 7 the percentages for semi-skilled labour for 1928 and 1933, comparable with those quoted in Table 6, are 53 and 57 respectively. By combining Tables 6 and 7, as has been done in Table 8, it is possible to see the changes over the period 1914 to 1933 more clearly.

TABLE 8

The Proportions of Skilled, Semi-skilled and Unskilled Workers in Firms Belonging to the Engineering and Allied Employers' National Federation

Year.	Approximate Percentage of :		
	Skilled.	Semi-skilled.	Unskilled.
1914 . . .	60	20	20
1921 . . .	50	30	20
1926 . . .	40	45	15
1928 . . .	34	53	13
1933 . . .	32	57	11

From Table 8 it is clear that the percentage of skilled and unskilled labour has been decreasing since 1914, whilst the proportion of semi-skilled workers has, therefore, steadily advanced. The percentages of skilled and unskilled workers have been halved during the period, and the proportion of semi-skilled workpeople is practically three times as great as it was when the War commenced.

The proportions of adult males, youths (under 21 years of age) and females, employed by firms in the Employers' Federation in the earlier part of the pre-War period are given in Table 9, which appears in "The Survey of the Metal Industries." In this table, skilled, semi-skilled operatives and labourers are included as "Adult Males," and "Youths" includes apprentices and other boys.

TABLE 9

The Proportions of Adult Males, Youths and Females in Firms Belonging to the Engineering and Allied Employers' National Federation

Year.	No. of Firms Included in Return.	No. of Work-people Employed by these Firms.	Percentage of :		
			Adult Males.	Youths.	Females.
1920	1,940	701,480	74	18	8
1923	1,940	328,382	70	19	11
1926	1,756	497,010	73	18	9

Summary

Until the end of the last century was approaching, semi-skilled hand or machine workers were small in numbers compared with the skilled workpeople in the industry. Since then there has been a steady development in the employment of semi-skilled labour, and a decline in the proportion of skilled men required.

Since the War commenced there has been a big increase in the amount of semi-skilled machine work, and at the present time semi-skilled machine workers outnumber the skilled machinists. On certain sections of semi-skilled machine work—press work and stampings in particular—females form a considerable proportion of the total numbers employed.

In the skilled occupations in the main branches of engineering, there have been very few women employed at any time. During the War women replacing men were sometimes classed as skilled workers. In the post-War period there has been a tendency for the small number of skilled women workers in engineering to be reduced.

Labourers and assistants have always been needed to help other workers. In the post-War period the proportion of labourers to skilled and semi-skilled workers has decreased.

The complicated development of the industry in its many sections, including changed methods of production, new techniques, the increased use of special machine tools, and the spread of the policy of quantity production of standard articles, makes it difficult to measure changes in the skill required by the different classes of workers employed, in anything but a general way.

CHAPTER III

ORGANISATION ON THE PART OF ENGINEERING EMPLOYERS AND WORKPEOPLE

The Engineering Employers' Federation

DURING the greater part of the last century a more individual outlook on manufacturing prevented engineering employers from forming associations having as principal objects the determination of wages rates and standard conditions of working. Associations of employers existed, but with objects different from those actuating present-day bodies.

Towards the end of the century the growing strength of trade unions, and their increased attention to wages matters and working conditions, were brought forcibly to the notice of engineering employers. Applications were made for increased wages and a shorter working week. Requests were also put forward that discussions should take place on the employers' "rights of management." Such activities resulted in employers joining together to take up a collective attitude on these several matters, and to place themselves in a more satisfactory position for bargaining and negotiating.

Local activity among employers was followed in 1896 by the formation of the Engineering Employers' Federation. A test of strength was quickly forthcoming in 1897, when a general dispute occurred over managerial matters, and the question of a working week of 48 hours. The newly formed Employers' Federation received much support, and grew from 180 member firms to 702 during the six months the dispute lasted.

Henceforward questions affecting the industry as a whole were put more into the hands of the Federation by the constituent members, whose number grew steadily. Although for many years after the formation of the Federation, wages matters were dealt with on a local basis, engineering wages and the conditions of employment within the different sections of the industry took on a more national aspect from the time the Federation came into being.

The Federation has continued to grow in stature until to-day, as the Engineering and Allied Employers' National Federation, a title assumed in 1918 following an enlargement of its functions, it consists of nearly 2,000 federated firms, which among them employ in normal times about 600,000 persons of both sexes.

The Federation is formed of District Associations. Individual firms are members of their local association, and through this are linked up with the national body. There are about 50 of these District Associations, operating in England and Scotland mainly, but also covering Dublin and Belfast engineering. The District Associations are also members of regional bodies which discuss questions affecting the areas which they represent.

A federated body working on similar lines, but much smaller in size, is the Shipbuilding Employers' Federation, which on occasion works in conjunction with the Engineering Employers' Federation.

Engineering Trade Unions

The workpeople concerned in the 1897 lock-out were mainly in the following societies :—

- Amalgamated Society of Engineers.
- Steam Engine Makers' Society.
- United Machine Workers' Association.
- London United Brassfounders' Society.
- United Society of Smiths and Hammermen.
- London and Provincial Society of Copper Smiths.
- London United Society of Drillers.
- London United Society of Brass Finishers.
- London Provincial Society of Hammermen.
- Amalgamated Society of Toolmakers.
- Scientific Instrument Makers.
- Marine and General Engineers' Society.

By far the largest of these was the first mentioned. All have, in the course of time, lost their separate identities.

At this period the "new unionism" was in its infancy. The craft unions, while recognising the growth of new classes of semi-skilled workers—and in some cases actively assisting in the formation of unions catering for them—had made comparatively little progress towards receiving such workers within their own ranks.

The Amalgamated Society of Engineers, after standing for a time opposed to the inclusion of any but tradesmen who

had served recognised apprenticeships, permitted membership to unapprenticed tradesmen, provided that they were in receipt of the trade union rate of wages.

At the beginning of this century a "Machinists Section" was opened for machine workers of different classes, who were regarded as generally less skilled than the tradesmen already eligible for membership. The contribution rate for this new class of members was lower. There appears to have been little real effort made at first to recruit members for this section, and there was strong feeling on the part of some branches with regard to the change in policy which this form of membership indicated.

Just prior to the War the unskilled labourers engaged in the industry were admitted to membership of this union. This Class "F" membership never proved popular, and the position of the engineering assistant was anomalous, as union membership in his case conferred no voting power. In 1917 this class of membership was discontinued. There still appears a number in this section, but as no further admissions are being made, the class will eventually disappear.

The Amalgamated Engineering Union

On July 1st, 1920, the Amalgamated Engineering Union was formed by the amalgamation of several of the leading unions of engineering workpeople. The following are the unions—with their membership figures—which formed the Amalgamated Engineering Union :—

Name.	Membership.
Amalgamated Society of Engineers	307,834
Amalgamated Toolmakers, Engineers and Machinists	44,607
Steam Engine Makers' Society	27,206
United Machine Workers' Association	24,607
United Kingdom Society of Amalgamated Smiths and Strikers	13,750
Amalgamated Instrument Makers' Trade Society	8,000
Associated Brass Founders, Turners, Fitters, Finishers and Coppersmiths' Society	6,561
North of England Brass Turners, Fitters and Finishers	1,080
East of Scotland Brassfounders' Society	641
London United Metal Turners, Fitters and Finishers' Society	581
Total	434,817

There are five principal classes of membership in the Amalgamated Engineering Union at the present day.

Classes 1 and 2 are for tradesmen under 40 years of age at the date of admission, duly proposed, seconded, and vouched for as good workers with at least five years experience. There is no rigid insistence on the serving of an indentured, or otherwise authenticated, apprenticeship. What claim the union has to be considered as a craft organisation rests mainly on these two classes of members. Class 3 is really the old "Machinists Section" of the Amalgamated Society of Engineers, and the contribution rates are lower than those which apply to Class 1 and 2 members. In Class 4 are apprentices and other young persons engaged in the industry. Their contributions are quite small.

In 1926 an Industrial Section was formed for anyone engaged in the engineering industry. In addition to this main Class 5 membership there is yet another industrial section—Class 5A—in which a lower contribution rate is payable.

Superannuation, sickness, unemployment, accident, legal, strike and funeral benefits are provided by the union, and the difference in the amount of the contributions, in the various sections, is dependent on the range and extent of the benefits to which the members are entitled.

The membership of this union declined rapidly after the serious dispute on Managerial Functions, which commenced in March 1922, and by 1925 there were less than 200,000 members. After the opening of the special Industrial Section, total membership figures took a slightly upward turn for a time. A further decrease in numbers commenced in 1931, and in 1933 the monthly average membership was down to 153,000. Since then numbers have been on the upgrade, and the total membership in July 1936 was 248,000.

Other Craft Unions of Importance

Other craft unions of importance in engineering include :—

Name.	1935. Membership Figures.
National Union of Foundry Workers	21,918
Boilermakers and Iron and Steel Shipbuilders	49,864
United Pattern Makers' Association	10,085
National Brass and Metal Mechanics	12,269
Electrical Trades Union	34,000
National Society of Coppersmiths, Braziers, and Metal Workers	3,000
National Union of Vehicle Builders	20,439
Amalgamated Society of Woodcutting Machinists	13,132
National Union of Sheet Metal Workers and Braziers	14,000

In addition to the above, there is a number of smaller unions of skilled men, which, in order to prove most effective, act jointly with the principal unions in any matters of general interest.

The Number and Membership of Engineering Trade Unions

In the Abstract of Labour Statistics the number and membership of engineering unions are shown combined with the totals for ironfounding, shipbuilding, and other metal-working and vehicle-building unions.

The figures which follow can, therefore, be used only in a general way to show the changes in the number and membership of trade unions in the engineering industry.

Just before the War there were 175 unions in this combined group of industries. This number has been reduced, largely as the result of amalgamations and the absorption of some of the smaller unions by larger bodies, until at the present time less than a hundred separate unions exist.

In 1914 there was a total male union membership of nearly half a million in engineering and these allied industries. This figure was practically doubled during the War. The total of a million was reached in 1920, which was the peak year. A decline then set in, and following the serious lock-out in March 1922 membership fell to 630,000 in 1923. Each succeeding year showed a steadily smaller number, until in 1932 the total was 470,000—a slightly lower level of membership than that recorded in 1914. Since 1934 membership figures have taken a distinctly upward turn, and the unions are at present carrying out intensive membership campaigns.

General Labour Unions

General labour unions were formed towards the end of the nineteenth century to accommodate the semi-skilled and unskilled workers. The growing sections of semi-skilled engineering workers were then largely unorganised, as were the labourers in the industry.

At first the recruitment of engineering workers in these unions was slow, but gained some impetus during the War. During the post-war period substantial numbers of semi-skilled and unskilled engineering workers have been admitted to membership of the general labour unions. Amalgamations have taken place, reducing overlapping and duplication of activities, until to-day the bulk of the general industrial

labour is in two unions, viz., the Transport and General Workers, and the National Union of General and Municipal Workers. Each union contains a healthy growing section of engineering workers, in spite of the fact that the Amalgamated Engineering Union has opened its ranks so as to be able to take in more of the lower grades of labour, and has actively set about the business of securing new members for these classes.

The general labour unions do not publish figures showing how their membership is spread over the different industries, and are indeed most zealous in preventing this information from becoming public knowledge. It has not been possible to form any reasonable estimate of the number of engineering workpeople in general labour unions. The total membership figures which are obtainable are of little value for the present purpose except to indicate the general importance of these unions. The membership figures, allowing for the inclusion from time to time of smaller unions, show similar changes to those which occurred in the engineering unions, except that a partial recovery from the decline in numbers in the early post-War years was made between 1924 and 1927. The decline then continued, but has been arrested, and both the principal general labour unions are at present making big advances in membership. In July 1935 the membership of the Transport and General Workers was 415,000, and that of the National Union of General and Municipal Workers 310,000.

Federated Working Among Trade Unions

On matters of general interest it is customary to find unions combining to present a case before the Employers' Federation. This federated working among trade unions takes place principally through two bodies, the Engineering Joint Trades Movement, and the Federation of Engineering and Shipbuilding Trades.

The Engineering Joint Trades Movement is not a standing body, but is called into existence as the need arises. It is representative of the unions interested in the particular questions at issue at the time, and may include the Federation of Engineering and Shipbuilding Trades. The membership of the Joint Trades Movement varies only slightly on the different occasions when it is called on to function.

The Federation of Engineering and Shipbuilding Trades is an old-established federation, which at present includes about twenty-five unions; but over 80 % of the total number

of members represented by these societies is covered by the two principal general labour unions referred to above. Several of the smaller unions which are members of this Federation are craft organisations composed wholly of workers in different sections of the engineering industry.

Limitations attached to Official Statistics

As a result of the inclusion of union membership figures in the industry group with which the majority of members of the union is believed to be connected, the statement of union membership for engineering workers lacks completeness.

There are many trade union members engaged in engineering work but enrolled in unions which are included in other industrial categories. Their exclusion from the metal industries group is a fact of increasing importance to those desirous of ascertaining the real extent of trade union membership in the engineering industry, on account of the growth of the engineering sections of the general labour unions.

Most of the engineering unions exclude females, and the official figures of female trade union membership in engineering do not disclose the true position. There are many female workers in the engineering trades who are members of the general labour unions. Particulars relating to female labour organisation appear in Chapter IX.

Summary

Organisation on the part both of workpeople and employers in the engineering industry is highly developed, notwithstanding the difficulties resulting from the large number of trades which are practised.

On the workers' side there are additional complications, as the occupations followed are not wholly confined to the engineering industry. Engineering workpeople are employed in practically every other industry, sometimes under conditions which are more allied to the industry which they serve than to the engineering industry itself.

The Engineering and Allied Employers' National Federation is a very powerful organisation, strongly supported throughout the country. It is the principal organisation on the employers' side, and handles all matters of major importance affecting the industry. Close contact with individual members is maintained through District Associations of employers.

Many of the important national craft unions have amalgamated, and since 1920 the Amalgamated Engineering Union has been the principal union in the industry. About half the total number of skilled engineering workers who are members of trade unions are enrolled in this large organisation. This union admits skilled workers in a number of related crafts, semi-skilled hand or machine workers, and has broadened its constitution to include unskilled workers and general engineering labourers.

Numbers of semi-skilled and unskilled engineering workers are members of a general labour union. These unions are now in direct competition with the Amalgamated Engineering Union for these classes of engineering work-people. The general labour unions, especially the National Union of General and Municipal Workers, encourage female engineering workers to become trade unionists. The Amalgamated Engineering Union, and other principal engineering unions, do not admit females to membership.

Trade union membership in engineering increased rapidly during the War, fell away sharply afterwards, continued to decline for several years, and is now increasing again.

On questions of general interest in engineering it is usual to find collective action on the part of trade unions which expresses itself through a federated body representative of the different unions concerned.

CHAPTER IV

THE PRICIPAL AGREEMENTS BETWEEN EMPLOYERS AND WORKPEOPLE RELATING TO WAGES AND WORKING CONDITIONS

UNTIL the serious engineering dispute in 1897 the industry had developed without any written agreements of anything more than local importance on wages and working conditions.

There were several questions of general interest on which it was desirable that formal agreement on a national scale should be reached between employers and workpeople.

The formation of the Employers' Federation in 1896 paved the way for the consideration of important issues on a wider basis than had hitherto been possible.

The newly formed Employers' Federation took a prominent part in the widespread lock-out which commenced in July 1897. This rupture precipitated the question of definite written agreements on the main labour issues confronting the industry, and when the dispute terminated in January 1898, an extensive agreement was drawn up between the two parties.

This agreement, which was officially called "Conditions of Management," is better known within the industry as "The Terms of Settlement." It has been chosen for two reasons as the point at which to commence this chapter. It was the first comprehensive agreement to be negotiated for the industry generally. Secondly, the questions with which it dealt are still of prime importance, and succeeding agreements on these matters are more in the nature of amendments to the appropriate clauses in the "Terms of Settlement."

The 1898 Terms of Settlement

The 1898 "Terms of Settlement" embodied the principle that there should be a recognised procedure with regard to the handling of questions arising between employers and workpeople, which provided for full discussion and thereby conduced to a satisfactory agreement being reached instead

of an active dispute occurring. The procedure to be adopted was stated, and consisted broadly of individual employers agreeing to receive deputations of workers, and if agreement could not be reached in this way, turning the matter over to their local Association of Employers. The local Employers' Association would then negotiate with the local trade union officials, to whom the workers had in the meantime stated their case. Should agreement still not be forthcoming, reference was to be made to the Executive Board of the Federation and the Central Authority of the trade union. While the questions were under discussion work was to continue under the existing conditions. As a supplement to this straightforward arrangement, the employers added a Note to the effect that they did not want to introduce any new or untried conditions of work, and had no intention of reducing the rates of skilled men.

The question of the employers' complete freedom of management was a principal contributory cause of the dispute preceding the "Terms of Settlement," and in this Agreement the general principle of freedom to employers in the management of their works was admitted. Employers regarded this as a cardinal principle of the industrial system which had to be observed, and in the Agreement appears the following statement: "The Federated Employers, whilst disavowing any intention of interfering with the proper functions of trade unions, will admit no interference with the management of their business. . . ."

Whilst it may be rather difficult to define the "proper functions of trade unions," it is quite clear that the Employers' Federation at the termination of the 1897 dispute was emphatically opposed to obtrusion on the part of trade unions in respect to questions of management.

No objections were to be raised to a man joining a trade union, but employers were equally free in their choice of labour. They might employ union and non-union workers, in which case all were to work peaceably together. The right of a man to join a trade union was to be freely construed as involving an equal right to refrain from joining if desired.

The above statements raise matters of considerable importance to individuals, the significance of which is more apparent when the following clause, which appears in the Agreement, is read: "The Federation do not advise their members to object to union workmen or to give preference to non-union workmen."

Individual firms were free to pursue their own policies regarding the employment of union and non-union men and to decide the position of, and treatment meted out to, each individual employee.

With regard to the manning of machines, which was one of the principal questions that led to the formation of the Employers' Federation, it was stated in the "Terms of Settlement" that employers should have full discretion to appoint men they considered suitable to work the different machine tools. The employers emphasised their desire to encourage ability, and were left with the right to "select, train and employ those they considered best adapted to the various operations and to pay them according to their ability as workmen."

The continuance of the practice of allowing individual employers to determine how many apprentices should be engaged was embodied in the settlement terms. It was felt that this should be recorded because of suggestions that the numbers of apprentices should be limited, and in some defined proportion to the numbers of journeymen in the factory.

Turning now to the portions of this important agreement which dealt more specifically with wages matters, the following abstract states the position with regard to piece-working, which was assuming some importance about this time.

"The right to work piece-work at present exercised by many of the Federated Employers shall be extended to all members of the Federation and all their union workmen.

"The prices to be paid for piece-work shall be fixed by mutual agreement between the employer and the workman or workmen who perform the work.

"The Federation will not countenance any piece-work conditions which will not allow a workman of average efficiency to earn at least the wage at which he is rated."

This last paragraph needed amplification, and the Federation stated that there was no intention of interfering with the usual practice of making extra payment for extra effort, nor did they seek to reduce the rates of wages of skilled men. An assertion was made that in various shops piece-working had been for long in force and individual workmen much benefited by the system.

Overtime, when necessary, would be worked with the following as a basis and guide :—

“That no man shall be required to work more than 40 hours overtime in any four weeks after full shop hours have been worked, allowance being made for time lost through sickness or absence with leave.”

A list was given of special cases when overtime should not be restricted. In general these related to conditions of emergency. In many shops no restrictions on overtime working existed, and this agreement marks the first broadly conceived effort to regulate overtime for trade union members.

Finally there appeared a most important reference to the determination of rates of wages :—

“Employers shall be free to employ workmen at rates of wages mutually satisfactory. They do not object to the unions or any other body of workmen in their collective capacity arranging among themselves rates of wages at which they will accept work, but, while admitting the position, they decline to enforce a rate of any Society of workmen or an agreement between any Society and its members.

“The unions will not interfere in any way with the wages of workmen outside their own unions.

“General alterations in the rate of wages in any district or districts will be negotiated between the Employers’ Local Association and the local representatives of the trade unions or other bodies of workmen concerned.”

Collective bargaining between the Employers’ Associations and the unions was thus made the subject of district agreement.

The 1907 Agreement

In 1901 a Provisional Agreement was reached between the Employers’ Federation and the officials of the engineering trade-unions, but this was rejected by the trade union members when a ballot vote was taken. In 1907 a new Agreement was made which dealt with the same principal matters as were included in the 1898 “Terms of Settlement.” This Agreement of October 1907 slightly altered the provisions for avoiding disputes, by supplying a little more detail with regard to the working of local and central conferences and the arrangements for convening these.

The principle of the employers' freedom of management remained unaltered. With reference to union membership and freedom of employment, an improvement, from the trade unionist's point of view, was made in the 1907 Agreement. A workman was not to be required as a condition of employment to state whether a union or non-union man, and the Federation undertook to recommend their members not to object to employing a workman simply on the grounds that he was a trade unionist.

It would appear that between 1898 and 1907 cases of discrimination must have taken place for this entry to have been made.

The workman's concern over his position, should machine improvements or altered methods result in his displacement, was acknowledged in the 1907 Agreement, and employers were recommended, when effecting alterations which displaced labour, to consider the case of those displaced so that if possible they should remain in employment.

As a result of further applications on the part of trade unions for the number of apprentices to be considered in relation to the number of journeymen employed, it was left open for the trade unions to discuss this question with the Federation on a broader basis, *i.e.*, the proportion of apprentices in the federated area, and not the numbers in individual factories. The importance of properly trained apprentices was recognised, and they were to be given opportunities to secure a good knowledge of the trades they entered, and encouraged to supplement practical experience with theoretical training.

Changes were made in piece-working arrangements. The spread of this was continuing and, in addition, other systems of payment by results were being introduced. In fact, the Halsey and Rowan * systems were already the subject of a separate memorandum (1902), in which employers were pledged, when using these systems, to guarantee time-rates, to maintain the prevailing overtime and night-shift conditions of payment, and to leave the "limit time" unchanged unless the methods or means of manufacture were altered.

These arrangements were reflected in the changes in connection with piece-working which were made in the 1907 Agreement. The most important of these changes was the provision that "each workman's day rate be guaranteed irrespective of his piece-work earnings." Prices continued

* Further information on these systems appears in Chapter VI.

to be fixed by mutual arrangement between employers and the workmen. This is known as the principle of "mutuality." Piece-workers on overtime or night-shift were to be paid the allowances made to time-workers employed in this way.

The amount of overtime for a trade union workman was reduced to 32 hours under the same provisos as stated in 1898, and systematic overtime was to be deprecated.

Nothing new was mentioned about the rating of skilled men, except that in fixing the rates the employer should have regard to those prevailing in the district for fully trained and skilled men.

The York Agreement, 1914

In March 1914 certain of the trade unions, including the Amalgamated Society of Engineers, terminated the 1907 Agreement.

The Amalgamated Society of Engineers entered into a new Agreement a month later (York Agreement) dealing only with the procedure to be followed when disputes were apprehended.

This York Agreement followed closely the "Provisions for Avoiding Disputes" section of the 1907 Agreement, which, in turn, contained similar provisions to those appearing in the 1898 Agreement. (A broad outline of these has been given.) Stress was laid on the desirability of settling troubles in the works where they occurred, through joint discussion between the management and workpeople directly concerned. Failing a settlement by such means, it was made permissible for further discussion to take place between deputations of workmen, accompanied by a stated trade union official, and the interested employers, who would be assisted in their deliberations by a representative of their Federation. Little else was changed or added, save that the existing machinery for negotiation was speeded up, and more precise instructions were given in connection with the calling of local or central conferences.

Although this Agreement was between the Amalgamated Society of Engineers and the Employers' Federation, other unions still remaining parties to the full text of the 1907 Agreement accepted these terms, which became those generally followed in the attempt to settle differences amicably.

Shop Stewards Agreement, 1917, and Works Committees Agreement, 1919

During the War, partly as a result of the special circumstances operating, the practice spread of choosing in each department of a factory a trade union member to act as spokesman on industrial matters. Those chosen were called "Shop Stewards,"* and the development of the practice was such that, at the end of 1917, an agreement was made on this subject between certain trade unions (excluding the Amalgamated Society of Engineers) and the Employers' Federation. The employers officially recognised the shop stewards and regulations were made as to their functions and the terms of their appointment.

There was, also during this same exceptional period, the growth of individual works committees, at first representative of workpeople only, but later—fostered by the recommendations of the Whitley Committee—of the joint type. The immediate post-War period saw a rapid growth in the number of these committees, and it was hoped that their existence would contribute to improved industrial relationships. In May 1919 an Agreement was made between the Employers' Federation and the trade unions, which dealt with the constitution and functions of these works committees, and revised the regulations appertaining to shop stewards. To this Agreement the Amalgamated Society of Engineers was a party, and the terms were included without alteration in the National Agreement of 1922.

The National Agreement of June 1922

The National Agreement of June 1922 is the principal Agreement in operation at the present time, stating the procedure for dealing with questions arising, and the provisions for avoiding disputes. This Agreement was concluded between the Employers' Federation and the principal trade unions in engineering and shipbuilding. It followed the termination of the dispute on managerial functions which commenced in March 1922.

The terms of the York Agreement are incorporated in the 1922 National Agreement, with but one slight alteration referring to the class of trade union official who may accompany deputations of workmen.

* For further information relating to the growth of the "Shop Steward Movement" during the War *vide* Report on Works Committees. H.M.S.O., 1918.

The general position in regard to shop stewards is that trade union members working in federated firms may appoint from their number, representatives—known as shop stewards—to act on their behalf, in accordance with the accepted provisions and procedure for avoiding disputes and for dealing with questions arising. Each trade union represented may appoint shop stewards, and intimates to the employer the names of the representatives and the shops which they serve.

Works Committees may be set up, consisting of not more than seven duly elected shop stewards, chosen so as to give fair representation to the various classes of workpeople, and not more than seven chosen by the management. It is usual to find the two sides equally represented in numbers. The proceedings must not result in any agreement being entered into which is contrary to existing agreements between the represented trade unions and the Employers' Federation or the Local Employers' Association.

Other matters of general interest in the National Agreement of June 1922 are the re-affirmation of the employers' right to manage their own establishments, and for trade unions to exercise their functions. A statement is also made that provision for changes in shop conditions is necessary in the process of evolution, but it is not intended to create any specially favoured class of workpeople.

The Post-War Position Concerning Various Important Questions

The important matters dealt with in the Agreements of 1898 and 1907 which do not appear in the National Agreement of June 1922 have been the subject of individual consideration, and some of them are dealt with in separate Agreements. The course which these questions have taken in the post-War period will now be described, and the present position in respect to each of them stated.

Trade Union Membership

Regarding the freedom of the individual worker to join a trade union without his position in the factory being in any way prejudiced, there is no separate or recent agreement existing. The Employers' Federation claims that federated firms continue to observe the clause in the 1907 Agreement dealing with this matter, and the attendant questions of amicable working between union and non-union men. The

essentials of this clause have been mentioned earlier in this chapter.

It requires but a little knowledge of industrial conditions for it to be appreciated that with union and non-union labour working side by side, friction may be caused and serious labour troubles result.

The Federation considers that the trade unions' attempt to recruit members is outside their concern, but coercive measures should not be applied, nor should employers be in any way penalised, through trade-union action, if individuals decide to remain outside trade-union membership.

"Poaching" on the part of different unions is another question which the employers consider to be purely domestic, and in which they have no wish to be involved.

Demarcation Questions

Demarcation questions have been a frequent source of trouble in the manufacture of various engineering products. *Disputes arise regarding the particular class of labour which shall carry out certain sections of the work.* Although these are principally inter-union matters, employers have often been involved. Sometimes they have made arbitrary decisions as to the class of craftsman to whom the work should be given, and their desire for unhindered production has led them on occasions to interfere with a view to effecting a settlement. As a result of the many demarcation questions arising, especially in marine engineering and ship-building, an agreement with regard to the procedure to be followed in these cases was concluded in 1912 between various trade unions and the Federations of Shipbuilding and Engineering Employers.

This agreement, which is still in operation, does not provide for the decisions reached to be given national application. Each is confined to the works in which the question arose, and is binding only for twelve months. After this period the issue may be raised again.

The number of stoppages of work arising out of demarcation troubles has been considerably reduced in recent years. This is partly explained by there being fewer demarcation questions to settle as a result of amalgamations among trade unions, and the changes towards industrial unionism occurring in certain of the leading unions. In addition, there is an altered outlook by the members of different craft unions. There is a noticeable desire to be more accommodating, and less rigid in the interpretation

of union rules concerning what work may be done. The workers have realised that the rules were framed when changes in methods of production were not taking place with the rapidity which has characterised the post-War years.

Manning of Machines

Continued improvement in machine tools has constantly kept to the fore the question of the rating of workers on different classes of machines, and the employers' claim to man machines with those they consider most suitable.

The big increase in the number of semi-skilled machine workers, who largely obtain their training, not by any ordered system of apprenticeship, but by "progressing up a ladder of progressively complex operations," has made this group of questions—viz., the selection, training and payment of machine workers—a most complicated set with which to deal.

The difficulties have not been confined to those existing between employers and trade unions, but have resulted in differences among the unions themselves.

At the beginning of the post-War period the officials of the Amalgamated Engineering Union considered the question of rating machines. They were in favour of a classification of machines with agreed minimum rates for the various classes. They recommended that planers, slotters, millers, gear-cutters, shapers, grinders, horizontal drillers and borers, radial drillers who perform knifing, boring, rose-bitting, tapping or studding operations, capstan, turret, combination or automatic operators who set-up their own work and machines, should in all respects be classed in the same category as turners, and paid according to the established rates for such workers in each district and trade. In a second class they included vertical drillers, screwers, sawyers, nut facers and workers on other machines not specified in the first big group. These workers, after a probationary period of two years, would receive the ordinary district rate, i.e. 95% of the rate payable to those in the first class.

This classification, and the suggested wage rates, were not accepted by the Employers' Federation. Such an arrangement would have meant extending the established rates for turners to a large number of machine workers in receipt of lower rates of payment, and increased rates to other grades of semi-skilled machine workers.

The Employers' Federation agreed that it was necessary,

in the best interests of the industry, to arrive at some understanding on the machine question, but at this time it was unwilling to move from the general position as stated in the 1907 Agreement. Under this Agreement employers were free to make their own choice of machine workers, and to pay them according to their ability as workmen.

The Federation's attitude was influenced by a recognition that, although up to this time it had been in negotiation on the machine question, chiefly with certain of the craft unions, the matter was becoming one of major importance to other unions, especially the quickly growing general labour unions which had many members engaged on machine work in engineering factories. Any agreement would need to take into account these unions, and a premature move might further complicate the position.

In 1923 the Amalgamated Engineering Union was informed of the Federation's disinclination to continue further discussions relating to machine classification, without all the unions interested in the question being invited to take part. The Amalgamated Engineering Union was unwilling at that time to participate in a general conference to explore the position.

The general workers' unions made it clear that it was their intention to assist their members to progress where they showed capacity, and to ask employers to allow them the opportunity to carry out those or machine hand operations for which they showed aptitude or possessed qualifications. These unions also favoured the development of minimum rates—preferably applied on a national basis—for certain operations, and agreement with regard to the training of workers.

When informed of the declared policy of the general workers' unions the Amalgamated Engineering Union referred the whole matter to its Executive Council, presumably for some pronouncement to be made at a later date. No announcement has yet been made by this union.

There the position rests, and no agreement has been formally expressed. The matter is more complicated than it was in 1923, both on account of the increasing membership in the engineering sections of the National Union of General and Municipal Workers, and the Transport and General Workers' Union, and the present policy of the Amalgamated Engineering Union of admitting all classes of engineering workers to membership.

The Number and Training of Apprentices

The apprenticeship question is, to a certain extent, bound up with the development of machine tools. Changes in methods of production have disturbed previously accepted opinions as to the length and the width of training necessary for engineering workers.

The trade unions favour a limitation of the number of apprentices on some agreed basis connected with the number of journeymen. Both employers and unions are agreed that a revised opinion regarding the period and form of apprenticeship is desirable from time to time in consequence of the changes which are occurring.

There are several other questions affecting apprentices, but nothing has been expressed in a national agreement since that of 1907, to which reference has already been made.

Overtime and Night-Shift Working

Prior to the War, when district settlements were the practice, overtime by day workers was paid at an average rate of time-and-one-quarter for the first two hours, and afterwards at time-and-one-half.

Overtime and night-shift working conditions and allowances were made the subject of a national agreement in 1920,* between the Employers' Federation and various trade unions with members in the engineering industry.

The overtime allowance to day workers provided by the 1920 Agreement was time-and-one-half until midnight, and double time afterwards until the next ordinary starting time.

In 1931 another agreement was made, altering certain parts of the Agreement reached in 1920. By the alteration in 1931 overtime is now paid at the rate of time-and-one-quarter in respect of the first two hours, and after this at the rate of time-and-one-half. In effect, there has been a reversion to the average pre-war overtime allowance, except that prior to the War, in many districts, overtime was not computed until the full working week of 53 or 54 hours had been completed, whereas each day now stands by itself.

The "rates" referred to above in connection with over-

* The full text of this Agreement, together with the changes made in 1931, appear in the Report on Collective Agreements, Vol. 1, pp. 227-228. H.M.S.O., 1934.

time allowances to day workers are the recognised day-shift wage rates for the classes of labour concerned.

Systematic overtime as a means of production is deprecated. The limitation of 32 hours overtime in any four weeks, to which reference was made when dealing with the 1907 Agreement, was reduced to 30 by the Overtime and Night-shift Agreement of 1920.

It is understood that employers have the right to decide when overtime is necessary, and that workpeople, or their representatives, may bring forward any cases for discussion in accordance with the procedure provided.

Night-shift is "where men other than day-shift men work throughout the night for not less than three consecutive nights." The 1920 Agreement provided for 47 hours to be worked during five nights, with payment at the rate of time-and-one-third throughout; overtime for night-shift workers to be paid for at time-and-two-thirds. In 1931 these allowances were reduced to time-and-one-sixth during the normal night-shift hours. For overtime by night-shift workers before or after the night-shift period, payment was fixed at the rate of time-and-one-quarter for the first two hours, and afterwards at time-and-one-half.

In June 1936 another Agreement was made by which allowances for night-shift were increased to time-and-one-fifth. The first two hours of overtime on night-shift are paid at the rate of time-and-one-third, and for all overtime hours worked thereafter by night-shift workers time-and-one-half is now paid. These night-shift overtime conditions apply also to night-shift men coupling-up.

The allowances for night-shift workers are calculated on the recognised day-shift rates of payment.

It is not easy to make a comparison between these allowances to night-shift workers and those operating before 1914. Prior to the War the night-shift week was not uniform in length. As in the case of day work, a full week had generally to be worked before overtime was computed. Night-shift working was commonly paid at time-and-one-quarter for all the hours worked in the normal week.

Shift-Work

Shift-working was the subject of a separate Agreement between the Employers' Federation and the Amalgamated Engineering Union in 1920. This stated the conditions for double day-shift and a three-shift system. In 1931 this

Agreement was amended, and the new arrangement * reduces the payment hours to the workers. Perhaps with improving trade there may be an increase in the amount of shift-working, now that the basis arrived at is considered by the employers to be more economic. Under the original plan, men on the first and second shifts (*i.e.* 6 a.m.—2 p.m. and 2 p.m.—10 p.m.; half-hour break in each shift and 12 noon finish on Saturdays) worked 43 or $37\frac{1}{2}$ hours respectively, but were paid on a 47-hour basis. On the third shift (10 p.m.—6 a.m.) $37\frac{1}{2}$ hours were worked and 50 payment hours recorded.

The alteration made in 1931 provides for 45 hours payment to workers in the first and second shifts, and 47 hours to those in the third shift. For the purposes of calculating war and special bonuses each full shift counts as a full working week.

There was no uniformity existing in pre-War days with regard to the arrangement of shifts, or the payment hours to be credited to those working in this way.

Holidays

Before the War there was considerable variation in the number of recognised holidays in different parts of the country, and the allowances made to workers whose services were required during these times.

After the War, discussions took place with the object of standardising the number of recognised holidays and the additional payments to those compelled to work.

An agreement on these matters was made in 1922, and supplemented by two further agreements in 1924. These agreements, which are still in operation, provide for double time to be paid on two holidays and time-and-one-half in respect of eight other full-day holidays.

The two general holidays in England, in respect of which double time is payable, are Christmas Day and either Good Friday or Easter Monday. The eight holidays which yield time-and-one-half to those at work on these occasions are the subject of local arrangement.

The agreements do not stand in the way of additional holidays being taken in any district, but merely state a number for which extra rates have been generally agreed. There are several local agreements in existence—made

* Report on Collective Agreements, Vol. I, p. 226, contains the text of the Agreement which is now in operation.

between different unions and the local Engineering Employers' Associations—regarding holiday arrangements.

Reductions in the Working Week and Compensations Therefor

A most important Agreement was negotiated at the end of 1918 providing for a reduction of the working week to 47 hours, commencing on January 1st, 1919.

There was no uniformity regarding the working week prior to this Agreement, but the range in the number of hours worked was limited, and hours varied between 50 and 54 per week.

There has been no general alteration in the length of the working week since the hours were reduced to 47 in 1919.

Several factories still practised the two break system at the end of the War. There was a break made for breakfast, and another in the middle of the day. This arrangement, which was very common in pre-War days, had been declining in favour for several years, and the 47 Hours Week Agreement provided for the single break system (no breakfast stoppage) to be generally adopted.

In the post-War period there has, therefore, been uniformity in federated firms in connection with the length of the normal working week, and in the practice of working with one main break only each day. There has also been comparatively little variation in the disposition of the hours of work, but recently an increase in the number of firms, and departments within firms, arranging their hours to avoid working on Saturdays, is noticeable. In some cases the five-day week has meant a reduction in hours from the basis agreed to in 1918.

The importance of the 47 Hours Week Agreement was further increased by the fact that weekly time rates remained unchanged. Hourly time rates were augmented for day-shift workers to compensate them in proportion to the reduction in hours experienced.

Night-shift rates were also adjusted on the same basis, but the number of hours worked remained unchanged until the Agreement was made in 1920.

For those working under premium bonus plans, hourly earnings were increased as calculations were based on the enhanced day-shift rates.

No change was made in piece-work prices or lieu rates* at the time the 47 hours week was introduced, but the

* A special form of bonus which is explained more fully in Chapter VI.

parties agreed to deal with these at an early date, and to consider "the economic conditions and systems and bases of remuneration necessary in the interests of industry" from a national viewpoint.

In April 1919 the principal engineering unions agreed with the employers that :—

"Where by reason of the introduction of the 47-hour-week a workman is not able to earn on piece-work his previous remuneration on the same job, the employers will undertake to recommend that suitable adjustments shall be made on the piece-work price for that job. It is agreed that piece-work prices shall be such as will enable a workman of average ability to earn at least $33\frac{1}{3}\%$ over present time rates (excluding war bonuses). Piece-work prices once established shall not be altered unless the means or method of manufacture is changed. Meantime it is agreed that where prices are such that on account of the reduction in hours the workman of average ability is unable to earn $33\frac{1}{3}\%$, the necessary adjustments should be made."

Systems of Payment by Results

It was mentioned earlier in this chapter that the Amalgamated Society of Engineers—the principal engineering union until the formation of the Amalgamated Engineering Union in 1920—withdrew from the 1907 Agreement in 1914. At the same time they withdrew from the conditions of the 1902 Memorandum relating to the Premium Bonus System. This Memorandum has been referred to previously in this chapter.

The Amalgamated Society of Engineers had, therefore, no formal Agreement with the Employers' Federation in connection with systems of payment by results during the whole of the War period. The union was a signatory to the Piece-work Agreement made in April 1919, which is referred to at the end of the preceding section of this chapter.

In this Agreement there was for the first time in an engineering agreement of national importance a definite percentage stated by which piece-workers' earnings should exceed time rates. The clause providing that piece-work prices should not be altered, unless the means or method of manufacture were changed, was also a development of importance.

Since 1919 there has been considerable development in the application of different incentive methods based on

payment in proportion to output. This development has been accompanied by frequent conferences between employers and various engineering unions in connection with how such methods of payment shall be introduced and worked.

Since the serious dispute in 1922 all agreements * between the Employers' Federation and engineering trade unions, relating to systems of payment by results, have been couched in similar terms.

A study of the text of the standard Agreement, which has been subscribed to by most of the important unions, except the Amalgamated Engineering Union, shows that the general principles have changed little from those expressed in the 1907 Agreement.

The employers have the right to introduce systems of payment by results. Prices still remain to be fixed by mutual arrangement between the individual employer and his workers, and there is the guarantee of the day-work time rate should piece-work earnings for the week fall short of this figure.

In 1931 when reductions were made in the allowances for overtime and night-shift working, alterations were also made in piece-work prices. The Agreement in June 1931 provided that :—

“(a) No piece-work prices, bonus or basis times once established may be altered except for the following reasons :—

- (1) A mistake in the calculation on either side or
- (2) The material means or methods of production or the quantities are changed or
- (3) A mutual arrangement has been come to between the employer and the worker in the same way as a new price is arranged.

(b) Piece-work prices and bonus or basis times shall be such as will enable a workman of average ability to earn at least 25% over time rates excluding War bonus.

(c) As regards existing prices or times :—

- (1) In those cases where the basis is 33 $\frac{1}{3}$ % it will be reduced to 25%, i.e., a reduction of 6 $\frac{1}{3}$ %.

* Details of the dates of these agreements, the subscribing parties, and a copy of the terms, appear in the “Report on Collective Agreements between Employers and Workpeople,” Vol. I. H.M.S.O., 1934.

- (2) In those cases where the basis is by agreement or recognition greater than $33\frac{1}{3}\%$, the reduction will be in the ratio of $33\frac{1}{3}$ to 25."

The above Agreement on piece-work was concluded between the Engineering Joint Trades Movement and the Employers' Federation, and is in operation at the present time.

It is interesting to note that the Amalgamated Engineering Union, as a member of the Engineering Joint Trades Movement, was a party to the 1931 Piece-work Agreement. This union was also a party to the 1919 Piece-work Agreement, but has made no other agreements on piece-work with the Employers' Federation. Both these Agreements, as their terms show, deal only with certain details of working, and assume that there is concord on the more general questions connected with the operation of systems of payment by results. These other generally accepted conditions appear in the piece-work agreements which have been concluded between the Employers' Federation and other engineering trade unions, but up to the present time the Amalgamated Engineering Union has not formally accepted them.

It will be noticed that the 1919 Piece-work Agreement makes reference only to "piece-workers," whereas the 1931 Agreement is so phrased as to cover other systems of payment by results.

In firms which are members of the Engineering Employers' Federation, allowances in respect of overtime, night-shift, work done on Sundays, and during recognised holidays, are paid in addition to the earnings under any system of payment by results. These allowances are, as in the case of time-workers, calculated on the basic time rates.

During the post-War period, as the result of negotiation between the Employers' Federation and the trade unions, several safeguards have been provided for those employed under systems of payment by results.

The supplying of particulars as to the nature of each job and the piece-work price, bonus or basic time allowed, is of distinct help to the workman in computing his wages. It may also be considered as playing a part in encouraging continued effort on the part of the worker. The quick appreciation of the exact payment for the work done is an integral part of a satisfactory individual incentive system.

Debit balances are not now carried forward for any considerable length of time. Also, a worker on a system of payment by results, prevented from proceeding with his work on account of delays which could not be properly or reasonably taken into account when the piece-work price or time allowance was fixed, is not to be penalised. Payment at time rates, with the usual additions for overtime or night-shift, is to be paid in such cases.

In explanation of the term "debit balance," it should be mentioned that the practice of debiting a worker with the amount by which his piece-work earnings fall short of his guaranteed time rate has been a common feature in many engineering factories for several years. This deficit has to be made good out of subsequent earnings above the guaranteed time rate of wages, and it was not uncommon some years ago to find workpeople with debit balances of several pounds. These workers had little chance of quickly wiping off the deficit and again obtaining earnings in excess of their guaranteed time rates of wages. Personal experience in factories where the debt system operated points to the fact that it was not necessarily the least competent workers who suffered most in this respect. After the War it was agreed, over a fairly wide area, that debit balances should not be carried forward for a period of more than three months. Since then various local agreements have been made reducing the time still further. For example, in 1927 it was agreed in the Manchester District that two months should be the limit. The question is again under consideration in this District, and it appears likely that the new settlement will virtually mean that debit balances are not carried forward at all to the detriment of the workers' earnings.

Wages

In connection with the actual rates of wages payable—either time or piece—in the engineering industry, there is comparatively little expressed in formal agreements between the employers and the trade unions.

The question of standardisation of wages has often been discussed, but little progress has been recorded even in the direction of fixing standard district time rates by definite agreements. There are not only variations in the recognised wages rates in different parts of the country, which would be difficult to remove to the satisfaction of employers and workers alike, but also differences of opinion among em-

ployers regarding the desirability of making formal agreements prescribing the actual rates to be applied in their factories.

There are several local wages agreements between District Associations of the Engineering Employers' Federation and certain trade unions. In some of these, standard time rates of wages are fixed for different grades of workpeople. A number of such agreements is to be found in the London area.

There is an interesting agreement in the Manchester District between the local Employers' Association and various unions now merged into the Amalgamated Engineering Union, relating to the wages of machine-men. This agreement was made in 1919. It provides for members of the societies specified, 22 years of age and over, who have worked continuously for a period of not less than five years as planers, slotters, millers, shapers and borers on the following grades of work: engine-building, machine-tool making, electrical engineering, general engineering or locomotive engineering, to be brought up to the pre-war rate of 36s. per week. The agreement has been quoted in some detail because it appears to be the only one in the Manchester District between the Amalgamated Engineering Union and the federated employers in which there is a definite rate stated.

Most of the wages agreements between the local Associations of the Engineering Employers' Federation deal with variations from the recognised time rates to be paid to different classes of engineering workers. The following two agreements in the Manchester District are good illustrations of this class.

MEMORANDUM OF AGREEMENT

between

THE MANCHESTER DISTRICT ENGINEERING EMPLOYERS'
ASSOCIATION

and the

AMALGAMATED ENGINEERING UNION

(arrived at, at Local Conference held 21/3/1927) regarding

THE PROBATIONARY PERIOD FOR STRIKERS

IT IS HEREBY MUTUALLY AGREED :—

1. Youths commencing as Strikers under 21 years of age, shall receive the full recognised district rate of Strikers at 21 years

of age, provided that they have completed 12 months' continuous Striking.

2. For those who work a shorter period, the following table shall apply :—

Period of Striking prior to 21 years of age.	Full rate to be paid at :—
11 months.	21 years 1 month.
10 "	" 2 "
9 "	" 3 "
8 "	" 4 "
7 "	" 5 "
6 " or less.	" 6 "

3. It is understood that in all cases under the foregoing table, 2s. per week above the rate of the ordinary labourer shall be paid at 21 years of age.
4. In the case of men commencing striking at 21 years of age or over, they shall receive 2s. per week above the rate of the labourer, the full rate of the Striker being paid at the end of 6 months.
5. This Agreement to become operative as from Monday, 11/4/1927.

Dated this 12th day of April, 1927.

MEMORANDUM OF LOCAL CONFERENCE

between the

MANCHESTER DISTRICT ENGINEERING TRADES
EMPLOYERS' ASSOCIATION

and the

AMALGAMATED ENGINEERING UNION

held 29th January, 1924

re

WAGES OF YOUNG JOURNEYMEN

IT IS HEREBY MUTUALLY AGREED TO RECOMMEND THAT :—

1. Young journeymen on completing their apprenticeship at the age of 21 years shall be paid 10s. per week below the full district rate recognised for that particular trade.
2. The foregoing rate shall be paid during a probationary period of twelve months, at the end of which the full recognised rate shall be paid.

3. Young journeymen who have not completed their twelve months probationary period and who take up employment with a firm included in the area of the association shall be paid in accordance with the terms of this agreement.
4. Young men who have completed their apprenticeship prior to this agreement being entered into shall, as far as the unexpired period of their probationary period is concerned, automatically come under the terms thereof as from the date of its operation.
5. This agreement shall apply to the area covered by the association, including Manchester, Ashton, Newton-le-Willows, Stockport and Warrington Districts.
6. Three months' notice shall be given by either party desiring to terminate this agreement, excepting that should a national agreement be arrived at on this question the latter will as from the date thereof supersede the local agreement.
7. This agreement shall become operative as from the date of acceptance by both parties, viz., February 18th, 1924.

It will be noticed that in each agreement reference is made to the "recognised district rate," but there are no formal agreements between the two parties establishing district rates for the different classes of engineering work-people.

Before trade unions had assumed any importance in the industry, employees—singly or in groups—agreed with their employer with regard to the payment they should receive. Practically all were then paid on a time basis. Some work might be let out on contract to an individual who engaged his own workers, and introduced them to the factory where the work was carried out. The "contractor" received a price for the job, but he usually paid his men on a time basis. The amount of work done in this way was not considerable.

As trade unions became more active in wages matters in the last quarter of the nineteenth century, they collected information about the rates paid by employers, and attempted to get district uniformity with regard to the minimum time rates to be paid to their members, on different classes of work. The trade unions took the lead in fixing time rates of wages at which their members might accept employment. Employers at this time in engaging men at these rates, and observing them, can be considered as complying with the trade unions' terms, but not necessarily as accepting the rates as those which ought to be paid.

Employers improved their organisation, trade unions continued their activity in connection with time rates for their members, and there developed recognised district time

rates for the whole of the country. These rates were not, however, definitely expressed in agreements between employers and workpeople.

No general progress has since been made in securing the ratification of district rates by engineering employers. The result is that the practice of recognised but not "agreed" rates for workers in different parts of the country has continued.

It is rather curious to find written agreements, of both local and wide application, referring to specified variations of payment for different classes of workers from basic rates which themselves have not been embodied in any agreement made between the employers and workpeople concerned.

Broadly, the basis for the rating of workmen remains, in federated firms, what it was in the 1907 Agreement. The employer may employ workpeople at rates which are mutually satisfactory, and in deciding the rates for skilled men shall have regard to those generally paid in the district for such classes of labour. The trade unions can fix the rates of wages at which their members may accept work, and general alterations in district rates are to form the subject of negotiation between the local Association of Engineering Employers and the trade union representatives.

There are some local wages agreements which have been negotiated between the unions and organisations of employers, in different parts of the country, who are not affiliated to the Engineering and Allied Employers' National Federation. Included among these are a few which definitely fix the time rates to be paid.

Until the War commenced, wages in the engineering industry were negotiated locally. The cost of living rose quickly after the War started, and there were many claims made for increased wages.

With a view to preventing stoppages of work on munitions and other products required for the War, the Committee on Production, which was set up early in 1915 to suggest ways and means of maintaining the full efficiency of output from engineering and shipbuilding firms, recommended that disputes be referred to an official Arbitration Tribunal, whose decisions should be legally binding on the two parties. This was acted upon, and the Committee on Production was empowered to sit as an Arbitration Tribunal dealing with wages and kindred matters.

So great was the number of claims from different districts for increases in the recognised rates to compensate for the

rising prices of commodities, and so slight were district variations in food prices, that almost uniform advances were given. This arrangement reduced the amount of discussion and conference work without contributing seriously to regional dissatisfaction over flat increases.

In this way the process of transferring wages questions from a local to a national basis was accelerated, and in 1917 a *National Wages Agreement* was made between the Employers' Federation and fifty unions, which provided for claims relating to general and district alterations in wages to be heard periodically for arbitration settlement by the Committee of Production sitting as an Arbitration Tribunal.

This was the first large-scale agreement in connection with wages. When the War finished, and the Committee on Production ceased to function, various pieces of legislation enabled wages claims still to go before arbitration bodies supported by the Government.

Wages claims were regularly heard in this way until the end of 1920, when the practice ceased as the result of an earlier intimation from the trade unions of their desire to end the National Wages Agreement made in the War-period.

In 1919 the unions suggested that the inequalities in district rates should be considered and the War wages consolidated into time rates. The Employers' Federation concurred with regard to the desirability of levelling district rates and securing agreement on the procedure to be employed when dealing with general fluctuations in wages. A series of discussions followed involving the consideration of the retention of some form of independent tribunal for the settlement of wages claims; a periodical review of wages; the arrangement of rates for specified areas; the continuance of a national basis for wages applications or the reversion to local arrangements. No unanimity was reached on these important issues, and since that time there has been no agreement on general wages questions of this character made between the trade unions and the Employers' Federation.

The practice of dealing with wages applications on a national basis was, however, established, and in 1927, 1935 and 1936, Agreements relating to general wages increases were concluded by the trade unions and the Engineering Employers' Federation.

Summary

Until the formation of the Engineering Employers' Federation in 1896, agreements between engineering employers and their workpeople were of a local character, and comparatively few in number.

A comprehensive Agreement on general working conditions was made in 1898 between the Employers' Federation and the leading trade unions. This Agreement was amplified in 1907.

The 1907 Agreement still remains the basis on which various important issues rest, but several of the questions dealt with in 1907 have since been the subject of separate general agreements. These separate agreements do not show any surprising changes in the position reached between the two parties relating to the main questions confronting the industry. In the main they supplement the Agreement of 1907; providing additional detail as the result of experience gained.

The growth of the Employers' Federation has given wider application to the agreements negotiated between this body and various trade unions. In addition to National Agreements of general application in the industry, there are a few agreements of national application existing between individual unions and the Employers' Federation. These deal with matters of special interest to the particular unions.

There are numerous local agreements in existence. Many of these have been made by local Engineering Employers' Associations, attached to the Federation, with different unions to cover special matters arising in their own areas.

Little has been expressed in written agreements—of either local or national application—regarding the actual rates of wages to be paid to the different classes of engineering workpeople. There are well-recognised rates for different classes of engineering workers all over the country. These "district rates," which are time rates for a normal working week, are observed in federated firms, but no formal agreement has been made accepting them. Numerous agreements are, however, in existence, based on these recognised district time rates. Several of these agreements define precisely the variations from the recognised district rates which shall be made for work done under special conditions.

CHAPTER V

TRADE UNION POLICY IN CONNECTION WITH WAGES QUESTIONS AND GENERAL LABOUR CONDITIONS

Engineering Disputes and Conciliation Machinery

TRADE unions and employers of labour seem so opposed in their interests that many people believe that every important question which arises is settled not on its true merits, but in accordance with which side has the greater power at the time. However true this may be, the extent to which conciliation procedure in the engineering industry has now been developed, and is made use of, is evidence of a desire on the part of employers and trade unions to look all round a question before reaching a decision. Furthermore, after making use of the recognised machinery for discussing differences arising, a settlement has generally been achieved without any stoppage of work occurring.

The machinery for the discussion and settlement of differences between an individual workman and his employer, or on a larger scale, has gradually been built up since the general stoppage of work which commenced in July 1897, and lasted for six months. Since that time only one other lock-out of major importance has occurred. This commenced in March 1922, over the question of "Managerial Functions," and terminated in June 1922.

There was a lock-out in 1920, arising from an objection by electrical workers to the employment of non-union foremen. Seven thousand workpeople were involved, but the dispute lasted only a fortnight.

When the full range of engineering work and the large number of firms involved are properly appreciated, the number of strikes which have occurred must be regarded as small. From 1898 until the War, no dispute of great importance disturbed the industry.

During the War there were some rather serious, but fortunately short-lived strikes, supported by the Shop Steward Movement. The post-War period, apart from the General Strike in 1926, in which engineering workpeople

were involved, has been comparatively untroubled by strikes of any size and importance in the industry generally.

There was in 1921 a long, serious wages dispute between the moulders and the Employers' Federation (65,000 men involved for 18½ weeks), which had its repercussions in other sections of the industry, many engineering workers going on to short time or being temporarily stopped.

Numerous stoppages of work have occurred since then in individual factories, involving sections or the whole of a firm's employees. The disputes have not spread to any extent, nor have they usually been of long duration. One of the most serious of these sporadic outbursts commenced in 1933 in a Manchester firm, with regard to alterations in working as a result of the introduction of the Bedaux system of payment.

The opportunity for joint discussion on approved lines has been recognised by employers and trade unions as of the utmost value in preventing difficulties from becoming acute and leading to an open rupture, and the system of conciliation procedure in force consists of a series of conferences, the first between the management and the workmen directly concerned. Afterwards, if necessary, deputations of workmen accompanied by a local trade union official meet the employer, who may then be assisted by a representative from the Federation. Failing settlement at this stage, the matter is dealt with at a conference between the local association of the Federation and the local representatives of the trade unions interested. Finally, the question goes before a Central Conference, where it is discussed by those who may be termed the industry's experts in negotiation. Should the two parties still disagree, they may then take what steps they think suitable, but they do this with the full knowledge of their responsibilities.

It will be noticed that at each stage in the procedure the question in dispute is removed a little farther from the actual persons concerned, but the discussion at all stages continues to be between the two parties themselves, without intervention from outsiders.

Ultimately it comes within the province of the representative heads of the Employers' Federation and the trade unions concerned, and at each step an additional sense of responsibility is introduced into the deliberations. The procedure is on a par with that laid down by different trade unions for dealing with members' questions which seriously affect union policy.

A criticism of the above procedure for dealing with differences which arise is based on the results noticed. In too many cases the conferences prior to the Central Conference are abortive, and there is a tendency for small matters to go the full distance of the available procedure before a decision is reached. Moreover, the removal of a local dispute to a national conference for settlement is a transition which is often not approved by the workpeople directly concerned.

Rates of Payment

The general policy of trade unions in the pre-war period in connection with rates of payment is discussed in the subsection on "Wages" in the preceding chapter. There it is pointed out that when the craft unions in the last century turned their attention to wages matters, they were quickly concerned with the development of uniform district minimum weekly time rates of payment for their members. Well-recognised district time rates, varying for different classes of skilled workers, were in existence before the War.

At first the trade union rates were not considered as applying of necessity to all trade union workers in the occupations to which they referred, but merely as rates for the average time-workers. Workers of special ability negotiated individually, or in groups, to secure additions, whilst payment below the rates to some workers was not uncommon, even in shops where labour was well organised. Soon, however, the craft unions insisted on all their members receiving at least the ordinary time rate as the minimum level of payment.

When the Employers' Federation was formed, the development of uniform district time rates proceeded more quickly, and the individual members of the Federation observed these rates as a standard for all workers in the different occupations to which they referred. Many workers, however, continued to receive a higher rate than that pertaining to their class of work, on account of special ability.

During the post-War period the policy of the unions has been to maintain the district time rates developed in pre-War days as the basis of payment for the different classes of engineering workpeople, whether employed by time or under a system of payment by results. The same actual monetary differences in the time rates exist in nearly all cases to-day as were found at the commencement of the War, but the

importance of these is much reduced on account of the substantial uniform additions to the rates and the comparatively large flat bonus awards which have been made since that time.

The craft unions were the only form of workers' organisation of any importance during the last century, and in the early years of the present century. Their outlook on wages questions was, for a time, rather narrow, and their policy confined to securing the best terms possible for their own members and for skilled workers in general. The appropriate unions endeavoured to establish a claim for much of the new special machine work, which developed at the end of the last century, to be done solely by skilled workers, and paid for at the full district rates. In addition, the craft unions opposed the encroachment of semi-skilled labour on to work which they considered the prerogative of the skilled man, and disagreed among themselves on occasions with regard to the boundaries of the work of the different unions.

During the whole of this period the craft unions secured relatively high wages for skilled workers compared with the payment obtained by other workers. During the immediate pre-War period, as a result of a steadily increasing membership, they were able to maintain the recognised time rates for their members in spite of considerable differences which existed in the character of the work carried out by men in the same occupations. The unions made the most of their strength by combined action in such matters, and the Amalgamated Society of Engineers' policy of uniform minimum rates for all fitters and turners, however employed, was given full support.

The quickly growing classes of semi-skilled workers bargained as best they could with individual employers over rates of payment. At times, when it suited their purposes, the craft unions made use of their powers to help these workers, but the support given was generally local in character and connected with details of wages. Trade union members realised, towards the end of the last century, that as the result of changes in methods of production they might be called on to do work very similar in character to that performed by semi-skilled workers receiving lower rates of payment than their own. This encouraged them to support the formation of other unions catering for semi-skilled classes of engineering labour. It also led certain of the important craft unions to admit semi-skilled workers to special classes of membership. With a wider industrial

basis they hoped to strengthen their bargaining power, and by improving the rates for their semi-skilled members, safeguard those of the craftsmen. Moreover, by grouping together in a special class of membership, certain sections of semi-skilled workers requiring approximately the same degree of skill in their work, the leading unions took a step towards checking the development of a large number of rates differing slightly on account of real or assumed small distinctions in the skill required.

Trade union members did not always approve of a change in policy which permitted semi-skilled workers to join their organisation and, as pointed out in Chapter III, the machinists section of the Amalgamated Society of Engineers, opened at the beginning of the century, was given little encouragement at first in many branches, whilst the labourers section opened in 1912 was a failure.

Incentive Systems of Payment

Until the last century was drawing to a close practically all engineering workers in the main branches of the industry were paid on a time basis. In some sections of the metal trades, where standardisation or repetition work was well established, piece-working was practised as a means of stimulating individual effort, and this system spread to general engineering factories during the last decades of the nineteenth century.

The trade unions for several years opposed any form of payment by results, and endeavoured to preserve time-work as the principal form of payment for their members. In the skilled sections of work the craft unions were able to prevent the quick development of piece-work or bonus systems. These methods of payment were more readily accepted by the unorganised semi-skilled workers, particularly the machine-men, as they yielded payment in closer accordance with individual ability, and helped to reduce the importance of the disparity between their time rates and those of skilled workers.

The guarantee of the recognised time rate removed, in part, the objections put forward by organised labour against systems of payment by results. The enhanced earnings of individual craftsmen and semi-skilled workers, employed on piece-work at the beginning of this century, further contributed to remove the barriers to the extended application of this system of payment. Gradually the attitude of trade

unions changed, but it will have been noticed from the agreements presented in the preceding chapter that the principal engineering union had terminated its agreements with the Employers' Federation, on systems of payment by results, just before the War commenced.

Under Government pressure a big increase in payment by results took place during the War. Most of the engineering firms were engaged on work of national importance, and the large-scale manufacture of war materials was conducive to the application of piece-working and bonus plans. When the War finished, trade unions found it difficult to take up again an opposing attitude to systems of payment by results. Moreover, engineering employers had profited by the experience of the war years, and by paying increased attention to the question of rate-fixing, and the determination of fair times and prices, removed another objection which had often been raised by trade unions against the operation of piece-work, or an alternative system of payment according to output.

The post-War period, during which the policy of standardisation and repetitive manufacturing has spread, has witnessed the further extension of piece-work and the introduction of a variety of wages plans under which earnings bear a close relation to output. The policy of trade unions has been to favour piece-work in preference to other systems of payment by results, especially those which are of an elaborate character, and to watch the earnings obtained by their members on different systems of payment by results, to ensure that at least the agreed minimum percentage above time rates is obtained.

The War Period

In the special conditions created by the War, trade union policy in general was directed towards furthering production, whilst maintaining as far as possible the "status quo ante bellum." Agreements relating to the length of the working week, the permissible amount of overtime, and similar matters were disregarded, and various other trade union regulations were waived in view of the exceptional circumstances.

The War hastened the breaking down of membership barriers erected by the trade unions. The craft unions feared a weakening in their bargaining power with employers should membership numbers fall considerably through trade

unionists going overseas. Several extended the privileges of membership to workers who had a very limited experience of the industry and could lay no claim to craft skill or a period of apprenticeship. Newcomers to the industry welcomed trade union membership for divers reasons, and during the War engineering trade union membership figures were practically doubled.

This open-door policy marks a turning point in the history of trade unionism. Many of the new members had no intention of remaining in the industry when the War ceased, and their attitude towards trade union matters and the engineering industry itself was quite different from that of the average regular worker in the industry.

Craft union principles may not have materially contributed to the development of a definite wages policy over the full width of the engineering industry, during pre-war days, but they had served the skilled workers reasonably well. They were sacrificed during the War in order that membership figures should be maintained, and since that time the claim that trade union membership is real evidence of the possession of craft skill, for which a recognised standard rate of payment shall be made, has been untenable.

Although large numbers of those inexperienced workers, given easy admission to the principal trade unions, left the industry in the years immediately after the War—incidentally depleting union funds considerably in several cases by long periods on benefit before complete secession—the damage was done. The leading unions have been more particular with regard to admission to full membership in the post-War period, but this is still fairly easily obtained.

Political Activity

The political side of trade union work has increased in importance. Opinions have changed with regard to what constitute the legitimate objects of trade unionism, and State activities in connection with wages and other labour matters encourage engineering workers in the belief that their interests can be furthered through politics. The majority of trade unionists give assent and financial support to a certain political creed, and there are not wanting those who suggest that organised labour, restricted in its effect through sectional interests which are difficult to remove with rapidity, may find a more convenient way of expression through the political machine.

Trade Union Structure

Since the War, the leading engineering unions have not only had to face the fact that many tradesmen are doing work similar in character to that done by men classed as semi-skilled, but they have witnessed an encroachment by this section of labour on to classes of machine- and hand-work—particularly the former—previously carried out only by skilled workers.

The principal craft unions appear to have given up the intention of strenuously opposing the advance of the general labour unions, and attempting to keep as much work as possible within their own province. As indicative of their realisation of the changing face of the industry, they are developing their own industrial sections as rapidly as the stalwarts, who still believe in the retention of craft principles, will allow.

This noticeable change in the structure of principal unions in the engineering industry suggests that the question of the relative merits of industrial and craft unions has been settled in favour of the former for present-day conditions.

The re-organisation which is taking place still leaves much to be settled between the engineering unions and the large body of workers in the engineering sections of the general labour unions.

The amount of combined working between engineering trade unions and the general labour unions, the number of amalgamations of engineering unions which have been made, and the action of individual unions in extending membership to all classes of workers in the industry, are pointers to the probable future policy of trade unionism in the engineering industry.

From the workers' point of view there is much to be said in these days, when a most efficient Engineering Employers' Federation exists, for a united front, so that a single line of policy can be developed.

It is reasonable to expect that further amalgamations will be made and more federated working take place. In fact, important changes in these directions are already in progress. The Federation of Engineering and Shipbuilding Trades is being widened to include the Electrical Trades Union and the Boiler Makers' Union. Also, certain of the small craft unions are considering the advisability of merging with other unions with which they have many things in common.

In spite of these developments, the day of the "one grand consolidated union" for all workers in engineering is still far distant. The praises of such an arrangement are often sung, and the obvious advantages—such as saving in expenditure, no overlapping in conference work, a single mouthpiece to the Government on engineering questions, and impressive membership—are backed up by others less patent. On the other hand, there are disadvantages which can just as easily be seen, and, what is more to the point, there would be considerable opposition from several trade unions, even if it were possible to safeguard the existing benefits of all trade union members, and to bring about the change in such a way that no official positions were jeopardised. Although combined working takes place on general questions, there is—especially in the case of the old-established unions—a rigidity which stands in the way of general amalgamation.

An alternative to one big engineering union is the development of comprehensive industrial unions for each of the main sections of the industry. A scheme of this kind, with properly co-ordinated action between the separate organisations of labour, would prevent any serious discrepancies between the wage differentials of the various branches, whilst the specialisation of industrial unionism would enable working conditions and wages questions to be discussed in more precise terms between the employers and workpeople.

Already there are examples of this form of organisation, and development along these lines would not stand in the way of larger amalgamations at some later date. The varying degrees of prosperity enjoyed by different branches of engineering is a condition favourable to the development of sectional industrial unions.

The industrial union can prove an efficient type of organisation, and should be instrumental in removing certain conflicting interests which are found between different classes of workpeople. In this form of union, sectional matters are subordinated to the majority interest, and each class of worker should stand to receive a more equitable share of the total wages sum which the industry provides.

Summary

In the last century the craft union was the only form of workers' organisation, and exerted a strong influence in

support of its own members. The short view prevailed, particularly in wages matters, and the unions had little time to devote to the interests of the unorganised workpeople. Standard district time rates of payment for trade unionists were developed. As might be expected, the craft unions, operating in an industrial field in which large numbers of workpeople had no collective voice, secured relatively good wages for their members.

The craft unions made their own bargains, and in driving them as much as possible to their own advantage applied the spur to the employers to find alternative and cheaper methods of production. This natural policy the employers pursued with zeal, and in a comparatively short space of time the members of the skilled crafts found increasing competition from workers on new types of machines, or engaged on hand processes of a specialised character.

The craft unions sought self-protection by endeavouring to establish sole claim to certain classes of work and to different processes of manufacture. A policy of "*saue qui peut*" led to demarcation rules which aggravated the differences between various sections of skilled and semi-skilled workers and restricted the development of manufacturing methods.

The difference in outlook on the part of the skilled organised workers and the new classes of machinists and hand workers prevented any rapid acceptance of the new order by the old. Until the War the quickly developing classes of semi-skilled workers were precluded from, or but coldly welcomed into, the craft unions. Those anxious for the protection which unionism could give them joined general labour unions. Then came the War years and "dilution" of the craft unions, since when they have made no serious attempt to revert to their former state. On the contrary, they are broadening the industrial base as quickly as possible, perhaps stimulated by the increased combination among employers, and certainly influenced by the rapid strides made by the engineering sections of the general labour unions.

Until the last quarter of the nineteenth century practically all engineering workers were paid by time. Since then several systems of payment in which the wage varies more closely in accordance with the output of the individual have been introduced. The trade unions have endeavoured to the present day to maintain the standard district time rates as the basis of payment for all workers; those on

systems of payment by results to obtain a percentage over their time rates which has been more precisely stated during the post-War period.

For several years the craft unions opposed the development of piece-work or any alternative system of payment by results. Gradually their attitude changed, and at the present time no opposition is raised by any union to the principle of payment according to output, but there are individual systems to which objection is taken.

CHAPTER VI

SYSTEMS OF WAGES IN ENGINEERING

IN previous chapters relating to trade union policy and to agreements between employers and workers on wages questions and working conditions, reference has been made to time wages rates, piece-work agreements, and the general position in connection with the operation of various systems of payment by results.

In subsequent chapters dealing with wages rates and earnings, a broad distinction only is drawn between time-workers and those on systems of payment by results. The proportion of time-workers to piece-workers and others paid by results is shown, but no attempt is made either to describe the different systems of payment by results which exist, or to show the extent to which each is applied in the industry.

It is convenient at this point to state in some detail what systems of wages are found in the engineering industry, and to indicate the relative importance—as measured by the extent of application—of the various systems of payment by results with which experiment has been made. In describing systems of payment by results it is not possible to mention many plans which have been tried in individual factories, but the material which follows deals with the principal systems under which most of the engineering work-people are employed.

Time-Work

Time-work requires little explanation. Workers under this system of payment are in receipt of accepted time rates which are based on the normal working week. A rate per hour is determined, and the worker is paid at this rate for the number of hours worked in the week. For work done outside the normal working day, payment is at an enhanced rate. Many time-workers, for special reasons, are in receipt of rates differing from those generally paid, but these rates and those for all other time-workers are constant, and pay-

ment does not vary directly in accordance with the quantity of work which is produced by the individual.

A rate a little in advance of the recognised district rate is frequently paid to certain workers in different sections of engineering, to encourage them to maintain output at a satisfactory level, or to preserve the quality of their work. The payment of a specially high time-wage to the main body of workers in a factory, as a means of securing a consistently high rate of output, does not, however, appear to be making much of a general appeal as an alternative to the various systems of payment by results.

When a high time-wage is paid, it is often confined to assembly work, where the speed of working is mechanically controlled, or to groups of workers engaged on sequential hand or machine operations—conditions not suitable for individual piece-work or any system individual in the character of its appeal to the worker.

In the Ford factories, for example, where assembly workers are paid a high flat time-wage, the pace of working is set by belt or conveyor, and standards of output are fixed for each worker. Close supervision is exercised and workers must keep in step with the rate of production which has been planned.

Under modern conditions of quantity production such as these, with repetitive operations carried out at an enforced rate, the high time-wage may prove quite successful in encouraging workers to maintain the level of output desired.

Piece-Work

There is consensus of opinion that among systems of payment by results, individual piece-working makes most appeal in the general run of engineering factories, and it certainly is, and always has been, the most extensively applied. Although there are no figures available of the numbers of engineering workpeople operating under each of the different systems of payment by results, it is considered that at least 70% are on piece-work.

Prices or times for piece-workers are fixed by mutual agreement between an individual employer and his workers, and the employer, when considering whether the system shall be instituted on an individual or collective basis, pays attention to the particular circumstances and conditions of the factory concerned.

However detailed and intensive a study may be made of employees before a decision is reached as to the amount of

work to be done in a certain interval of time, the employer finally has to fix a rate. This is the crux of all systems of payment, and piece rates which, in engineering, are an arbitrary choice on the part of an individual employer, are frequently the subject of criticism by the workers concerned. Within any factory, as specialisation proceeds, there is opportunity for standard prices to be fixed; but differences between the work done in various establishments and the different methods employed by firms engaged on work of a similar character, mitigate against the development of standardised piece lists which could be used over sections of the industry or throughout certain districts.

The guarantee of the time-wage, which is a feature of all systems of payment by results in federated firms, and most non-federated firms, too, in this country, has often been the subject of controversy. Several employers feel that there should be no such general guarantee safeguarding the lower limit of the worker's earnings, and that competent workers will regularly secure wages higher than this fixed minimum level. Organised labour is strongly in favour of the retention of the time-wage protection to those on systems of payment by results, maintaining that competent and conscientious workmen have in some factories regularly failed to earn, under a system of payment by results, an amount equal to the guarantee.

Ap[ro]pos piece-work, with the proviso that the time-wage is guaranteed, a "debt system" under which any deficiency in earnings is booked against the worker, and has to be made good out of subsequent earnings above the fixed base, stifles enthusiasm and has a pernicious effect on output. Reference has already been made to the gradual abandonment of this policy in federated firms during recent years.

From the employers' point of view, a piece-work system is simple and cheap to operate, easily understood, and gives a direct labour charge which is in constant direct relationship to achievement. In addition, it is a system which enables the worker to compute his earnings very easily, thus providing a definite incentive throughout the work. Enquiry among workers shows that a well-planned piece-work system is acceptable to them. They feel a certain sense of freedom, and are stimulated to display the full ability they possess, because the system gives a direct return to each individual for the effort he puts forth. Trade unions, generally, have shown a preference for straight-line piece-work when it has been a question of accepting a system of payment by results.

Ordinary piece-working is to-day an accepted system of payment, having grown steadily for more than half a century. The industry's familiarity with the system is a strong point making for its extended application when the manufacturing conditions are suitable for a system of payment by results to be introduced.

Differential Piece Rate.—The differential piece rate as used by F. W. Taylor in America in 1884 for repetitive work in machine shops has found no significant amount of support in engineering factories in this country.

The system consists of two rates, one much higher—30% to 50%—than the other. The lower rate is paid for all production below a certain level. Production at or above the standard or “task” figure means payment to the worker at the higher rate for all his output. For example, if standard production is fixed at 50 units in a day, and the two rates are 3*d.* and 4½*d.* per unit, a worker producing 49 units will receive $49 \times 3d. = 12s. 3d.$, whereas a production of 50 units would mean daily earnings of $50 \times 4\frac{1}{2}d. = 18s. 9d.$

The cardinal feature of the scheme is the big step up in payment when the set standard of production is reached. These standards of production, which must be carefully chosen, are difficult of attainment, and the plan is designed to appeal to first-class workers by providing a generous return if the high rate of output is achieved. No time-wages rate was guaranteed, and the lack of this, together with the comparative smallness of the piece rates given for production below the standard, led to the system being much criticised in its effect on the average worker. Many employers, too, at this time were chary of introducing a system the success of which was largely dependent on an accurate knowledge of the capabilities of their workmen and equipment and all the details of factory expense.

A variation of this system consists of a scale of piece rates for different quantities of output. For example:—

Output	400 pieces per day.	Piece rate	1 <i>s.</i>	per 100 pieces.
“	500	“	“	1 <i>s.</i> 1½ <i>d.</i>
“	600	“	“	1 <i>s.</i> 3 <i>d.</i>
“	700	“	“	1 <i>s.</i> 4½ <i>d.</i>
“	800	“	“	1 <i>s.</i> 6 <i>d.</i>

It will be observed that daily earnings increase from 4*s.* for an output of 400 pieces, to 12*s.* when the output is doubled. Each higher level of daily production attained by the worker

means that he receives a higher piece rate for the whole of his output.

Individual Premium Systems

The Bedaux System

During the last few years a considerable amount of interest has been displayed in the Bedaux system of payment. The system appears to have originated about 1915, and takes its name from Charles Bedaux, a French-Canadian. There does not appear to be any particular difference between this plan and several others, except in the claim it makes that all human effort may be measured in terms of a common unit made up of a combination of work and rest. The proportions of work and rest are dependent upon the nature of the effort and the subsequent relaxation required to compensate for it. The unit of human power measurement can be described in general terms as the amount of work a man of average ability could do in one minute when working at his normal speed under ordinary conditions, and availing himself of the full measure of permitted relaxation. This means that normal production is 60 units per hour for every individual, regardless of sex, age or occupation. The Bedaux measurement factor can be applied practically throughout an organisation, and by dividing the total number of units or points produced in different departments by the actual working times, in minutes, the output efficiencies of the various sections can be compared.

It should be remembered that the Bedaux and less-known Haynes-Manit system, which is very similar, are something more than mere systems of payment by results which can be introduced immediately into an existing organisation. The schemes have as their real objective improved production in the broadest sense, and include, in addition to a fairly extensive study of the human element, a critical examination of the objective conditions under which work is carried out. Reorganised layouts and methods of production are frequently introduced before a change-over is made to the Bedaux system of payment. The work involved, especially the fixing of the units of output for the various classes of workers, is not carried out by the firms themselves, but by the Bedaux Company, which has a staff of engineers, whose business it is to examine existing conditions, suggest alterations, and finally measure up human effort in terms of the Bedaux unit, when the actual con-

ditions under which the work is to be carried out have been determined.

Although the standard rate of output is defined by the Bedaux officials, the payment for the achievement of this level is a matter for negotiation between the workers and the management. It is not decided by the Bedaux engineers, whose function is limited to measuring or rating the work from the point of view of effort and time taken. It is a definite part of the Bedaux system that whether the standard output be attained or not, payment shall be made at the rate fixed for standard production. Output in excess of the 60 units per hour secures extra payment. A common arrangement—but not an essential feature—is that only 75% of the additional units or points produced is credited to the individual worker. The remainder go to a pool out of which various indirect workers, who are considered to have contributed to the earning capacity of the direct workers, are paid a bonus on their ordinary wages rates. The direct worker receives payment for the extra or premium points, with which he is credited, at the same rate he is paid per unit for the standard quantity of production. Each day's work may be considered separately for payment purposes, or the total for the whole week may be taken. Wherever possible, group payment is avoided, as the system is considered to be productive of better results when each employee is treated as a separate unit.

The Bedaux scheme endeavours to substitute accurate measurement for less exact information, and to pay bonus in direct proportion to the extra quantity of work produced by the individual above the standard set. It will be recognised that in attempting to employ a unit which consists of the effort required from a worker during each minute of his employment, very careful time study and precise measurement in relation to effort and achievement are necessary. The Bedaux system has this in view, but there are so many factors requiring study that although the units of speed and effort obtained by a Bedaux engineer are the result of numerous investigations, certain of the elements involved are dealt with in an arbitrary manner. For example, experience is relied on when assessing the normal effort which should be displayed, and the relaxation time allowed is another quantity which is chosen empirically by the investigator.

Only a few engineering factories have experimented with this system up to the present, but many employers have

evinced an interest in it. The establishment of a branch of the Bedaux Company in London, and a recent company flotation in connection with the Bedaux system, show that the organisation is a progressive one, and suggest that more may be heard of this method of payment—subject, perhaps, to certain modifications—in engineering factories in the near future.

The opposing attitude of labour generally to this system of labour measurement and payment by results is well known. Several industrial disputes have occurred over the introduction of the Bedaux methods, and in nearly every case where the system has been applied it has been viewed with suspicion and resentment by the workers. Organised labour has already expressed its opinion on this system, after obtaining information by means of a questionnaire sent out to various trade unions by the Trades Union Congress.*

The chief objections appear to be that the Bedaux engineers are not considered capable, in the limited time during which they are making investigations in a factory, of coming to sound conclusions regarding the capabilities of each individual worker; in view of the variety of work, the changing circumstances under which it is carried out, and the limited amount of knowledge regarding the capacity of individuals, there can be no certainty about the standards fixed; the introduction of the system usually means a considerable speeding-up of the workers; and the complexity from the worker's point of view in calculating the bonus for production in excess of the standard quantity, is greater in this system than in most other systems of payment by results.

The Bedaux Company has stressed its desire to work amicably with trade unions, disclaimed any intention of speeding-up workers in a way which is detrimental to health, and considers that the difficulties in the way of calculating bonus are exaggerated. It takes credit for a practical system which follows scientific lines, and provides a common measure for calculating efficiency and wage payments.

The Rowan System

The Rowan premium bonus system has been extensively applied in engineering factories, and is probably the best known of the individual bonus schemes used in engineering. It was introduced by Mr. J. Rowan, of Glasgow, in 1898, and can be said to have passed its zenith. It was steadily

* *Vide* "Bedaux" Trades Union Congress Pamphlet, 1933.

increasing in favour for certain classes of work during the pre-War years. During the War it was quite commonly used, but in the post-War years it has been on the decline. It belongs to an age which is passing. To-day rate-fixing is much more accurate and precise, as a result of the development of batch and quantity production, and the tendency is to choose a system of wage payment which works very closely in accordance with output. The Rowan system, which is better suited to less standard conditions of manufacturing, finds little opportunity to expand, and as the developments in production, mentioned above, encroach on work where it is applied, it is superseded by another system. Frequently it is piece-work which ousts the premium bonus system.

Under the Rowan system an estimate is made—with as close an approach to accuracy as can be secured without undue expenditure of time and effort—of the time the work should take for its completion. The worker is paid his ordinary time rate for the whole time taken, and if he takes less than the estimated or “allowed time,” a bonus is earned. The bonus is calculated on the time taken, and is in the ratio that the time saved bears to the time allowed. This bonus time is also paid at the recognised time rate. For example, if the standard time allowed for a piece of work is 10 hours, and the worker completes this in 7, thus saving 3 hours, he receives payment at his hourly rate for the 7 hours taken, and, in addition, qualifies for bonus. The bonus time is $\frac{3}{10} \times 7$ hours $\left(\frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time worked} \right)$. With this bonus time of 2.1 hours the worker thus receives, in all, payment at his customary hourly rate for 9.1 hours, whereas the work was completed in 7 hours. In the event of more than 10 hours being taken, there is payment at the hourly rate for the whole of the time required, but no bonus is earned.

The scheme is such that the share of the time saved, paid to the worker as bonus time, is a varying amount, greatest when the saving is least and decreasing in direct proportion to the increase in the time saved. Thus, when $\frac{1}{10}$ of the time allowed is saved, the worker receives, as bonus, payment at his customary rate for $\frac{1}{10}$ of this saved time. When $\frac{1}{5}$ of the standard time allowed is saved, the worker receives payment for $\frac{1}{5}$ of the saved time as bonus; $\frac{2}{10}$ saved from the time allowed means a bonus payment to the worker of $\frac{2}{10}$ of this saving, and so on. Expressed in an alternative form, under the Rowan system, when one-quarter of the

time is saved, the worker is paid time-and-one-quarter, and when one-half of the time allowed is saved, payment is at the rate of time-and-one-half. It will be seen that it is not possible for double time to be earned, however quickly the work be done. This system protects the employer in the event of a serious error in his original estimate of the time to be allowed for the work.

It will be recognised that if the Rowan system be used for repetitive work, the formula is one which gives the worker a smaller price per unit of product as the rate of production increases. In spite of its differential character, increased output means increased hourly earnings, and the Rowan System is not without supporters among different classes of workmen. As with any other system, it is as much a question of the times and prices allowed in individual factories as the fundamentals of the system, which make for its favourable or unfavourable reception by the workers.

Like piece-work, the Rowan system has a cheapness of operation which commends it to an employer. Piece-work entails expenditure connected with accurate rate-fixing, but once the rates are determined, the labour in estimating and costing is reduced. The Rowan system, by comparison, means less expenditure in fixing rates, since the setting of excessive standard times is not such a serious matter as generous piece prices from the employer's viewpoint. The direct labour cost of similar jobs is, however, not constant, and accurate estimating is more difficult. Also, there is more clerical labour needed for costing and wages computation purposes than is the case with piece-work.

Under the Rowan system, and others similar to it, where a bonus is paid dependent on the time taken or time saved from an "allowed time," the worker cannot visualise the reward for effort as clearly as with piece-work, and the stimulus is, therefore, less direct and effective.

The Halsey System

The Halsey premium system introduced by Mr. F. A. Halsey is of Canadian origin, and dates back to 1890. It is one of the oldest of the premium plans. The worker is paid the recognised time rate for the full time spent on a job, and if the work is completed in less time than the arbitrary standard fixed by the employer, the worker is credited with a percentage of the saved time. This saving is also paid for at the recognised time rate. For example,

if 10 hours be the time chosen by the employer, and the work is completed in 7, the worker receives payment at his hourly rate for the 7 hours taken and, in addition, obtains bonus. Assuming him to be credited with $\frac{1}{3}$ of the time saved—the fraction usually associated with Mr. Halsey's operation of the plan—this bonus will represent 1 hour's additional payment. Thus, the worker in this instance is paid at his customary rate for 8 hours for work completed in 7 hours. It is quite common to find half the time saved conceded as the worker's share, and when this is the case, the system is identical with the Weir plan introduced at the firm of Messrs. G. and J. Weir, Cathcart, Glasgow, in 1897.

It will be noticed that the Halsey and Rowan systems are similar in several respects, the essential difference between them being the way in which bonus is computed. The Halsey (or Weir System) appears to have been less generally used than the Rowan, but allowing for a less extensive application, the two systems have similar histories: they were introduced about the same time, increased in popularity before the War, continued to be made use of during the War, and are distinctly on the wane at the present time. The Halsey system, like the Rowan plan, is simple to understand and comparatively inexpensive to operate. The calculations which the worker must make to compute his earnings at any time are even simpler than those in the Rowan system, but their presence reduces the directness of the incentive as compared with piece-work with fixed prices, which method of payment stands in a class by itself in this respect.

Other Individual Bonus Plans

There are many individual bonus plans in existence which are restricted in application to a single factory or to a small number of firms, and American plans, such as the Emerson, Barth, Wennerlund, Bigelow, Knoeppel, Sherman, Baum, Diemer and Ficker, have found little direct application in the engineering factories of this country.

Several of the American systems, in their attempt to grade bonus in accordance with the attainment of certain standards of output, involve a considerable amount of clerical labour. Also, and as a corollary, they are not systems which enable workers quickly to ascertain the extent of their earnings at any time during the working week.

The majority of plans which are in operation conform to

one of four main types. When the bonus award is plotted against efficiency—as measured by the approach made to a chosen standard of production—a straight line is shown, a concave or convex curve obtained, or a stepped graph is the result.

The straight-line plans indicate bonus in direct proportion to efficiency over the whole range covered by the scheme. In those plans which show a concave curve a proportionately lower bonus return is made when efficiency is well below the standard. The rate of bonus payment increases as efficiency approaches, and exceeds the arbitrarily selected 100% level of production. On the other hand, in those schemes which give convex curves the bonus awards are proportionately greater to workers improving on a low standard of efficiency. Stepped graphs are the result of bonus awards remaining constant over chosen small ranges of efficiency, and such schemes are generally used with the intention of simplifying the amount of clerical labour required when the scheme is in operation.

It will be appreciated that schemes which give a concave curve are most suitable when the purpose of the bonus incentive is to increase the production of workers whose rate of output, without the bonus scheme, is considered fairly efficient, whereas schemes which show convex curves are more suited to those cases where an employer feels that, without the stimulus of the bonus system, nearly all the workers produce well below the level they are capable of reaching.

Emerson System

In the system devised by Mr. Harrington Emerson a standard time is fixed for a piece of work, and this, divided by the time taken for its accomplishment, gives the worker's efficiency.* The worker is guaranteed his time rate for all the time taken on a job, and if his efficiency is above 66⅔%, he receives bonus in addition. The bonus increases as the efficiency increases, and when standard time is attained, a bonus of 20% of the time wages is commonly paid. In the case, therefore, of a standard time of 10 hours, a worker completing the task in just this length of time would receive

* Whereas the term "efficiency" is used by engineers in the technical sense to denote the ratio of actual results to ideal performance, it is here used to signify the ratio of an arbitrarily chosen standard to the actual performance. This is the usual meaning of the word in connection with wages systems and the output of individuals.

payment for 12 hours at his customary hourly rate, but any worker improving on a time of 15 hours would come into the scope of the bonus system. It may be noted that at 90% efficiency the bonus is 10% of the time wages payable to the worker, and each increase of 1% efficiency from this point yields an additional 1% in bonus. From 90% efficiency upwards, therefore—even beyond the 100% efficiency mark—the bonus percentages plotted against efficiency percentages lie on a straight line, but between $66\frac{2}{3}\%$ and 90% efficiency they lie on a parabolic curve, and the bonus is very small in amount at first.

In practice the bonus is not usually paid for each job, but over a chosen period of time—a week or longer—a record is kept of the standard times allowed for all the work completed. This total time divided by the actual time taken on these jobs gives the worker's efficiency for bonus purposes. By extending the period for bonus computation in this way, Mr. Emerson considers that the worker is encouraged to sustained effort. The arrangement certainly has the advantage of reducing the amount of clerical labour required for the satisfactory operation of the system. This clerical work would be excessive in most engineering factories if each job stood on its own.

Gantt System

The severity of Taylor's differential piece rate was modified by Mr. H. L. Gantt, who felt that some incentive must be given to the average workman. His task-with-bonus system, introduced in America in 1901, was designed to utilise the strong stimulus of Taylor's plan and to avoid the effect of the low piece rate for production below the standard or task level. In this system time wages are paid for all the time taken and, in addition, the worker receives a substantial bonus for the satisfactory attainment of the set standard of production. This bonus varies in amount according to the nature of the task and the demands made upon the worker, but is commonly about 30% of the standard time allowed. In the original plan all bonus was sacrificed if the worker failed to reach the task standard, but afterwards Gantt modified his system, providing a graduated bonus scale with small awards commencing as soon as an efficiency of more than $66\frac{2}{3}\%$ was shown.¹

The original Gantt plan is not materially different in principle from some of the bonus schemes which are found

in operation in British engineering factories. In most of the bonus plans, however, which are used in this country, bonus is not concentrated wholly at one point, but, as in the Emerson and modified Gantt systems, varies in amount between certain limits, according to the degree of efficiency of the worker as measured by his approach to an arbitrary standard of production.

Lieu Rates

To workers who cannot easily be put on a system of payment by results, a bonus known as a "lieu rate" is sometimes paid, to encourage the maintenance of a good quality of workmanship, or a desired level of output. Millwrights, tool-makers and maintenance men are the principal classes of workpeople to whom such payments have been made. The term is also applied to special allowances above time rates paid to certain workers, normally engaged on piece-work, on occasions when they are employed on work for which no piece prices have been fixed.

"Lieu rates" are less encountered at the present time than formerly, on account of the spread of the policy of introducing a definite system of payment by results wherever possible. There is no uniformity in the amount which is paid. In some cases ten shillings per week is given, in others there is an addition of 25% to the base rate, whilst in some shops the amount of the "lieu rate" is equal to the average piece-work earnings.

Collective Bonus Schemes

It is recognised by employers generally that, as far as possible, systems of payment by results should be based on individual achievement. Individual piece-work is considered preferable to group piece-work, and the latter is frequently adopted only as an expedient when there are difficulties in the way of giving each man a separate job and price. Bonus schemes are also devised mainly to provide a return to each worker in accordance with individual effort.

There are, however, several engineering firms in which some form of collective bonus plan is in operation. Usually the scheme is quite simple in character, and supplements the existing system of wages payment under which the work is carried out. An additional stimulus of this kind may increase output when first it is applied, but it is difficult to determine how lasting is its effect. In some organisations the bonus-on-output plan applies only to a group of workers or one depart-

ment. In other firms, where the character of the work done is suitable, one bonus plan may be serviceable and applied to the whole factory. The common arrangement is to fix a standard of output, and if this be exceeded, to pay bonus on the time rates of all workers in the scheme, in direct proportion to the percentage increase of production above the standard which has been set.

The introduction of such a system leaves the existing wage structure unchanged, and if production increases above the standard, the worker secures additional remuneration. In comparatively few engineering factories is it possible to measure the output of the factory, as a whole, on a weekly basis with sufficient accuracy for a collective bonus system to operate. If a longer period is required over which to assess output in terms of bonus, the bonus to be paid to each worker may be spread evenly over the number of weeks which elapse before a further declaration is made, or, alternatively, paid in a lump sum.

Bonus on output plans capable of application over a whole factory are not practicable in a large number of engineering establishments, owing to difficulties in the way of measuring the product. Schemes for different sections of the workers can usually be put into operation quite easily if desired, and the production of standard units makes it easier to frame a suitable scheme.

The plan introduced at Priestman Brothers Ltd. in 1917 has proved attractive to some other engineering firms having similar conditions of manufacturing. The principles are similar to those which have been mentioned above. The scheme at its inception covered the staff, foremen, skilled and unskilled workers. The class of work made it possible for weight alone to form the basis of the "standard" chosen. Also, the rate of output of finished product was sufficiently constant for the arrangement of calculating output for periods of four weeks to be satisfactory. In the case of production above the "standard," the percentage increase was determined, and bonus of this proportion of the time rates of wages paid to all the workers concerned for the four following weekly pay-days. The scheme provided for adjustments in the "standard" according to the numbers engaged and the hours worked. Production below the "standard" meant a deficit which had to be made good in the following month before the surplus for bonus payment was declared.

In another engineering works where the product is simple enough in character for weight alone to form the basis of a

scheme suitable for application over the whole works, the labour cost per cwt. is the standard chosen. The net weight of output per month is determined. The net labour cost for the same period is obtained, and the labour cost per cwt. is then ascertained. This figure is added to the corresponding figures of the preceding two months and the average amount taken. This is compared with the standard labour cost of production per cwt., and a bonus declared proportionately to the reduction on the basic figure, *i.e.*, by whatever percentage the cost per cwt. is reduced below the base figure, each employee receives a bonus of a similar percentage on his time wage rate each week of the following month.

The scheme is subject to periodical reviews, when, as the result of changes in the product turned out, new investigations may be made which alter the agreed basic rate per cwt. The scheme is subject to termination on one month's notice from either side.

Pattern-makers' Bonus Scheme

Although pattern-makers signed a National Agreement in 1922, which provided for the operation of piece-work, if employers desired to introduce it, under terms similar to those which applied to other classes of engineering workers, it is still a common practice in federated firms for pattern-makers to be paid time rates of wages and to participate in a special bonus scheme.

The bonus scheme for pattern-makers, details of which appear in various local agreements made in 1919, is continued principally because of the disinclination on the part of this set of workpeople to accept piece-work, and certain practical difficulties in connection with the satisfactory operation of this system of payment. It is admitted, however, that many pattern-makers are now working directly under various systems of payment by results.

The bonus scheme for pattern-makers is of a different character from the group bonus schemes mentioned above, which do not relate to any special class of engineering worker. By the agreements made shortly after the War finished, relating to the payment of bonus to pattern-makers, employers were recommended to fix a labour cost for a pattern and to pay a bonus on the amount saved: the savings to be pooled and bonus paid to all pattern-makers in proportion to their wage rates. In fixing a labour cost, employees were to take into consideration the National Piece-work Agreement, which then provided for a man of average ability to

earn at least 33½ % above time rates. Since that time this percentage has been reduced to 25 %.

The pooling scheme was to apply to all firms, provided that those employing more than twenty pattern-makers should have the option of adopting a group system to fit in with the firm's system of management. Differences of opinion with regard to the original plan led to a memorandum which stated that the Agreement referred to a system of payment by results, and that the percentage mentioned was not guaranteed, but had to be earned. Pattern-makers agreed to co-operate with the employers to secure effective working of the adopted scheme.

Profit-Sharing and Co-Partnership

Closely related to systems of wages are profit-sharing and co-partnership schemes. There are comparatively few engineering firms where such schemes are in existence, and co-operation of this kind has never been a prominent feature in the industry.

These schemes are generally designed with the intention of doing something more than inspiring the workers to increase production and maintain quality. Their objects are to improve industrial relations, to encourage workers to give of their best in all ways, and to work harmoniously at their tasks. Although the aims are wide, the desirability of maintaining a consistently good level of output is not lost sight of when framing the schemes, and in several the distribution of profit takes place at frequent intervals, in order to encourage the worker to sustained effort. Where this is the case, the scheme is making an appeal similar in character to that of various bonus-on-output plans.

Summary

Systems of wages for engineering workers can be divided into two main classes, one in which payment is in strict accordance with the time spent by the worker, and the other in which payment varies in relation to the output of work. In time-work the usual arrangement is for the worker to receive payment at a rate per hour which is in conformity with well-recognised weekly time rates for different classes of workers in various parts of the country. For special reasons, certain time-workers are paid at rates which differ from those normally paid for their class of labour. The variations are comparatively small in most cases, but in a

few organisations time rates at a much higher level are paid to encourage a high rate of output.

Among systems of payment by results in engineering, piece-work stands out clearly as by far the most extensively applied. It was the first system to be employed on anything like a wide scale, and has always been used to a much greater extent than any other system of payment by results. Other schemes extensively used in engineering are comparatively few in number. In the main, the alternatives to piece-work are bonus schemes in which a time value is fixed for an article or operation, and workers completing the work in less time than that estimated share—in some defined proportion—in the saving which has been effected. The old-established Halsey and Rowan bonus plans are more critically examined by employers and workers to-day, and they are declining in use. Changes in industrial methods make them less serviceable than was formerly the case. There are many other plans in operation, mostly fairly simple in character, and designed to suit the special circumstances found in individual establishments.

The majority of schemes in operation are individual in appeal, and collective or group systems forming the sole means of wages are generally confined to workers for whom individual methods of payment by results are impracticable. Several collective bonus-on-output schemes are found supplementing time or piece systems of wages.

Trade unions, generally, have shown a preference for straight-line piece-work—with time rates guaranteed—when it has been a question of accepting a system of payment by results. Under this system the gain to the worker is in direct proportion to the quantity of work produced. Because of this, and the simplicity of the system, piece-work is more readily acceptable than several other systems of payment. Systems which are based on a lower rate per unit after production has reached a predetermined level, or schemes which require a series of calculations before the actual amount of bonus or the full extent of the earnings can be ascertained, have a serious handicap to overcome compared with piece-work.

Operation study involving micro-motion or stop-watch timing, and reorganised methods of production, is usually distasteful to workers. They are distrustful of an elaborate system of wages based on measurements and studies of this kind, and fear that the main object of the investigations, *i.e.*, lessened total cost of production, is wholly, or in part, to be realised at their expense.

CHAPTER VII

WAGES RATES AND EARNINGS IN THE PRE-WAR PERIOD

Pre-War Wages Statistics

In any study of engineering wages, the clearest distinction must be drawn between wages rates and earnings.

Reference has already been made to the development of wages rates in engineering, and records of weekly time rates for different classes of engineering workers date back many years, but prior to 1878 consecutive records are confined to one or two special districts. The Board of Trade Labour Department published information on wages rates at intervals before the War, and this can be supplemented by numerous trade union records dealing with standard district weekly time rates.

The early records relate to rates which had only local application, and provide an insufficient amount of material from which to construct time-rate figures for the industry as a whole. Even for those districts to which they refer there is no reliable information as to the proportion of men in the different occupations receiving the rates which are quoted. Gradually more uniform rates with wider application were developed, and for several years before the War there were well-recognised district weekly time rates observed not only in federated firms, but reasonably well over the whole of the main branches of the industry.

In this pre-War period, so long as workers were paid by time, their average earnings for a full normal week corresponded very closely to their recognised district time rates. Until 1875 systems of payment by results were of negligible proportions in engineering, so that up to this point the comparatively few wages rates which exist form a valuable index of the normal full-time earnings of all the workers to whom they apply. From this point onwards, as the practice developed of paying workpeople in accordance with the quantity of their output, at prices based on time rates, the wages rates become less and less reliable evidence of the earnings generally obtained.

The amount of short-time working, regular overtime or

work done outside the normal week, the prevalence of night working, with its higher rates, the number of hours normally worked each week, are other factors which need to be taken into consideration in determining the actual weekly earnings obtained. There is insufficient data available for the pre-War period to take any of these factors seriously into account. It may be mentioned that although the normal working hours per week varied in the different districts, and variations were found even in a single town, prior to 1870 about 57 hours were commonly worked weekly in engineering factories. This number had decreased to between 53 and 54 hours by the end of the century, and a working week of this length continued until the War commenced.

The Development of Piece-Work

From the Wage Census of 1886 it appears that 6% of the turners were on piece-work, whereas among the semi-skilled machine-men 11% were paid in this way. General labourers in the industry were nearly all paid by time, only 2% being piece-workers. The beginning of the century saw an increase in the amount of piece-working and the introduction of the premium bonus system. From this time onwards the numbers of those on systems of payment by results increased steadily. The percentages in Table 10 have been worked out from the information supplied in the 1906 Enquiry into Hours and Earnings, relating to the total numbers of workers in different engineering occupations in the United Kingdom paid by time and piece. The figures from which the percentages are obtained include those working more or less than full time in addition to the full-time workers.

Table 10

The Extent of Piece-Working as Shown by the 1906 Enquiry into Hours and Earnings

Occupation.	Percentage of Total Number on Piece-work in 1906.
Iron and Steel Moulders	24
Smiths	35
Turners	32
Fitters, Erectors and Millwrights	24
Machine-men	42
Platers	48
Riveters and Caulkers	37

It should be noted that the platers, riveters and caulkers referred to were those engaged in boiler-shops, and their number does not include shipbuilding workers. The percentages relate only to workers in engineering and boiler-making. By far the largest class, from the returns received, was that which includes fitters, erectors and millwrights. The term "millwright" had by this time a restricted meaning. It applied mainly to the body of workers engaged in the repair and maintenance of machine tools and other engineering equipment, and not, as formerly, to workers actually employed in the making of mills or machinery.

It will be noticed that the list does not include pattern-makers and joiners. These wood-workers were nearly all employed on a time basis. In view of the development of similar wages rates for fitters and turners, it is interesting to note that the percentage of fitters on piece-work at this time was smaller than that of turners. Although both classes of workers now show higher piece-working percentages, there still remains a smaller percentage number of fitters employed as piece-workers.

In 1913, according to an estimate made by J. W. F. Rowe in "Wages in Practice and Theory," 39% of the turners, 47% of the machino-men, and 9% of the general labourers were on piece-work. In July 1914 the Employers' Federation made an enquiry of its members, and the examination of some 980 returns, covering more than a quarter of a million men, showed that nearly 46% of the turners and 37% of the fitters were on systems of payment by results. 40% of the platers, riveters and caulkers, and 26% of the moulders were also on piece-work, or an alternative system of payment by results. Pattern-makers were still the set of tradesmen least affected by piece-working, but 6.7% worked on systems of payment by results at this time. 7.5% of the general labourers were piece-workers. Taking all classes of engineering workers together, nearly 31% of those in federated firms were, at the outbreak of War, working under a system of payment by results, and the majority of these were on piece-work.

6

Earnings of Piece-Workers and Time-Workers Compared

According to the careful estimate made by J. W. F. Rowe in "Wages in Practice and Theory," turners on piece-work in 1886 received on an average a little more than 14% above time rates in a full normal week. This percentage can be considered as sufficiently accurate for the fitters then on

piece-work. Machine-men employed on piece-work earned nearly 22% above time rates, while the few labourers who were paid at this time by piece increased their earnings by about 29%. From the 1906 wage census returns both turners and machine-men on piece-work received earnings which were some 18½% more than those of time-workers in the same occupations. Fitters on piece-work received nearly 16% more than if employed by time. The position was substantially the same in 1913, with turners and machinists earning on piece-work about 19% more than their weekly time rates and fitters a slightly less percentage.* The few general labourers employed on a piece-work basis increased their earnings by approximately 31%.

Average Full-time Earnings in 1886, 1906 and 1913.

The proportion of those on piece-work in various engineering occupations has been stated for 1886, 1906 and 1913, as well as the percentage increase at those dates in the earnings of piece-workers compared with those paid by time. The approximate weekly full-time earnings for all workers (time- and piece-workers combined) in the different engineering occupations in these base years can, therefore, be obtained if the average earnings of the time-workers in the various occupations are known.

The average full-time earnings of men on time rates in the main engineering occupations were recorded at the wages censuses of 1886 and 1906. These figures are given in Table 11, together with an estimate for 1913.

The 1906 wages enquiry quoted one combined figure for machine-men, but in 1886 separate figures were given for different classes of machine workers. The figure of 21s. 10d. for machine-men in 1886 is the result of combining the time wages of planers, shapers, slotters and borers, drillers and screwers, in a weighted average according to the numbers in the different classes.

According to the Board of Trade Index—which covers shipbuilding as well as engineering—of changes in the rates of wages, there was a general rise between 1906 and 1913 of approximately 4%. The 1913 figures for the average time

* Enquiry among a number of older engineering workers suggests that the piece-work earnings of fitters and turners were nearer 25% above weekly time rates in 1913. Support is also given to this higher figure in an article entitled "The Wages of Engineers" appearing in *The Times Trade and Engineering Supplement*, 6th March, 1926.

wages have been obtained by assuming this advance to apply uniformly over the different classes and adding 4% to the 1906 figures. In view of the growing organisation among the semi-skilled machine workers at this time, and the continued strength of the principal craft unions, it appears likely that these classes of workers would secure at least the 4% increase. From the details which follow relating to the movement of time wages rates for skilled men in the Manchester District, it is clear that these workers obtained an increase in time wages rates of approximately 7% during the same period. It is questionable whether the rate for labourers made any general advance over the period.

TABLE 11

The Average Full-Time Earnings of Men Time-workers at the Wages Censuses in 1886 and 1906

	Average Time Wages per Week.		
	1886.	1906.	1913.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Turners	29 6	34 2	35 6
Fitters	29 2	34 8	36 0
Machine-men . . .	21 10	27 0	28 1
General Labourers . .	17 10	20 5	21 3

Due to the small proportion of workers on piece-work in 1886, the weekly earnings of each class of workpeople at this time show little change from the average time wages appearing in Table 11.

The average earnings of all fitters and turners in 1906 were approximately the same, and slightly in excess of 36s. for a full week. Machine-men received average earnings of 29s. This position is more easily observed by the introduction of Table 12, which shows the average earnings at the wages census in 1906 for time- and piece-workers in the chief engineering occupations. From Table 12 and from the proportion of piece-workers in each of the main engineering occupations given in Table 10, the average earnings for each class of workpeople in 1906 can be ascertained if desired. It may be mentioned that at this time the average earnings of all general labourers were 21s., which figure is less than 3% above the average earnings of those labourers paid by time.

In 1913 the average earnings for all turners for a full

normal week were a little more than 38s., *i.e.*, about $7\frac{1}{2}\%$ greater than the average earnings of time-workers in this occupation. Fitters' earnings were approximately the same as those for turners. Machine-men obtained 30s. 6d. as a general average of earnings, *i.e.*, nearly 9% above the figure given for time-workers in this category.

The small percentage number of labourers on systems of payment by results still left labourers' earnings for a normal week less than 22s., *i.e.*, only 3% above the average time wages for this class of labour.

TABLE 12

The Average Full-time Earnings of Men in the Chief Engineering Occupations, in the Last Pay Week of September, 1906
(Board of Trade Enquiry into Hours and Earnings)

		<i>s.</i>	<i>d.</i>
Pattern-makers	Time-workers.	37	3
Joiners	Time-workers.	33	8
Moulders (Iron and Steel)	Time-workers.	36	11
	Piece-workers.	41	2
Smiths	Time-workers.	34	0
	Piece-workers.	44	6
Turners (other than brass)	Time-workers.	34	2
	Piece-workers.	40	6
Fitters, Erectors and Mill-wrights	Time-workers.	34	8
	Piece-workers.	40	1
Machine-men (Planers, Borers, etc.)	Time-workers.	27	0
	Piece-workers.	31	11
Platers (Boiler-shops)	Time-workers.	38	11
	Piece-workers.	47	1
Riveters and Caulkers (Boiler-shops)	Time-workers.	36	7
	Piece-workers.	45	8

The figures for piece-work earnings are exclusive of the earnings of men returned as working under individual bonus systems. The number of such workers was not great in 1906—about 1 in 80 of all male operatives.

It is not proposed to make a detailed and critical study of the relative positions of the different classes of workers during the pre-War years, but the following points are of interest. Whether time rates or full-time earnings records are studied, the relative positions of the various classes of workers are shown to have undergone little change from 1880 until the War. When advances or reductions were made in the rates for skilled grades, they were followed by approximately equivalent percentage alterations to the rates of

machine-men and unskilled workers. Also, alterations in time rates were accompanied by changes in piece rates which tended to prevent normal piece-work earnings from moving too far away from time wages rates. Difficulties in the way of transferring pattern-makers to piece-work, coupled with the increase of piece-working in other occupations resulted, towards the end of the pre-War period, in the pattern-maker slipping downwards a place or two in the scale where full-time earnings are the determinant factor in the placings of the different classes of workers.

The general averages hide certain interesting details with regard to the different classes of workers. The same occupation if carried out in different branches of the industry frequently meant payment at different rates. District rates for similar work varied in a way which could not always be considered as bearing a close relationship to differences in the cost of living at these places. Each occupation covered a wide range of work, and often considerable differences existed in the skill demanded of workers in the same category in an individual factory. In some cases the differences were recognised by payment at an enhanced rate to those whose work was of a higher order. Extra payment of this kind demonstrates that the skill required had an influence on the rates obtained, but how far this was responsible for the wage differentials existing, it is difficult to determine.

The fact that the rates of large numbers of skilled workers in different classes were approximately the same shows the operation of other factors. The existence of these is made further evident by the fact that once differences in payment were established, they tended to remain in force in spite of changes in the skill required by the workers, and alterations in methods of production. Not only did differences in payment persist, but often they remained of the same monetary amount, although the basic rates showed substantial alterations.

The Movement of Time Rates of Wages up to the War

In the Manchester District there is a longer consecutive record of time rates for tradesmen in engineering than is available in most other parts of the country. Table 13*

* This Table is compiled from information supplied by the Manchester District Engineering Employers' Association. The time rates of wages shown are in close conformity with those in the Table prepared by Mr. G. H. Wood for engineering wages in Manchester, appearing in "Wages in the United Kingdom in the Nineteenth Century"—Bowley.

gives details of the movement of the time rate of wages in the Manchester District for fitters and turners from 1879 until the War. In this district these two classes of workers have always received practically the same rate. The time rate for smiths with single-handed fires has also been approximately the same in this period as that for fitters and turners. Blacksmiths with double-handed fires obtained a higher rate—frequently an addition of 2s. The rates for iron-moulders and pattern-makers in this district, as elsewhere, were above the rates for fitters and turners. Although moulders and

TABLE 13

The Pre-War Weekly Time Rate of Wages of Fitters and Turners in Federated Firms in the Manchester District

Date.	Wages Movement.		Result in Time Rate of Wages.
1879. Jan. 1st.	<i>Reduced.</i>	If receiving under 28s., 1s.	31s.
1882. Feb. 11th.	<i>Advanced.</i>	28s. or over, 2s.	33s.
1886. Mar. 19th.	<i>Reduced.</i>	If receiving under 28s., 1s.	31s.
1888. Jan. 5th.	<i>Advanced.</i>	28s. or over, 2s.	33s.
1896. Oct. 5th.		Receiving under 30s., 1s.	34s.
1897. Jan. 1st.		30s. and over, 2s.	35s.
1906. Nov. 3rd.		Receiving under 30s., 1s.	36s.
1906. Dec. 1st.		30s. and over, 2s.	37s.
1908. Jan.		1s. per week.	38s.
1909. Feb. 13th.		1s. "	37s.
1912. Nov. 16th.		1s. and 2½% on piece rates.	38s.
1913. Jan. 11th.		1s. and 2½% " "	39s.

pattern-makers were in separate craft unions, and negotiated separately with employers on wages questions, their rates were similar in amount and showed approximately the same movement. Pattern-makers in this district were commonly paid 4s. above the fitters' weekly time rate, irrespective of the section of the trade in which they followed their calling. Brass moulders received payment at a lower weekly rate than iron sand moulders, the difference being about 3s. This disparity remained until 1920, when brass-moulders concluded an agreement under which their rates were advanced to correspond with those for iron-moulders.

The Manchester figures are the ordinary time rates for

fitters and turners employed on general engineering and machine-tool manufacturing. These classes of workers, if engaged in the making of certain textile machinery or on sections of locomotive building, received 2s. less per week. On the other hand, fitters and turners in tool-rooms generally received 2s. above the ordinary district time rate.

The combined average weekly wages of pattern-makers, moulders, turners and fitters from 1850 to the War, at selected dates, expressed as index-numbers with the year 1900 = 100 are given in Table 14, which is an extract from the full table appearing in "British Engineering Wages," by R. S. Spicer.

From 1850 to 1878 the wages rates refer to the Manchester District. From 1879 to 1913 the Board of Trade Index based on 36 District Rates has been used.

TABLE 14

The Average Weekly Wages Rates of Pattern-Makers, Moulders, Turners and Fitters (1900 = 100)

1850	.	.	.	.	.	73
1855	.	.	.	.	.	79
1860	.	.	.	.	.	79
1865	.	.	.	.	.	82
1870	.	.	.	.	.	83
1875	.	.	.	.	.	93
1880	.	.	.	.	.	88
1885	.	.	.	.	.	90
1890	.	.	.	.	.	93
1895	.	.	.	.	.	93
1900	.	.	.	.	.	100
1905	.	.	.	.	.	100
1910	.	.	.	.	.	102
1914	.	.	.	.	.	105

This Board of Trade index includes shipbuilding, but the changes in the pre-War period were very similar in these two industries. As regards the actual level of wages in shillings per week, there is a slight variation between the bases of the two sources corresponding to the different areas covered by them. The Manchester rates in the earliest period tend to be slightly higher than the unweighted Board of Trade figures, which include smaller districts with lower rates. It is considered that the disparity in the actual level between the two sources does not affect their validity as a measure of the fluctuation taking place.

The true average wages rate for the base year 1900 has been assessed by R. S. Spicer at 37s. 10d., but this figure

appears to be high, even allowing for the fact that the rate includes pattern-makers and moulders in addition to the lower-rated but larger numerical classes of turners and fitters. That this figure is high as an average for the country is supported by the previous wages material, and by the results of an enquiry into the rates of wages prevailing in October 1905. This enquiry by the Board of Trade (Cd. 3864, 1908) was complementary to one into working-class rents, housing and retail prices, with which the wages figures are included. The range of weekly time rates, recognised as "standard" by the trade unions concerned, for certain skilled occupations, and for labourers in the engineering trades as recorded by this official enquiry, are given in Table 15.

TABLE 15

The Recognised Weekly Time Rates for Certain Classes of Engineering Workers as given by a Board of Trade Enquiry, 1905

<i>Occupation.</i>	<i>No. of Towns Included (England and Wales).</i>	<i>Range of Weekly Time Wages at Oct. 1905.</i>
Fitters	61	32s. to 36s.
Turners	61	32s. to 36s.
Pattern-makers	58	34s. to 38s.
Smiths	57	32s. to 36s.
Labourers	39	18s. to 22s.

As only a slight increase took place in the level of time wages rates between 1900 and 1905, the rates in Table 15 can, therefore, be considered as approximately those which were in existence in 1900. The figures in Table 15 show the range of weekly time rates only, but from those relating to fitters, turners and pattern-makers—bearing in mind the comparatively small number of the latter—and from the earnings figures in Table 11 for fitters and turners on time-work in 1906, it is reasonable to infer that the average time rate, for the three classes of workers combined, was between 34s. and 35s. in 1900. The inclusion of moulders, a class larger than pattern-makers but much smaller than either fitters or turners, would, it is considered—allowing for their high rate—still leave the average weekly time rate of wages for these four classes of skilled workers in the neighbourhood of 35s.

Any comparison between the movement of wage rates in the chief occupations and changes in the skill required from these workers, is complicated by the continual changes taking place in the methods of manufacture of most engineering products, the improvements in machine tools, and the specialisation of work which has occurred. These and kindred matters have been dealt with in Chapter II. From what appears there, it might be expected that if wages rates had moved closely in accordance with the skill required, the gap between the rates for moulders and pattern-makers and the rate for fitters and turners would have widened. In point of fact no change of any consequence took place in this direction. How far fitters and turners maintained their position through trade union influence and the "united front" policy of the Amalgamated Society of Engineers is not ascertainable, but beyond the natural conservatism of the industry opposing any alteration in the existing wage structure, there seems little else which stood in the way of changes being effected. This leading union strenuously pressed for a uniform minimum rate for all fitters, despite variations in the work performed, and another uniform rate of practically the same dimensions in most districts, for all the skilled machine workers classed as "turners," among whom also there was considerable variation in the skill required for the work performed by different individuals.

*The Economic Position of Engineering
Workers : Pre-War*

If the index-numbers in Table 14 be considered in relation to changes in food prices as measured by the Board of Trade Index of Retail Food Prices from 1892, and prior to this by the Sauerbeck index for wholesale food prices, it will be found that by this rough measure the workers' position was best about 1896. After a long period during which wages had shown an upward trend and prices had moved, if not steadily, in a general downward direction, a point was then reached where the time wages level stood above the level of prices. After two or three years, food prices started on an upward movement which was not accompanied by a corresponding increase in time wages rates. In the first few years of the century the time wages level remained practically unchanged, and the slow but steady upward movement of prices widened the gap between them. During the decade before the War, food prices continued to rise at a faster rate than the rise in wages rates, so that by 1914 the true position

of the skilled time-worker in engineering was probably more unsatisfactory than when the century opened. The increasing amount of piece-work to which reference has been made, and the earnings obtained in this way, enabled a number of engineering workers to offset the upward movement in prices that was in progress.

Summary

Accurate statistics regarding the earnings of engineering workers in the pre-War period are difficult to obtain, on account of insufficient data relating to several factors which have an important bearing on this question.

The varying time rates originally fixed between employers and workers in individual factories in any district were followed by more uniform rates for the different classes of workers, and these rates resolved themselves into well-recognised standard district weekly time rates of fairly general application throughout the industry some years before the War commenced.

As the rates of payment became more uniform over the industry, the time-rate records which are available provide more reliable evidence of the earnings generally obtained by time-workers in the classes to which the rates apply, and for the immediate pre-war years the full-time earnings of time-workers corresponded very closely to their weekly time rates.

Until 1875 nearly all engineering workers were paid by time, but from that point onwards, as the practice developed of paying workers according to output, principally on a piece-work system, there was a continually increasing proportion of workers in most of the main occupations whose time rates are unreliable as indicators of the earnings obtained.

The extent of the development of systems of payment by results, enabling earnings well in excess of time rates to be obtained, is shown by the fact that taking all classes of engineering workers together, 31% of those in federated firms were working under such systems at the outbreak of the War. It has been estimated that about this time turners and other machinists on piece-work were earning approximately 19% more than if paid by time, whilst the percentage in the case of fitters was slightly less.

Pattern-makers were the class of skilled workers least affected by systems of payment by results, and the proportion of fitters paid in this way was consistently smaller than that of turners. Generally speaking, piece-work and bonus

systems were developed more quickly among semi-skilled workers—especially those on machines—than among the different classes of skilled men. This was partly due to the nature of their work, and for this same reason a very small percentage of labourers was paid by piece or any alternative system of payment by results.

From information relating to the proportions of time- and piece-workers in the chief engineering occupations, and the average earnings of both classes, the average earnings of time and piece-workers combined has been estimated for these occupations at various periods prior to the War.

In 1906 the average full-time earnings of turners and fitters were approximately the same, and slightly in excess of 36s. a week. Machine-men received average full-time earnings of 29s., and general labourers obtained 21s. In 1913 the average full-time earnings of fitters and turners were a little more than 38s., or about $7\frac{1}{2}\%$ above the average full-time earnings of turners paid by time. Machine-men then received 30s. 6d. weekly, which represented nearly 9% increase on normal time earnings, but the average full-time earnings for all general labourers were less than 22s., and showed an increase of only 3% above the normal full-time wages of the labourers paid by time.

In the Manchester District, studied because of its long consecutive record of time rates, the time rate of wages for fitters and turners was the same, and increased gradually from 31s. in 1879 to 39s. in 1913. Moulders and pattern-makers in this district, as in several others, have always received higher rates. In many districts these two classes of workers received similar weekly time rates, which at the outbreak of War were 2s. to 4s. higher than those paid to fitters and turners. The standard time rates for fitters and turners in the large centres of engineering were fairly comparable at the end of the pre-War period. In these top-rated districts the rate lay between 38s. and 40s. per week, but in the majority of districts in which engineering work was carried out the rates varied between 35s. and 37s. for these workers, who formed a large proportion of the skilled operatives.

Whether time rates or full-time earnings are chosen as the standard of measurement, for most of the pre-War period there is little difference in the relative positions of the different classes of workers. Towards the end of the period, however, as the result of the considerable increase in piece-working in most of the occupations except pattern-making,

pattern-makers descended two or three places in the scale where full-time earnings decide the position.

Comparisons between the movement of wages rates and changes in the skill required in the principal occupations are complicated by changes in methods of manufacture, improvements in machine tools and the specialisation of work. Where it has been possible to assess changes in skill it is found, however, that wages rates have not moved in accordance with the amount of skill required, owing to the operation of various factors, including the influence of trade unions.

When earnings are considered in relationship to the cost of living, it appears that the worker was in the best position about 1896. The increase in food prices in the decade before the War, at a rate faster than the increase in wages rates, placed the skilled time-worker in 1914 in a less satisfactory position than he occupied at the opening of the century. The development of piece-working, however, enabled an increasing number of engineering workers to avoid any worsening of their position through rises in the cost of living unaccompanied by commensurate advances in time rates.

CHAPTER VIII

WAGES RATES DURING THE WAR, AND WAGES RATES AND EARNINGS IN THE POST-WAR PERIOD

Wages Rates During the War

Increases in Time Rates

SOON after the War commenced, several claims were made by engineering workers, largely as the result of a rising cost of living, for increases in wages. At first the system of local settlement continued in force, and increases were granted from time to time, which by the end of 1916 amounted to approximately 7s. on the pre-War time rates in the industry. At this time so many claims were forthcoming that it was imperative for some more general means to be adopted for dealing with applications. An agreement was reached, following negotiations between the employers and trade unions, which provided for wages claims to be dealt with on a national basis at frequent intervals, and adjusted the time rates so that a 7s. uniform advance on pre-War figures had been granted by April 1st, 1917. This National Wages Agreement, made in February 1917, and the machinery provided for dealing with claims for district and general alterations in wages, have been referred to in Chapter IV.

Wages increases occurred at frequent intervals from early 1917 until the middle of 1920. In view of the number of these increases,* they have been stated in Table 16 and, merely as an example, their effect shown on the full-time wages of fitters and turners in the Manchester District, employed as time-workers. The wages movement of these two classes of workpeople was the subject of special mention in

* Boys and youths under 18 years of age in the industry during the War received only part of the war bonus. In each case an award was made they obtained one-half of the full amount, with the exception that they received no part of the final 5s. granted in December, 1919. Thus their bonus finally reached a total of 10s. 9d. per week.

the preceding chapter, and their time rate, which was 39s. in July 1914, had increased to 46s. before the National Wages Agreement was made in February 1917.

TABLE 16

General Increases to Engineering Workers following the National Wages Agreement of February 1st, 1917

Award.	Date.	Increase.	Fitters and Turners (Time-workers). Manchester District.	
			Full-time Wages.	% Increase from July 1914 Rate of 39s.
Committee on Pro- duction. Award No. 689.	March 1st, 1917.	5s.	51s.	31
Committee on Pro- duction. Award No. 105.	July 14th, 1917.	3s.	54s.	38
Ministry of Muni- tions. Award No. 1061.	Oct. 13th, 1917.	12½%	60s. 9d.	56
Committee on Pro- duction. Award No. 430.	Nov. 6th, 1917.	5s.	66s. 4½d.	70
Committee on Pro- duction. Award No. 1920.	July 24th, 1918.	3s. 6d.	70s. 3½d.	80
Committee on Pro- duction. Award No. 2800.	Dec. 1918.	5s.	75s. 11¼d.	95
Court of Arbitra- tion. Award No. 870.	Dec. 1919.	5s.	81s. 6¼d.	109
Industrial Court. Award No. 180.	Mar. 1920.	3s.	84s. 11¼d.	118
Industrial Court. Award No. 180.	May 1920.	3s.	88s. 3¾d.	126

The increases, with the exception of the 12½% and the two awards of the Industrial Court, were classed as war bonus, and applied to all engineering workers aged 18 years and over, whether paid by time or working under a system of payment by results. This war bonus finally amounted to

26s. 6d. in December 1919. The $12\frac{1}{2}\%$ was granted to time-workers only, and was added to their total weekly earnings. The final two awards, each of 3s. in amount, were increases to the time rates of wages for those aged 21 years and over, thus making a total increase of 13s. in time rates between 1914 and the middle of 1920.

Increases in Piece Rates

The position of piece-workers was considered at various times during the War and in the immediate post-war period, and these workers, in addition to obtaining the full War-bonus awards, generally received an increase in piece prices when additions were made to the time wages rates. It was a common practice to increase piece prices by $2\frac{1}{2}\%$ from the 1914 level for each 1s. advance in time rates. Thus, the 7s. advance in time rates which was made uniform over the industry in February 1917, under the National Wages Agreement, was accompanied by percentage increases in piece rates amounting in most cases to $17\frac{1}{2}\%$ above 1914 figures. Until 1919, however, as it was pointed out in Chapter IV, there was nothing fixed regarding the minimum percentage which a piece-worker should earn above time rates. Piece-workers considered that they should receive an advance comparable with the $12\frac{1}{2}\%$ on total earnings granted to time workers in October 1917, and in January 1918 they were granted a $7\frac{1}{2}\%$ addition to their total earnings. When the time rates were again increased, by the Industrial Court awards in 1920, piece rates were also advanced, in most cases by $7\frac{1}{2}\%$ for each 3s. increase to time-workers.

Wages Rates : Post-War

Reductions Following the War

Sweeping general reductions in engineering wages were made in 1921 and 1922, amounting to 16s. 6d. of the 26s. 6d. war bonus, 6s. of the 13s. increase in time rates which had been made since 1914, and the removal of both the $12\frac{1}{2}\%$ increase on earnings to time-workers and the $7\frac{1}{2}\%$ which was granted to piece-workers. In addition, piece-work rates were reduced when the basic time rates were brought to a lower level. These reductions left the engineering workers with time rates 7s. above pro-War levels in most instances, and in possession of a flat bonus of 10s. per week.

The full details of these reductions, which were of national application, are given in Table 17.

TABLE 17

The Fall in Engineering Wages during 1921 and 1922

Date.	Nature of Change.
July 15th, 1921.	<i>Reductions.</i> 3s. from time rates and a corresponding reduction on piece rates. ⁴
Aug. 15th, 1921.	3s. from time rates and a corresponding reduction on piece rates.*
Nov. 1st, 1921.	4½% of the 12½% granted to time-workers and 2½% of the 7½% granted to piece-workers.
Dec. 1st, 1921.	Further 4½% from time-workers and 2½% from piece-workers.
Jan. 1st, 1922.	Final 4½% from time-workers and the remaining 2½% from piece-workers.
July 31st, 1922.	5s. 6d. war bonus.
Aug. 28th, 1922.	5s. 6d. „
Sept. 25th, 1922.	5s. 6d. „

* A shilling advance in time rates was generally accompanied by an increase of 2½% in piece prices. When deductions were made from time rates an appropriate decrease was made in the piece-work price or time.

Subsequent Increases in Basic Wages

After the serious reductions detailed above, an application was put forward by the trade unions in 1924 for a uniform advance of 20s. per week to all adult workers. It appears that a difference of opinion existed among the various trade unions regarding the amount which should be sought. The employers desired that the unions should reach unanimity with regard to a figure, and put this forward collectively for discussion. A figure of 20s. was chosen, but it is doubtful whether the union leaders, in their most optimistic moments, considered that any sum approaching this figure—which was put forward more as a reminder of the large reductions which had been made than as a practical proposition—would come out of the negotiations.

A most protracted set of conferences followed the application for the pound increase, and in June 1927 an offer was made to increase the bonus of all plain time-workers, aged 21 years and over, by 2s. per week. After a ballot vote of their members the unions accepted this offer. Piece-workers did not receive this bonus increase, nor were piece rates increased at this time.

The various forms of merit increments, existing in engineering factories, caused some confusion as to how far the 2s. bonus granted to time-workers might be extended. Both employers and trade unions desired the application of the bonus to be uniform and equitable, and recognised that, on account of its restricted scope, there would be border-line cases over which difficulties might arise.

As a guide to the payment of the bonus, it was decided at a conference between the Joint Committee of the Employers' Federation and the Engineering Joint Trades Movement that all time-workers on district rate should be eligible for the advance, even if their district rate were enhanced by an increment in respect of ability or merit. Workers on systems of payment by results were outside the award, as were also staff workers on an upstanding wage; and the bonus was not payable to workers whose wages fluctuated in accordance with the wages of those employed in other industries. Finally, "workers in receipt of an increment to their district time rates, if that increment is granted in respect that the workers in question are not employed on a basis of payment by results," were declared ineligible for the bonus. Under this decision "lieu rate" workers found themselves debarred from obtaining the advance which had been made.

The end of the negotiations in 1927 was the commencing point for a fresh series of conferences to discuss an application by the unions for an all-round increase of 8s. per week. In 1935 one stage of these negotiations was completed by the granting of a 2s. increase in bonus to all adult male workers, whether employed by time or working under a system of payment by results. This bonus was granted in two equal instalments, the first payable in May, and the second in July 1935.

In June 1936 a second stage was concluded, when the Employers' Federation conceded a further 3s. per week advance in bonus to all male workers, whether paid by time or working under a system of payment by results. One shilling of this increase applied from the beginning of July, the second shilling was paid in October, and the final instalment in January 1937.

The bonus increases from 1927 onwards are shown in Table 18, and it will be realised that, at the present time, the time-worker is in receipt of a bonus of 17s., whilst the piece-worker's bonus is 15s. per week.

TABLE 18

General Bonus Awards, from 1927, to Engineering Workers in Federated Firms

Date.	Award.
August, 1927.	2s. Bonus to time-workers, 21 years and over.
May, 1935.	1s. „ all male workers 21 years and over.
July, 1935.	1s. „ „ „ „
July, 1936.	1s. „ „ „ „
October, 1936.	1s. „ „ „ „
January, 1937.	1s. „ „ „ „

In Table 19 the movement of the time wages of fitters and turners in the Manchester District from 1921 onwards is given, and Tables 13, 16 and 19 together provide a consecutive record of full-time time wages of these skilled workers for a period of nearly sixty years.

TABLE 19

The Weekly Time Wages of Fitters and Turners in Federated Firms in the Manchester District

Date.	Weekly Time Wages.	Percentage Increase above July 1914.
July 15th, 1921	84s. 11½d.	118
Aug. 15th, 1921	81s. 6½d.	109
Nov. 1st, 1921	78s. 6½d.	101
Dec. 1st, 1921	75s. 6½d.	94
Jan. 1st, 1922	72s. 6d.	86
July 31st, 1922	67s.	72
Aug. 28th, 1922	61s. 6d.	58
Sept. 25th, 1922	56s.	44
to		
July 31st, 1927		
Aug. 1st, 1927	58s.	49
to		
May, 1935		
May, 1935	59s.	51.5
to		
July, 1935		
July, 1935	60s.	54
to		
June 29th, 1936		
July, 1936	61s.	56.5
to		
Sept. 28th, 1936		
Oct., 1936	62s.	59
to		
Dec. 28th, 1936		
Jan., 1937	63s.	61.5

Earnings of Engineering Workpeople

Up to this point the account of wages from the commencement of the War has been confined to a record of the various alterations made in time wages rates, and the changes in the amount of bonus payable to time and piece-workers.

The wages position of the plain time-worker on full time in the War and post-War years can be clearly seen. From the record presented of changes in time rates—on which piece-work and premium bonus prices are fixed—plus a knowledge of the minimum percentages which piece-workers should receive above their time rates, only a very general impression, however, of the earnings of piece-workers on full time can be obtained.

It is necessary both to show the extent of piece-working and to give more precise information about the earnings of those employed in this way before a true picture of the average full-time earnings of engineering workers can be obtained. Moreover, there are other factors—such as the extent of short-time working, the amount of regular overtime, and the prevalence of shift work—which need to be taken into account before the average weekly earnings of either time-workers or those on systems of payment by results can be accurately stated.

It is principally, however, as a result of the continued advance made, since the outbreak of the War, in the employment of systems of payment by results in engineering, that the old relation between time wages rates and remuneration has been further broken down. The proportions on piece-work, or an alternative system of payment by results, vary in the different classes of engineering workpeople, and the ratio of the average piece-work earnings to the accepted time rate also differs in the various occupations. Furthermore, in any single occupation the average piece-work earnings vary from time to time through alterations in piece prices consequent upon changed methods, and the introduction of new work. Among any group of workers paid by piece, a fair amount of variation is found in the individual earnings, on account of differences in ability and energy. Because of these last-mentioned differences among individuals, changes made to time rates, which involve appropriate alterations to piece prices, do not necessarily result in corresponding alterations in piece-work earnings.

On account of the several factors mentioned above, the comprehensive enquiries by the Ministry of Labour into

standard time rates of wages and hours of labour carried out in 1920 and 1929 are of little help in determining the weekly earnings received by the various classes of workers at the specified dates. Nor is the official record, which is published, of the unweighted averages of the recognised district time rates in sixteen principal centres for certain representative engineering occupations, of any greater value, except that there is continuity of time instead of a greater wealth of detail at two points nearly ten years apart.

The Growth of Piecework and Other Systems of Payment By Results

In Table 20 * the changes which have taken place in federated firms, in the percentages of workmen in the principal engineering occupations on systems of payment by results, are shown at various periods from 1914 until 1927. It is the policy of the Employers' Federation to make payment by results as universal as possible, and further progress in this direction has been made since 1927, but it has not been possible to obtain more recent figures for all the classes of workers shown in Table 20. At the present time, however, considerably more than half the male workers in firms which are members of the Employers' Federation are on systems of payment by results.

TABLE 20

Percentages of Workmen, 21 Years of Age and Over, in Federated Firms on Systems of Payment by Results

Date.	Fitters.	Turners.	Pattern-makers.	Moulders.	Platers, Riveters and Caulkers.
1914	36.8	45.8	6.7	26.2	40.4
1918	51.9	57.5	11.8	27.6	50.7
1923	41.0	52.7	29.6	51.1	55.9
1924	45.5	55.5	30.2	53.4	58.0
1925	48.4	59.4	38.2	55.4	59.3
1926	49.3	60.3	39.4	56.0	61.8
1927	51.6	64.4	37.1	56.3	62.3

* "Thirty Years of Industrial Conciliation." Engineering and Allied Employers' National Federation.

Date.	Sheet-Metal Workers.	Copper-smiths.	Labourers.	Other Classes.	All Classes of Mon.
1914	—	—	7.5	37.8	30.7
1918	—	—	14.9	47.7	40.8
1923	—	—	11.9	44.0	38.4
1924	72.9	—	14.1	50.5	43.2
1925	72.4	48.2	12.5	52.7	45.7
1926	74.4	51.9	14.3	53.8	46.7
1927	79.6	56.5	15.7	56.9	49.6

On examining Table 20 it will be seen that the big increase in piece-working which took place during the War was followed by a slight set-back in the early post-War period, but steady improvement has since been made. The difference between the percentage of fitters and turners on systems of payment by results, which was remarked on in the previous chapter, is shown in the table. Always there has been a greater proportion of turners on piece-work, and this is understandable in view of the character of much of the work and their closer association with a machine, which facilitates rate-fixing. As might be expected, labourers as a class have remained the least affected by systems of payment by results; but even among these workers there has been an important upward movement since 1914 in the proportion paid in this way.

In some districts, or in special branches of the industry, a much higher percentage of piece-working among labourers is found. For example, in the London District in federated firms,* from returns over a period of four weeks in October 1928, more than 22% of the labourers were on systems of payment by results.

The increase in piece-working among moulders between the end of the War and 1923 was considerable, and especially noticeable since no appreciable change was made in the percentage on piece-work during the War itself. Experience was gained during the War on repetitive moulding work, and after the War finished a large amount of reorganisation took place in foundries. This paved the way for piece-work when batch production could be practised, and after the serious wages dispute between the moulders and the Employers' Federation, in 1921, piece-working was substantially increased. It will be noticed, however, that since 1923 the

* "New Survey of London Life and Labour," Vol. II.

rate of increase of systems of payment by results in foundry practice has been comparatively slow.

Pattern-makers have remained the class of skilled workers to which systems of payment by results least apply, but it will be noticed that whereas in 1914 less than 7% of their number were working on piece-work or an alternative system of payment by results, by 1927 there were 37% employed in this way.

Post-War Earnings Enquiries by the Ministry of Labour

In 1924, 1928 and 1931 the Ministry of Labour conducted Enquiries * into the average weekly earnings and weekly hours of labour of workpeople in the principal industries in Great Britain and Northern Ireland. The width of these Enquiries has reduced their value for the present purpose of ascertaining the earnings of workers in the principal engineering occupations. Although various sections of the engineering industry are given separate treatment in these Enquiries, there is *no attempt made to show the earnings of different representative classes of workers separately, nor to differentiate between the earnings of time-workers and those on systems of payment by results.* The workpeople covered in the returns include male and female wage-earners of all ages. This further detracts from the value of the figures of earnings per head, since, although a distinction is made between the earnings of male and female workers, the proportions of adults and juveniles are not made evident.

On account of the limited periods over which the returns were collected, and the long intervals between the Enquiries, the results are further restricted in value. In view of the considerable fluctuations in trade which have occurred during the post-war period, something more than October records in three years are needed for any clear impression of changes in post-war earnings in engineering to be obtained.

In the 1924 Enquiry information was sought regarding the recognised hours of labour. Of the total number of workpeople covered by the returns in the following main branches of the engineering industry—marine, agricultural, structural and general engineering, the manufacture of textile machinery, aircraft, electrical machinery, and motor vehicles, etc.—86.4% were actually on a 47-hour week, 6.5% normally worked a shorter week, and the remaining 7.1% had a recog-

* For details of the three Enquiries which were made *vide* "Ministry of Labour Gazette" for Sept. 1926, Nov. 1928, and Jan. 1933.

nised week in excess of 47 hours. Only 3·5%, however, worked less than 44 hours per week, and 3·8% above 48 hours weekly.

Information collected regularly by the Ministry of Labour shows that since this time there have been only very slight changes in the recognised hours in engineering factories, and most of the workers still have a normal working week of 47 hours.

The average weekly earnings of all the engineering work-people, and males and females separately, as obtained at the three Enquiries, are given in Table 21.

TABLE 21
Ministry of Labour Enquiries
Average Weekly Earnings in Engineering

Date.	All Workpeople.	Males.	Females.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Oct., 1924 . .	50 9	53 0	27 0
„ 1928 . .	53 2	56 0	28 0
„ 1931 . .	49 1	51 8	27 7

In the 1931 Enquiry a distinction was drawn between factories employing fewer than 10 workers and those of larger dimensions. From the aggregate figures the earnings in the small firms are shown to be several shillings below the level in the larger establishments. The figures for 1931 in Table 21 are those for all firms sending in returns. If the level of earnings in the larger shops were taken, the amount for “all workpeople” would be increased to 49s. 7d. and the earnings of male workers raised to 52s. 6d. No appreciable change in the earnings of females would take place. The slightness of the rise is accounted for by the fact that the number of workers employed in the very small firms is only a small proportion of the total. The difference between the payment in large and very small factories varies in the separate sections of the industry, and in one or two branches the higher level of earnings is in the smallest shops.

The detailed returns relating to the different branches of the industry show that, at each Enquiry, the highest average weekly earnings were obtained by the male workers in the larger motor and cycle firms. Second in order of earnings

at each Enquiry were the male workers in the comparatively small section of the industry concerned with the manufacture of aircraft.

Table 22 gives an approximate comparison of the earnings per head of all workpeople in the main branches of engineering when the three Enquiries were made. The limitations of these figures should be borne in mind.

TABLE 22

Average Weekly Earnings of all Workpeople in the Main Branches of Engineering at the Ministry of Labour Enquiries

	1924.	1928.	1931.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Marine Engineering	52 1	53 0	45 11
Agricultural Engineering . .	46 8	48 7	40 3
Textile Machinery Manufacture .	43 5	46 0	43 1
Aircraft Manufacture	55 7	60 0	56 8
Structural Engineering	53 4	56 4	52 10
Electrical Machinery Manufacture .	45 3	56 0	43 11
Motor Vehicle and Cycle Manufacture			
or Repair (a) Larger firms . .	58 2	62 1	57 6
(b) Smaller firms . .	46 4	47 0	47 0
General Engineering	51 1	53 8	49 0

Some portion of the general advance in earnings noticeable between 1924 and 1928, in Table 22, can be attributed to the increase of 2s. in the bonus of plain time-workers, of 21 years and over in federated firms, which occurred in 1927. Similarly, the decline in average weekly earnings between 1928 and 1931 is in part explained by the fact that trade was comparatively good in 1928, and the amount of short-time working relatively small, whereas in 1931 the effect of short-time working on earnings was more serious.

Engineering Employers' Federation Earnings Statistics

At certain periods each year the Engineering Employers' Federation collects from its members information of quite a detailed character relating to the earnings of the different classes of workpeople employed. Although some of this information is of a private nature, much of it is disclosed by the employers, frequently to trade unions in the course of wages discussions. The principal conferences between the employers and workpeople on wages questions are usually

followed by the publication of verbatim reports of the proceedings, and the figures which follow have been extracted from such reports and various other publications of the Employers' Federation.

The average weekly earnings of all classes of male engineering workpeople, 21 years and over, from 1914 to 1927 at selected dates, are shown in Table 23. Between 1918 and 1923 the reductions in wages, which have been considered in detail earlier in this chapter, took place, and the level of earnings fell considerably on this account. It will be noticed that from 1923 until March 1927, during which time wages rates were unchanged, there was a continuous rise in earnings which amounted at the end of the period to $7\frac{1}{2}\%$ of the 1923 weekly sum of 59s. 6d.

TABLE 23

Average Weekly Earnings of all Classes of Male Engineering Workpeople, 21 Years and Over, Employed in Federated Firms

Date.	Earnings.	% Increase from July 1914 Level of 35s.
	<i>s.</i> <i>d.</i>	
July 1914	35 0	—
Sept. 1918	84 $2\frac{1}{2}$	140·5
Feb. 1923	59 6	70·0
April 1924	60 $7\frac{1}{2}$	73·2
March 1925	62 5	78·5
March 1926	62 9	79·3
March 1927	64 1	83·2

It has not been possible to ascertain the extent to which short-time working or overtime influenced the figures in the returns. In view of the general state of the industry during the period under review, however, it is fairly evident that short-time working was on the decrease between 1923 and 1927, when it reached quite small proportions; but it is considered that the quantity of work done between 1923 and 1927 at higher than normal time rates, as the result of overtime or night-shift working, would show little alteration. It is felt that the substantial increase in the amount of piece-working which occurred between 1923 and 1927 was chiefly responsible for the increase in earnings which took place.

It should be remembered when examining the changes in earnings which occurred that hours were reduced in 1919 to

47 per normal week from the previously existing level of 53½ approximately. When this reduction was made, piece-work prices were adjusted to allow the workers to earn their previous remuneration on the basis then existing of piece-workers' earnings being at least 33½% above the time wages rates.

In Table 24 the average weekly earnings of men in federated firms in the principal engineering occupations are shown for July 1914 and March 1927, *i.e.*, half-way through the period which has elapsed since the War finished. This table is an interesting one, as the earnings of time-workers, and those on systems of payment by results, are shown separately, and the average weekly earnings of all the men in each occupation, whether paid by time or otherwise, are also given.

It will be seen at a glance that the earnings of those on piece-work, or alternative systems of payment based on output, are substantially above the time-workers' earnings. If the figures are examined more closely, it will be found that the percentage increase above time-workers' earnings obtained by those on systems of payment by results in 1914 was less for all classes of workers, with the exception of platers, riveters and caulkers, than in 1927. Also the difference, in 1927, between the earnings of time-workers and those on systems of payment by results in the classes enumerated, was reasonably close to that which would be expected allowing piece-workers 33½% above basic time rates, and the same bonus as received by time-workers.

Pattern-makers, who, as a class, have always had one of the highest time rates, are shown sixth in the list in 1927, when the earnings of those on time and systems of payment by results are combined in accordance with the numbers engaged. The highest average earnings are those of sheet-metal workers, whose basic time rate is less than that of the pattern-maker, but of whose total number 80% were piece-workers in 1927.

The figures in Table 24 are based on weighted averages, and as a result of the increased proportion of work done under systems of payment by results since 1914, the disparity between the earnings figure for time and payment by results workers combined and that for plain time-workers had considerably increased by 1927.

Serious fluctuations in trade have taken place since 1927. 1928 and 1929 were reasonably good years, then trade declined, unemployment increased, and the amount of short-

TABLE 24

*Average Weekly Earnings of Men, 21 Years and Over,
in Federated Firms*

	July, 1914.		
	Payment by Results.	Time.	Time and Pay- ment by Results Combined.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Fitters	45 9½	39 6½	41 10
Turners	44 8	39 2½	41 8½
Pattern-makers	47 8	40 4¾	41 11
Moulders	42 9	39 1	40 0½
Platers, Riveters and Caulkers	55 10½	40 6	46 9
Sheet-Metal Workers	—	—	—
Coppersmiths	—	—	—
Labourers	27 8¾	24 11½	25 2
Other Classes	37 10¾	32 0	34 3
All Classes	40 9	32 5½	35 0

	March, 1927.		
	Payment by Results.	Time.	Time and Pay- ment by Results Combined.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Fitters	76 5½	63 2	70 0
Turners	74 11¾	59 5½	69 4
Pattern-makers	77 0	64 1½	69 1½
Moulders	74 0	59 11	67 7½
Platers, Riveters and Caulkers	81 0	61 2	73 8½
Sheet-Metal Workers	89 0	63 4¾	83 9½
Coppersmiths	86 5	63 6	76 6
Labourers	55 6½	46 8	48 0
Other Classes	71 5	58 1	65 6
All Classes	72 8½	55 10	64 1

time working rose very considerably, having an important effect on the average weekly earnings obtained. Recovery has now been made, and the amount of short-time working is once again not a factor of considerable importance.

The position of the average earnings of all classes of adult male workers on a 47-hours-week basis during the second half of the post-War period is shown in Table 25.

TABLE 25

Average Earnings in Federated Firms of Male Adult Workers for 47 Hours—All Classes—Time and Payment by Results Workers Combined

Period.	Changes in the Year Affecting Earnings.	Index of Earnings. Oct. 1926 = 100.
Oct. 1926 .		100·0
„ 1927 .	Aug. : 2s. increase to time-workers.	103·0
„ 1928 .		103·2
„ 1929 .		104·8
„ 1930 .		103·8
„ 1931 .	June : Alterations in working conditions.	100·0
„ 1932 .		100·2
„ 1933 .		100·4
„ 1934 .		102·3
„ 1935 .	May and July : 2s. increase in Bonus	106·6

This table does not disclose the serious effect of short-time working on the average weekly earnings during the years of depression, and cannot easily be compared or combined with Table 23, which gives the average weekly earnings of the same body of workers for the earlier part of the post-War period. It may be mentioned that in October 1926, the commencing point of Table 25, the average weekly earnings for all classes of workpeople, 21 years and over, were 61s. 1d. From a knowledge of the general position of the industry at that time, it is considered that these earnings were obtained in a working week, the average length of which, for all workers combined, was between 46 and 47 hours.

From 1927 until 1930 average weekly earnings continued to rise. For example, in October 1927 the average weekly earnings for all fitters, whether working by time or on a system of payment by results, were 71s. 9½d. for 48·7 hours. By October 1930 the corresponding figure for this class of workpeople was 72s. 10d. for 48·4 hours work. By the end of 1930 short-time working was becoming serious in the

industry, and average earnings started to fall. The fall was accelerated by the alteration in working conditions which took place in 1931—the average earnings for all fitters were 67s. 3½d. for 45·8 hours in 1932—and earnings did not reach their 1927 levels again until the autumn of 1934. Since then a further upward movement has been in progress, assisted by the bonus awards of 2s. and 3s., made in 1935 and 1936 respectively.

TABLE 26

The Average Earnings in Federated Firms of Men, 21 Years of Age and Over, for 47 Hours

Occupation.	Time-workers.			Payment by Results Workers		
	Oct. 1934.	Oct. 1935.	Increase 1935 over 1934.	Oct. 1934.	Oct. 1935.	Increase 1935 over 1934.
Fitters	s. d. 63 2½	s. d. 66 0½	s. d. 2 9½	s. d. 74 3½	s. d. 78 0	s. d. 3 8½
Machine-men (rated at or above Fitters' rate)	s. d. 64 4½	s. d. 67 8½	s. d. 3 4½	s. d. 79 0½	s. d. 83 4½	s. d. 3 6½
All skilled classes	s. d. 63 2½	s. d. 65 11½	s. d. 2 9½	s. d. 75 10	s. d. 78 10½	s. d. 3 0½
Machine-men (rated below Fitters' rate)	s. d. 51 2½	s. d. 54 7	s. d. 3 4½	s. d. 63 5½	s. d. 66 1½	s. d. 2 8½
All classes of adult males other than labourers	s. d. 58 7½	s. d. 61 3½	s. d. 2 8	s. d. 71 6½	s. d. 74 2½	s. d. 2 7½
Labourers	s. d. 45 2½	s. d. 47 10	s. d. 2 7½	s. d. 54 3	s. d. 56 8½	s. d. 2 5½

Occupation.	Time and Payment by Result Workers.		
	Oct. 1934.	Oct. 1935.	Increase 1935 over 1934.
Fitters	s. d. 69 1	s. d. 72 8½	s. d. 3 7½
Machine-men (rated at or above Fitters' rate)	s. d. 70 2½	s. d. 79 10½	s. d. 3 8½
All skilled classes	s. d. 70 9	s. d. 73 11	s. d. 3 2
Machine-men (rated below Fitters' rate)	s. d. 61 0	s. d. 63 11½	s. d. 2 11½
All classes of adult males other than labourers	s. d. 65 11½	s. d. 68 10	s. d. 2 10½
Labourers	s. d. 46 7½	s. d. 49 1½	s. d. 2 6

Some indication of the improvement recently made can be obtained from Table 26, which shows the average earnings on a 47-hours-week basis for October 1934 and October 1935 for certain classes of adult engineering workers. Moreover, the period of improved trade has meant that the 47-hours basis does not represent the full average number of hours generally worked. For example, the actual average weekly earnings for all skilled classes in October 1934 were 73s. 0½d., whereas on a 47-hours basis the figure recorded was 70s. 9d.

The class of workers referred to collectively in Table 26 as "machine-men (rated below fitters' rate)" includes the majority of the semi-skilled machine workers in the industry, whilst the turners form the bulk of those in the "machine-men (rated at or above fitters' rate)" class.

It will be seen from Table 26 that the earnings of the time-workers, for 47 hours, are appreciably greater than the average time wages rates, including bonus, for the particular classes of labour. The difference is in part due to the extent of shift-working, paid at rates above the ordinary time rates, merit increments, etc., but it is considered that it may also be due partly to the method employed for reducing the actual weekly earnings to a 47-hours basis. A decrease in these earnings in strict proportion to the excess of hours above 47 would give a higher level of earnings for 47 hours than would actually be attained if only 47 hours were worked in the week.

Using the time-workers' figures in Table 26 as a basis, it appears from the corresponding figures relating to piece-workers that, in spite of the change made in 1931 to 25%, instead of 33⅓%, as the minimum percentage for piece-workers to obtain above their basic time rates, these workers obtained on the average something in the neighbourhood of 33⅓% above their time rates.

In concluding this section dealing with Engineering Employers' Federation statistics, it may be mentioned that the earnings figures quoted are the full earnings, including bonuses, allowances for overtime and night-shift working, and any other items which normally contribute to the total sum received by the worker. Out-working allowances, travelling expenses and certain special payments are excluded from the returns.

Extent of Short-Time Working

It will have been realised from the foregoing particulars of earnings that short-time working has seriously influenced the total weekly sums received by workers during certain

parts of the post-War period. To some extent the piece-worker can counteract the effect of reductions in hours by additional effort, and this has been noticed in many instances, but the time-worker has not this opportunity.

There is comparatively little reliable information regarding the extent of the short-time working which has occurred in the engineering industry, and there is no consecutive record available for the post-War years. The three Ministry of Labour Enquiries into earnings and hours of labour in the post-War period, to which reference has been made, were designed to find out not only the total wages paid to all the operatives in employ during the specified week in October, whether working overtime, full time or short time, but to ascertain, in addition, the number working less than the normal week, and the average number of hours lost per head by these workpeople on short time.

TABLE 27

Extent of Short-Time Working as Recorded by the Ministry of Labour Enquiries into Average Weekly Earnings and Weekly Hours of Labour

	Percentage of Total Number of Workpeople—Males and Females—on Short Time.			Average Number of Hours lost by those on Short Time.		
	1924.	1928.	1931.	1924.	1928.	1931.
<i>Engineering</i> . . .	7.7	4.9	22.4	10.8	12.2	10.9
<i>Marine</i> . . .	2.6	1.1	33.7	12.8	7.9	12.8
<i>Agricultural</i> . . .	18.0	7.7	45.0	8.3	14.3	13.6
<i>Textile</i> . . .	52.5	37.0	64.6	13.8	16.5	13.6
<i>Structural</i> . . .	3.2	5.4	18.8	7.2	9.5	9.4
<i>Electrical machinery, etc.</i> . . .	2.2	0.7	11.1	8.0	7.2	8.4
<i>Larger motor vehicle and cycle firms</i> . . .	4.6	3.3	18.6	7.9	8.0	11.1
<i>Smaller motor vehicle and cycle firms</i> . . .	2.5	2.7	6.6	9.0	10.8	10.2
<i>General</i> . . .	6.4	3.9	26.7	8.8	9.2	10.7

Workpeople stood off for the whole of the specified week during which wages information was obtained were not taken into account in compiling the statistics. They were regarded

as unemployed, except in a comparatively small number of cases, where they were known to be working under a system of employment in alternative weeks, or to have been "standing off" in rotation. Persons working alternate weeks were included in the short-time records as working only half the full normal time. Those standing off in rotation were shown as losing the average number of hours lost per week over the period covered by the rota.

In Table 27 a comparison is made between the amount of short time worked at the three different periods when the Enquiries were made. The figures, which relate to males and females of all ages, are not strictly comparable, but the table gives a reasonably accurate summarised account of the changes which took place. The effect of this short-time working, spread over all the engineering workpeople, meant approximately an hour lost per week per head in October 1924, two-thirds of an hour in 1928, and over two hours per head lost in 1931 by all the workpeople covered by the returns.

The difference between the earnings for engineering workpeople, as recorded by the Ministry of Labour Enquiries, and those obtained by the Employers' Federation at approximately the same time, is not wholly attributable to the fact that the former cover a wider range of workers and include all juveniles as well as adults. The variation is in part due to a difference in interpretation of short-time working, and the extent to which account is taken of this feature of employment.

The Employers' Federation, working with 47 hours as a normal week for all engineering factories, measured short time* in 1928 as affecting 15% of the skilled men, 22% of the semi-skilled and 13% of the labourers; 15% of the apprentices were also on short time, and 21% of the boys and youths. By 1933 these percentages were in most cases a little more than doubled. The percentage on short time for all classes combined was 16.6% in 1928 and 34.5% in 1933. The precise amount of short time is not stated, but in 1928 11.3% of those on short time worked a week between 40 and 47 hours in length, and the remaining 5.3% worked less than 40 hours. In 1933 18.6% of those on short time worked over 40 hours but less than 47 hours, and 15.9% worked less than 40 hours.

The severity of short-time working in recent years can be

* "Unemployment. Its Realities and Problems." Engineering Employers' Federation. July 1933.

appreciated from the foregoing figures, and incidentally it may be remarked that the total number employed in federated firms in 1933 was only three-quarters of that engaged in 1928. By October 1935, however, the total number employed in federated firms was slightly higher than at the corresponding period in 1928, and since then numbers have further increased.

The Employers' Federation figures relating to short time show semi-skilled workers with a much higher percentage than that recorded for skilled men. The explanation appears to be that this class of men is engaged to a large extent on hand or machine work less individual in character than that performed by skilled men; and most of the jobs are not of long duration. Consequently it was easier for employers to distribute the smaller volume of work available over a larger percentage number of the workers in this class, thus increasing the percentage on short time, but spreading the employment more equitably over the total number of workers.

The Attitude of Employers and Unions to Changes in Wages Rates and the Payment of Cost of Living Bonuses

When considering the attitude of the employers towards the War-time increases, it should be remembered that during the War engineering factories were working at full pressure, and that the numbers engaged in the industry nearly doubled between 1914 and 1918. The unusual state of affairs which then existed enabled employers to make handsome profits, and encouraged them to countenance the arrangement whereby workers' time wages advanced when the cost of living increased.

Their attitude on this matter was expressed by the representative of the Engineering Employers' Federation before the Committee on Production when the first award for the engineering and foundry trades was under discussion in March 1917.

"Workpeople," he said, "were entitled to advances only in compensation towards the increased cost of living to which they were subjected . . . If we look at the present application, not as an advance in wages, but as a recompense or as compensation in respect of the extraordinary expenditure, then we may get on very much better than we will otherwise, because to admit for one

moment that the rates should be increased in order to meet an extraordinary position of affairs such as we now have is a position which we cannot take, but we are prepared to admit the question of compensation." *

When the War finished, engineering employers found it difficult to pick up the threads of ordinary business which they had laid aside in 1914. There was a short period of good trade, but then a depression set in. As a result, employers' minds turned to the question of reducing wages rates and War bonus as a step towards trade recovery, and once again "the capacity of the industry to pay" was brought to the forefront in wages matters. No longer were employers prepared to agree to a simple regulation of wages in accordance with the cost of living.

In the negotiations which preceded the award of 2s. to plain time-workers in 1927, the disparity between the increase in the cost of living and of time wages over the 1914 level was stressed by the unions. The employers emphasised again that whatever sympathy they might have with the maintenance of a certain standard of living for their work-people, the sum available for wages was limited by the capacity of the industry. In short, there has been a return to the pre-War state of affairs in connection with discussions on wages questions, with the difference that to-day the employers place more data in front of the unions in support of the statements which they make regarding their inability to pay wages equal to those to which the unions lay claim.

The employers' attitude and the workers' insistence on an improved standard of life show a divergence of interests, and there has not emerged, up to the present, any criterion which both can accept for the regulation of engineering wages.

In view of the confused state of the whole wages structure in engineering at the present time, it is not surprising, however, that neither employers nor workers are satisfied with what confronts them. In spite of the vast changes which have taken place in the industry since 1914, the wages rates which were then in existence still operate in most districts with a flat addition of 7s. Failure to attempt to remove some of the district variations in time rates, and to put in their stead standard rates with wide application over the industry, can be excused in view of the more serious problems which call for solution. In fact, the increasing sectional character

* "Wages, Prices and Profits." Labour Research Dept., 1922.

tion of the present differences in district rates. Such an overhaul of wages rates might lead, however, to fewer rates for the different classes of engineering workpeople employed and to a re-grading of the occupations for wages rates purposes.

The number of rates in existence in a district may appear unnecessarily large in view of the slight variation between many of them, and the fact that these small differences in amount are rendered even less significant because of the prevalence of piece-working and other systems of payment by results.

To illustrate the present state of affairs, the time rates (inclusive of national bonus) for the various classes of engineering workers in the Manchester District, who are members of the Amalgamated Engineering Union—as given in the Rule Book—are shown in Table 28.

Economic Position of Engineering Workers since 1914

As a result of the policy adopted during the War, and continued to the present time, of granting uniform increases to all workers, the importance of the pre-War differences which existed between wages rates in the various occupations has been reduced. The continued development of piece-working and other systems of payment by results has also contributed to destroy the old relation existing between occupation and remuneration.

After the early years of the War, during which the cost of living rose at a very much faster rate than wages increases, general labourers and nearly all the semi-skilled hand or machine workers received increases which resulted in their full-time wages, as time-workers, showing a greater percentage increase from the corresponding figures for 1914 than the increase in the cost of living as recorded by the Ministry of Labour index.

On the other hand, the majority of the skilled workers, as a result of their higher pre-War rates, at no time from the commencement of the War until the uniform increases ceased in 1920 enjoyed, as plain time-workers, wages which had increased from the 1914 level by a percentage equivalent to the rise in cost of living.

The skilled, semi-skilled and unskilled workers, however, all worked long hours during the War period, and there was a big increase in systems of payment by results among skilled and semi-skilled workers which further contributed

to increase their average weekly earnings. On account of the scanty material available regarding the earnings of engineering workpeople during the War years—no attempt has been made in the preceding part of the chapter to estimate War-time earnings—it is not possible to compare the earnings of the various classes during this period.

A point, however, with regard to the War period, which it is felt should not be overlooked, is that in the big increase in payment by results which took place, semi-skilled workers, as a class, did proportionately better for themselves than the skilled workers, thus further closing the gap between them. Moreover, the influx of inexperienced workers, male and female, and the recruitment of skilled workers in the armed forces, so reduced the proportion of skilled men that many employers found it necessary to make most of those who remained instructors, setters-up, etc., or to employ them on specially intricate and non-repetitive work. This meant that these skilled men had no opportunity for piece-working, and received time wages, generally with a comparatively small additional amount for the skilful or responsible nature of their work.

The severe reductions which took place shortly after the return to peace-time conditions restored to a limited extent the importance of the time-wages rate differences in the various occupations. When the last of the series of reductions had taken place, the time wages (inclusive of national bonus awards) of the skilled fitter or turner were about 45% above the July 1914 rates, whilst the rise in the cost of living was 79%. The labourers' total time wages after the reductions showed a percentage increase from the 1914 level approximately equal to the rise in the cost of living. The semi-skilled worker, if employed by time, whilst not so favourably placed as the general labourer with regard to the increase of wages, was, of course, better placed than the skilled man, and his rate plus bonus gave him about 60% advance from the time-wage level in 1914.

After the early post-War reductions, wages rates remained unaltered until 1927, but real wages steadily improved during this period, on account of the decline which took place in the cost of living, and the continued spread of systems of payment by results enabled a greater proportion of workers considerably to augment their time-wages.

In March 1927, for example, according to the Employers' Federation figures given in Table 24, the average weekly earnings for fitters and turners (time- and piece-workers

combined) were nearly 70s. This figure represents an increase of 85% over the pre-war level for full-time weekly earnings in these occupations, whereas the cost of living at this time was down to 71% above the July 1914 figure. Labourers, in March 1927, were in receipt of average weekly earnings which were about 118% higher than those obtained by full-time workers in this occupation just before the War commenced.

The decline in the cost of living continued until the middle of 1933, and this, together with the increase in bonus in 1927 conceded to all plain time-workers, resulted in further improvement in the workers' position.

In October 1931, for example, according to the figures from the Ministry of Labour Enquiry into Earnings and Hours given earlier in the chapter, the average weekly earnings of all males in engineering were 51s. 8d. In 1913, using figures from the previous chapter, the average weekly full-time earnings of fitters and turners were 38s., machinemmen obtained 30s. 6d. and the labourers about 22s. Assuming these figures to be representative of the average earnings in July 1914 of all the full-time adult male skilled, semi-skilled and unskilled workers respectively, and combining them according to the weights 3, 1, 1 (given in Table 6, Chapter II, as the relative proportion of skilled, semi-skilled and unskilled labour in federated firms in 1914), the approximate average full-time earnings in July 1914 for all classes of adult male engineering workers was 33s. 4d. The October 1931 figure of 51s. 8d. represents an increase of 55% above this estimate of 33s. 4d. The increase in the cost of living at October 1931 was 45%.

It is considered that any increase to the pre-War figure of 33s. 4d. which may be necessary in order to arrive at a sum which represents the average weekly earnings, instead of the full-time earnings, would be more than counterbalanced in effect by the addition necessary to the figure of 51s. 8d.—which includes youths and boys—to bring this up to the average weekly earnings of men workers in engineering.

Since 1933 there has been an upward movement in progress in the cost-of-living index-number, but it has been sufficiently slight for real wages to have substantially improved through the bonus awards made in 1935 and 1936 to all male adult workers.

The position in the autumn of 1935, according to the Employers' Federation figures given in Table 26, was that the average earnings, for 47 hours, for all fitters (time and

payment by results workers), were about 90 % greater than the full-time earnings in 1914. Turners, semi-skilled machine-men and labourers all showed earnings, on a 47-hours basis, greater than 100 % above the pre-War earnings in a full week. The percentage increase in the cost of living in October 1935 as compared with July 1914 was 45 %.

In considering the fluctuation in weekly earnings since 1914, it should be remembered that, whereas the normal hours of labour per week were then between 53 and 54, since 1919 the normal week has been one of 47 hours in the majority of engineering factories. Also, the percentage increases in the cost of living as compared with July 1914, to which reference has been made above, are the average percentage increases at the beginning of the month for all the items included in the statistics.

Summary

The wages information in this chapter relates to the large body of workers in the principal branches of the industry and especially to all those for whom the Employers' Federation agreements and regulations are in force. It does not necessarily refer to engineering workers employed in other industries, many of whom are paid in accordance with the wages arrangements of the industry in which they work. For example, engineering workers in the electrical supply industry or cable-making are paid at rates fixed by the Joint Industrial Councils which exist, and railway shopmen have their own independent traditions and wages agreements.

The time rates which are referred to can be considered as applying in all firms which are members of the Employers' Federation, and as having an important influence on the time wages paid in non-federated firms.

For some time after the War commenced, the system of local settlement in connection with wages questions was continued, but the large number of claims for increases in wages made it necessary for a more general means of settlement to be adopted. From early 1917 wages claims were dealt with on a national basis, at frequent intervals, and uniform advances made to all classes of workers. This policy of advancing or reducing wages, nationally, by the same amount for the workers in all occupations, has been continued to the present day by the Employers' Federation.

Between the commencement of the War and the summer of 1920 the time wages rates of most engineering workers were

increased by 13s. A bonus of 26s. 6d. had been built up, thus making a total increase of 39s. 6d. In addition, from October 1917 time-workers received 12½% on their total weekly earnings. Piece-workers received the same War bonus as was paid to time-workers; their piece rates were increased when additions were made to the basic time rates, and from the beginning of 1918 they were in receipt of a 7½% addition to their total weekly earnings.

Large reductions in engineering wages were made in 1921 and 1922, which left the workers in most instances with time rates 7s. above those received in 1914, and a bonus of 10s. per week. The subsequent uniform increases which have taken place are 2s. to the bonus of time-workers, made in 1927, and 2s. and 3s., in 1935 and 1936 respectively, to the bonus of all workers, whether paid by time or otherwise.

During the War period boys and youths obtained part of the bonus granted to adults, but the increases in bonus from 1927 onwards relate only to men workers 21 years and over.

Extreme caution is required when making any estimate of the average weekly earnings of engineering workpeople, because of the many factors which need to be considered, and the shortage of information relating to some of them. On account of the scarcity of facts relating to earnings during the War period, no attempt has been made to show what weekly sums the different classes of workers then obtained. During the post-War years short-time working has, at certain periods, seriously affected the earnings obtained.

The full-time earnings of time-workers can be estimated with reasonable accuracy from the time-wages rates information, but this does not tell the earnings of those on piece-work or an alternative system of payment by results. The large increase in piece-working which has taken place since the outbreak of the War has rendered the time-wages rates less reliable as indicators of the average weekly earnings obtained in any occupation.

The big increase in payment by results which took place during the War meant that an additional 10% of all classes of workers in federated firms were employed in this way in 1918 as compared with 1914. A slight setback then took place, but further development has since been made. At the present time considerably more than half the workers in these firms are on systems of payment by results.

From Ministry of Labour Enquiries conducted in the month of October in 1924, 1928 and 1931 the average weekly

earnings of all male workers in engineering—adults and juveniles—were 53s., 56s. and 51s. 8d. respectively. The detailed returns, relating to the different branches of the industry, showed that, at the particular time each enquiry was made, the highest average weekly earnings were obtained by those employed in the large motor and cycle factories.

The Employers' Federation regularly collects information regarding the earnings of workers in the constituent firms, and this is the principal available source of engineering earnings data. According to this source, the average weekly earnings of all classes of male engineering workpeople, 21 years and over, which were 35s. in 1914, had increased to 64s. by March 1927. From 1923 until 1927, during which period wages rates were unchanged, the weekly earnings rose by $7\frac{1}{2}\%$, and it is considered that this increase was largely because of the extra proportion of workers placed on systems of payment by results during this period.

From 1927 until 1930 average weekly earnings continued to rise—trade was good, especially in 1928 and most of 1929, and more than full time was frequently worked; in addition, there was the effect of the 1927 increase in bonus to time-workers—but then short-time working became serious in the industry, and average earnings started to decline. The fall was assisted by the changes in working conditions which were made in 1931, and it was not until the autumn of 1934 that the 1927 levels of earnings were reached again. Since 1934 a further upward movement in weekly earnings has taken place, and factors contributing to this include the increases in bonus in 1935 and 1936, the lessened incidence of short-time working, and the adjustment of the piece-worker to the changes made in 1931.

From the statistics available relating to the federated firms, it appears that piece-workers in these establishments have earned, on the average, at least the stated minimum percentage above their basic time rates, and that, at present, although this percentage is 25%, they earn in the neighbourhood of $33\frac{1}{3}\%$, which was the agreed minimum from 1919 until 1931.

During the War employers agreed to a policy of increasing wages to compensate for changes in the cost of living, but on the return to peace-time conditions they were no longer willing to accept a simple regulation of wages in this way and, as in pre-War days, their dictum is that the sum available for wages is limited by the capacity of the industry. It is not easy to reconcile this with the present arrangement of

paying uniform increases to all classes of workers in all the main branches of engineering, in view of the distinct differences which exist in the prosperity in various sections. Neither employers nor workers are satisfied with the wages structure existing at present, but so far they have made no attempt to effect radical changes.

As a result of the flat increases of wages given to all classes of engineering workers during the War and in the post-War period, the status of the skilled worker has declined since 1914. To some extent he has been able to maintain his position, compared with the unskilled worker, because of the greater opportunities for piece-work open to him, but this does not apply so far as the semi-skilled worker is concerned. In fact, over the wide range of semi-skilled work systems of payment by results have advanced at a faster rate than in the skilled sections of the industry.

After the severe reductions in wages which took place in 1921 and 1922, leaving the skilled time-worker relatively worse off than in 1914, wages rates remained unchanged until 1927, but, as a result of the steady decline in cost of living, real wages improved over the whole of this period. Since the early part of 1927 there have been three bonus awards, and a further spread of piece-working and alternative systems of payment by results enabling a greater proportion of workers to obtain earnings substantially in advance of their time-wages. The decline in the cost of living continued until the middle of 1933, and the upward movement since then has been comparatively slight, consequently real wages have substantially improved since 1927. In October 1935, for example, the average earnings, for 47 hours, for the principal classes of engineering workers in federated firms varied between 90% and 125% above the levels of the full-time earnings obtaining in 1914, whereas the corresponding percentage increase in the cost of living was 45. In 1914 the normal working week was one between 53 and 54 hours, but since 1919 most engineering factories have had a normal working week of 47 hours.

CHAPTER IX

THE EMPLOYMENT AND WAGES OF WOMEN IN ENGINEERING

The Pre-War Period

ALTHOUGH examples are cited * of repetitive manufacturing by women employed on specialised machines in metal-working trades as far back as 1746, it was not until a more general attempt at specialisation, both in machinery and processes, was made, that female labour assumed any real importance in engineering. Prior to this general tendency towards specialisation, which may be said to date from the beginning of this century, female labour was practically confined to the Birmingham and district metal trades, where, however, it was strongly entrenched. Here, in several of the trades, practically the whole of the workers employed were women. Even in the forties women formed 80 % to 90 % of the workers engaged in the screw trade and in the stamping of brass nails and other small metal ware. In general engineering factories the character of most of the work carried out was unsuitable for female labour, whilst early opposition by the craft unions to the employment of women further tended to keep their numbers small.

With the development of semi-automatic machinery an influx of women commenced, and as the opportunities for repetitive manufacturing increased, so the numbers of females grew, employers quickly realising the advantages of employing females or young persons of either sex in preference to men on such work. As the industry developed, new products were made and new processes introduced, some of this work from its commencement being almost exclusively carried out by females. In addition, there was an amount of direct displacement of males by females. The change over from male to female labour was often preceded by simplifying the process—perhaps by further sub-division of operations, made possible through an increasing volume of product—or by the introduction of a new type of machine which reduced still further the demands made on the physique of the worker or the skill needed.

* *Vide* "Women in Industry." H.M.S.O., 1930.

As in the days before the general introduction of specialised processes and semi-automatic machinery, and despite a tendency towards the employment of women on certain machines to the exclusion of men over the industry generally, the Coventry and Birmingham area still proved the chief centre of female employment.

"In the cycle and motor trades, the electrical trades, the brass trade, in the host of small metal trades, including nut and bolt, screw, rivet, pen, pin, lamp, bedstead, fuse and cartridge making, female labour was established already before the War on every variety of automatic or semi-automatic machine—capstan, press, milling, drilling, grinding, polishing, screwing, gear cutting; the women performing whole series of operations of a light 'repetitive' character and passing freely from one trade to another as 'lathe' or 'press' hands. However, men and women were seldom employed together on identical operations. Exceptions appear in cable making, exhausting, filament winding and other processes in the electrical trades, in small part-making in the cycle and motor trades, in brass burnishing and polishing, brass core-making, fusc stamping, cartridge-drawing: and women competed with boys as automatic machine minders." *

Compared with this, the progress made during the pre-War period by females in general engineering and other main branches of the industry was slow. In several cases the nature of the work restricted the spread of female labour and, in addition, there was the continued opposition of craft unionism, which during this period was a strong force in various sections of the industry.

It has been estimated † that the total number of females employed in engineering and the allied metal trades, including precious-metal workers, rose only from 44,000 to 58,000 between 1861 and 1891, but had increased to 85,000 by 1901. In 1911 the number had reached 128,000 and before the War commenced had grown to 170,000, according to an estimate in a Board of Trade Report on Employment. In general engineering works and machine shops, where the advance of women was less rapid than in other sections, the number of

* This account, which appears in "Women in the Engineering Trades," B. Drake, is substantiated by particulars in the "Report of the War Cabinet Committee on Women in Industry."

† "Women in the Engineering Trades," B. Drake.

females increased from 9000 to 17,000 between 1911 and the outbreak of the War. These figures are only approximate, and a radical change in the method of classification was made at the Census of Population in 1911, widening the range of females included. It will be noticed that wherever comparison is possible with the figures shown in Table I, Chapter I, of the number of females engaged in the manufacture of metals, machines, implements and conveyances at each population census, the estimates above are consistently higher than the Census returns.

Wages Before the War

The Board of Trade Enquiry into Hours and Earnings conducted in 1906 provides some authoritative information

TABLE 29

*Average Full-Time Weekly Earnings of Women in the Metal Trades **

Metal Trades.		1906.	Hours.	1914.
Needles, fish-hooks, fishing-tackle.	—	12s. 10d.	50	No change since 1906.
Lock, latch and key-making.	—	9s. 6d.	55	—
Hollow ware.	—	—	—	10s. min.
Brass work, lacquering.	1840 { Wolver- 1850 { hampton, 1860 { 7s. to 10s. 1880 { 36 hours. 1880 { Birming- ham, 6s. to 12s.	12s. —	52·7 —	London : cheap work, 10s. to 12s.; skilled, 18s. to 28s. Birmingham, 12s. 6d. to 15s.
Chain-making.	1892. Fine, 8s. to 12s.; coarse, 7s. to 10s.	Full time, 9s. 6d. = 2·4d. per hour. More or less than full time, 7s. 6d.	46·8	Min. of 2½d. an hour.
Screws and nails.	1880. Birming- ham, 9s. 6d.	11s. 2d	53	12s. to 14s.
Tin plate.	1886. 10s. 4d.	14s. 9d.	47·8	—
All metals.	—	12s. 8d.	53·2	15s. to 16s.

* "Course of Women's Wages," D. M. Barton. *Journal of the Royal Statistical Society*, July 1919.

on the question of women's wages in pre-War days. From Table 29, in which all the figures for 1906 are from the Wages Census of that year and refer to the United Kingdom, the average full-time earnings of women in the metal trades in 1906 appear as 12s. 8d. for a week of 53.2 hours. A figure of 12s. 2d. represents the average of earnings when more for less than full time was worked. It is probable that these figures from the 1906 Wages Census are rather higher than the actual level for all women in the trades at this time. The 1914 figures provide a useful comparison, the hours being approximately the same as in 1906.

From the nineties until the passing of the first Trade Boards Act in 1909 several enquiries were made into trades where "sweating" was considered to exist. These were largely trades where women were employed either on the employer's premises or as out-workers, and several were connected with metal manufactures.

Select Committees of the House of Commons sat in 1907 and 1908 to enquire into home-work, and it was stated in evidence then that in the Birmingham metal trades the wage for an adult woman was between 10s. and 12s. per week: a wage of 15s. was high. The working week was between 50 and 55 hours. Telephone, sewing-machine and typewriter-making, the small ammunition trades, fuse- and cartridge-making and gun-engraving, were quoted as among the worst "sweated" trades. Where work was done off the premises of the employer, there is less reliable evidence of the hours spent by the operatives for the wages received, but the material prepared for the *Daily News* Exhibition of Sweated Industries, in 1906, gives, *inter alia*, details of both the earnings and hours of female out-workers and home-workers in different small metal trades. The particulars in Table 30 have been taken from this source.*

According to the Report of the War Cabinet Committee on Women in Industry (Cmd. 135, 1919), female labour on general engineering work in the Wolverhampton district in pre-war days could be obtained without difficulty from 8s. to 9s. per week, and in the lighter trades young girls from 14 to 16 years of age were frequently employed at wages between 3s. 6d. and 5s. per week: a woman of 21 years of age would ordinarily get about 12s. An agreement made in 1913 between the Midland employers and certain

* "Handbook of the *Daily News* Sweated Industries Exhibition," compiled by R. Mudie Smith, 1906.

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trade unions fixed the following time rates for females in engineering :—

Girls 14 years	6s.	per week.
„ 15 „	6d. 6d.	„
„ 16 „	7s.	„
„ 17 „	8s.	„
„ 18 „	9s.	„
„ 19 „	10s.	„
„ 20 „	11s.	„
„ 21 „	12s.	„

Many females were on piece-work, but their average earnings were quite low. For example, women on piece-work, making nails, screws and rivets, earned 12s. to 14s. weekly, whilst in the manufacture of bolts wages between 16s. and 18s. were obtained. In the cycle and motor trade the average pre-War weekly wages for all female labour were 13s. 3d. 65% of those employed were 18 years and over, and averaged 15s. 3d. per week. Those under 18 years of age obtained average wages of 9s. 6d.

TABLE 30

Hours and Earnings of Female Out-Workers and Home-Workers in Different Small Metal Trades

Description of Work.	Rates Paid.	Average Working Day.	Approximate Average Weekly Earnings.
<i>Chain-making :—</i>			
No. 1 size	5s. per cwt.	12 hours	6s. 5d.
$\frac{3}{8}$ size	3s. 6d. „	„	—
$\frac{1}{2}$ size	3s. 8d. „	„	6s. 9d.
No. 4 size	7s. 6d. „	„	6s. 6d.
<i>Nail-making :—</i>			
Sprigs	4½d. to 6½d. per 1150.	12-14 hrs.	5s. to 7s.
Hobs	5½d. per 1150.	„	6s.
Flat-headed tacks	7½d. to 10½d. per 1150.	„	6s. to 10s.
<i>Safety Pins :—</i>			
Capping and closing	1s. 6d. per 100 gross.	12½ „	4s. to 7s.
<i>Tin Work :—</i>			
Labels cut and shaped	1s. per 200 pieces.	—	6d. per day.

The Pre-War Attitude of Craft Unions

It has been shown that the increasing number of women employed in engineering and other metal trades was due not only to the expansion of these industries, but also to the greater use of easily operated machines and the policy of repetitive manufacturing. The women were engaged principally on tasks requiring little skill but an assiduity not always obtainable from male operatives. Their status was, in fact, equivalent to that of youths, or to that of the lowest of semi-skilled male workers. Employers, however, found them a reliable, docile and, what is perhaps most important, cheap form of labour.

It was the cheapness of this class of labour, rather than female employment *per se*, that was particularly disturbing to the craft unions, especially when it was engaged on work in any way competitive with that performed by union members. They saw with the extension of female labour the progressive degradation of their own earnings, and were consequently opposed to further in any way the employment of female workers.

Females were not admitted to membership of the engineering unions, but it is doubtful whether they would have welcomed the opportunity to join, if such a course had been open to them, as their outlook on trade unionism was entirely different from that of the skilled male worker. They did not desire long apprenticeships as a prelude to payment at certain fixed rates, nor were employers inclined to spend much time training workers who might soon leave the industry altogether. The female entrants were suited by work quickly learnt and calling in its execution for no considerable display of mental or physical effort. They set no great value on their labour, and on account of this and their individual position, accepted rates of payment remarkably low when compared with those existing for similar processes carried out by men.

The increasing growth in the numbers of females in the immediate pre-War years brought about a change in policy on the part of certain of the smaller craft unions. For some the question of female employment was acute, and a few in the metal trades attempted to organise women, principally with the intention of keeping them to certain sections of the trade. It may be added that these attempts were, with one exception, unsuccessful, and at the outbreak of the War there were only four engineering unions, all of minor import-

ance, which permitted female membership. These unions had a combined total of only 300 female members.

To the leading craft unions in the engineering trades the problem of female employment was not so immediate, due to the comparatively slow growth in the number of women engaged, coupled with their confinement to the lowest classes of machine and hand work. These craft unions, especially the Amalgamated Society of Engineers, with a membership of 200,000 before the War, could exert considerable influence in cases where the employment of women proved very distasteful.

The general labour unions whose male members were spread over several industries and trades had not the same objection to the employment of females, and admitted them to membership on equal terms with the men. The two principal unions of this character were the Workers' Union, and the National Union of General Workers, each of which included a number of female machine and metal workers before the War. The number was small, but it must be remembered that the total number of organised semi-skilled and unskilled male workers in engineering was also a small figure at this time.

The National Federation of Women Workers was the principal organisation for females in the engineering trades, but even this was of quite small proportions, and it is unlikely that the total number of organised women workers in the engineering and allied metal trades exceeded 3000 before the War.

The War Period

It has been shown in a previous chapter how the advent of war, with the consequent demand for a large armament production, led to a great increase in the number of semi-skilled male workers. The same conditions which brought this about—viz., that the work was largely of a repetitive type, capable of being carried out on semi-automatic machines—together with the fact that every available man was required for the fighting forces, naturally gave a great impetus to the employment of women. It has been estimated that considerably more than half a million females entered the engineering and allied metal trades during the War.

According to a Board of Trade estimate, the total number of women and girls engaged increased from 170,000 in July 1914 to 440,000 in January 1917. About 100,000 of the newcomers displaced men, and another 140,000 were engaged

on work of a character which had before the War been confined to male workers. More than half of the additional females were engaged in general engineering factories and workshops, where female numbers increased to 174,000 from the July 1914 figure of 17,000 quoted earlier in the chapter. A very large proportion of these females was engaged on work of national importance connected with the manufacture of munitions.

These figures relate to private firms, but, in addition, the number of females engaged on engineering munitions work in Government factories also rose during the same period of two and a half years from 2000 to 170,000. Of the 168,000 extra female workers in these Government factories, 50,000 were employed in "filling" shells and other projectiles.

The numbers of females employed in private and national factories continued to grow, and in July 1918 there were 594,000 in private firms and 225,000 in Government establishments, out of which total 392,000 directly displaced men. It is interesting to note that the total figure for July 1914, of 172,000 women and girls in Government and private establishments in engineering and the allied metal trades, represented 3·4% of the total employed females. The July 1918 total of 819,000, which is a 376% increase from July 1914 level, was 13·0% of the total females employed.

Women's Work During the War

The replacement of men by women during the War made it necessary in many cases to readjust the work to such an extent that special skill was not required, with the result that the majority of females employed were engaged on semi-skilled or unskilled work of a repetitive character. The sub-division and simplification of operations were also encouraged by the demand for large and rapid production, and, as a result of the changes, women, adequately supervised, were able to produce work of high quality. In addition, new work was developed which was designed for, and employed, only females from its inception.

In general, the output of female workers compared most favourably with that of males on similar work, women being found particularly suitable—as they had shown themselves in pre-War days—for comparatively light and simple repetitive work. To some extent their prowess must be considered as due to their desire to prove themselves worthy of their new status in engineering, and output was, in many cases, a

matter of personal pride. Again, their relationships with employers were newer and less strained than those existing between trade union workers and employers. Regarding their work as of a temporary character, and with no contemplation of becoming regular workers in the industry, they were not concerned with safeguarding conditions for the future, displayed less regard for recognised shop practices, and solely concerned themselves with immediate production and its reward. In this way the results of female labour may have shown up in a better light when compared with those of the established male worker than would otherwise have been the case.

The War opened the door to the employment of women in engineering factories to which they had gained no admittance in pre-War days. They were introduced to a variety of work, including turning, milling, screwing, drilling, boring, slotting, shaping, grinding, gear-cutting, core-making and bench operations in various departments, including tool-rooms. In the cycle and motor trades, and other branches of engineering to which women were admitted before the War, they were promoted during this period from lighter to heavier work, and from less skilled to more skilled operations. Sometimes a readjustment of the work was necessary, but often the female labour took over machine work directly from the male operatives, receiving at first additional supervision, which was dispensed with as the worker showed aptitude or responded to a limited amount of special training. In addition, females entered the aircraft and shipbuilding trades, proving themselves especially useful in the former, where specialised light repetitive work developed with rapidity.

Wages and Labour Conditions During the War

It is difficult to trace the history of the wages and general labour conditions applying to females in engineering during the War years. Between February 1916 and September 1918 forty-six Orders were issued regulating wages and conditions for women and girls on munitions work under control of the Ministry of Munitions. The changes in wages and conditions of those outside munitions work are also difficult to follow, but in many cases the changes which took place were in close accordance with the regulations affecting the female workers directly engaged on munitions work.

There were no accepted time rates for the small number

of female workers in engineering in pre-War days, such as those which applied to trade union members in different districts, which can be used as the basis of an estimate of the wages obtained. It is considered, however, that in the immediate pre-War period the weekly earnings of women in engineering were approximately 15s., the hours varying, as for male workers, between 50 and 54, with the majority of firms working between 53 and 54 hours in a normal week.

Women and girls had had protection up to this time, under the Factory Acts, against any considerable increase in the normal working week, and against excessive overtime working. During the War the Factory Acts were relaxed by Home Office Orders, and the legal restrictions with regard to overtime, night-work, Sunday work and the length of the working week were altered to permit increased hours to be worked. Although the dispensations contained certain definite regulations with regard to working hours, they were not the same for all factories, whilst the intentness on output was so great that disregard of Orders frequently escaped either punishment or reprimand. The variation in hours worked, together with the quick development of systems of payment according to output, consequent upon the vast demand for standard products, complicates the consideration of workers' earnings in the engineering trades during the War. One fact remains obvious, however, and that is that the palpably unorganised state of female labour and its inexperience of factory conditions, coupled with the state of national emergency, made it easy for employers to fix low time and piece rates, and difficult for trade unions to protest without laying themselves open to a charge of considering their personal interests more than those of the nation.

The rapid development of mass production; inexperience in fixing basic times or prices for systems of payment by results; the substitution of special machinery for general purpose equipment and other changes in production methods; the extended sub-division of operations and the substitution of females for male workers, all contributed to the difficulties confronting employers when deciding rates and prices; but they tended to fix these to permit of earnings comparable with those usually obtained by pre-War female labour, and, unfortunately for women, the pre-War wages of females in engineering and the metal trades were low. When females replaced males, the rate was generally cut, although the character of the work might remain the same, and if the

process was altered in any way, the cut in price was even more certain. When females on piece-work earned considerably in excess of the level of earnings which the employer had in mind when fixing the piece rates, they were not always credited with diligence and close application to their work : the more usual result was a lowered piece rate.

Females taking the whole place of fully skilled tradesmen in munitions factories were given some measure of protection, in that they were to receive the usual rates of the district for the operations performed ; but the number of such women was extremely small. Most females replacing men took over semi-skilled or unskilled work for which this guarantee did not apply. To these workers, according to a note issued by the Employers' Federation to its members, the recognised district rates for youths on the operations in question were to be paid. The trade unions were informed that female labour undertaking the work of semi-skilled and unskilled men would be paid the recognised rates of the district for female labour on the operations in question. This distinction shows the intention of employers to pay females at special rates much lower than those paid to male workers.

These low rates of pay, plus the practice of cutting piece rates to keep earnings in a certain relationship to the wages of time-workers, caused dissatisfaction, which increased as the cost of living rose. Failure to secure an improvement by individual action encouraged females to join together in protest, and a great increase in trade union membership took place.

The trade unions catering for females grew quickly in membership. The National Federation of Women Workers opened branches at important munitions centres, and during 1916 increased in membership from 20,000 to 40,000. The female membership of the Workers' Union rose from 5,000 to 20,000 during 1915, and had reached 35,000 by the end of 1916. This increase in membership was largely due to the enrolment of munitions workers.

Although the Amalgamated Society of Engineers turned down a motion in 1915 to admit women to membership, the union was alive to the need for giving support to female workers in their attempts to increase wages, and an informal alliance was entered into between organised women workers and the Amalgamated Society of Engineers on matters of policy affecting wages and conditions of employment.

Various bodies representing women were also active in attempting to protect female labour and secure adequate

wages. Out of the different discussions between these bodies and trade unions there crystallised a proposal for submission to the Government, that all women over eighteen years of age on munitions work should receive not less than £1 a week for a normal working week, as recognised prior to the War, except where the work prior to the War had been recognised by the principal unions as women's work in the districts concerned.

This proposal was one of expediency and not so complete in its demands as many of the sponsors wished. The whole body of munitions workers was included in the proposals put forward by various women's societies which were concerned, in addition to wages, with broader issues, including proper training facilities and security for women workers against unemployment after the War.

The men's unions in the engineering trades, whilst agreeing to the admission of women to the industry during the period of the War, were not prepared to discuss the future position. Also, they were principally interested in the female rates and earnings on work customarily performed by males. This explains why the proposals submitted to the Minister of Munitions in August 1915, in order to obtain the full support of the engineering unions, contained no reference to general matters about which there might have been a difference of opinion, and referred only to females engaged on work "not recognised as women's work before the War."

A quick response to this combined effort to influence the wages of women munitions workers was the appearance of the important official memorandum known as Circular L2. This made various recommendations, which at that time were optional, and the effect of the Circular was confined to national factories under the immediate control of the Minister of Munitions.

In February 1916, however, the Minister of Munitions was empowered to fix rates of wages and other conditions of female labour on munitions work generally, and issued instructions that Circular L2 was to be put into operation. Briefly, it provided that women over 18 years of age employed on work "not recognised as women's work before the War" should be paid a standard time wage of £1 per week, reckoned on the usual working hours of the district for men in engineering establishments; with a reservation that where the work was previously done by fully skilled tradesmen, the women should be paid the same time rates as these workers had received. It has been mentioned earlier that very few

women took the "whole place of fully skilled tradesmen," and only to this small section of women workers was the "rate customarily paid for the job" secured. Night-shift, overtime, Sunday and holiday allowances were to be paid on the same conditions as in the case of men. Piece prices and premium bonus rates were to be the same as were customarily paid to men, and, once fixed, were not to be altered without a definite change in the process of manufacture being made. The standard time wage of £1 per week was guaranteed, irrespective of the piece-work earnings. Several of the other provisions of this Circular were similar to those appearing in agreements between the craft unions and employers with regard to the way in which systems of payment by results should be operated.

The immediate effect of this Circular on the earnings of women, and in removing the worst abuses of the piece rate, was considerable. It should be noticed that the £1 per week stipulated was a standard sum, and not a minimum amount of payment. The majority of women munitions workers who were not engaged on piece-work or premium bonus received this statutory amount when replacing males, or carrying out work customarily done by men.

The absence of any prescribed rates for females under 18 years of age was a cause of dissatisfaction, and in July 1916 an Order was issued relating to the employment and remuneration of this class of female labour when engaged on munitions work of a category usually performed by males of 18 years of age and over. This applied the main provisions of Circular L2 to these workers, but the standard time wages were less, and graded in accordance with the age of the girl. Also piece-work prices were less than those paid for the work when carried out by males, the reductions varying from 10 to 30%, in accordance with the worker's age.

A special Tribunal for Women was set up early in 1916, which could deal with wages claims made by those employed on classes of munitions work which had regularly been carried out by women, as well as with claims from women and girls employed on munitions work of a character customarily performed by men.

Appeals to arbitration, if backed up by trade union support, frequently resulted in rates being raised. Many of the claims were from females on work not covered by the recently introduced Circular L2, viz., females on work which was not established as men's work prior to the War. During the first eighteen months, the Tribunal determined 150

awards in different factories affecting about 100,000 women in the engineering trades. In the first few months of its existence the rates of wages were raised in several factories, and the awards of this Tribunal relating to women and young girls employed on work "not recognised as men's work before the War" were consolidated in July 1916 by general Order 447.

This laid down that the time rates for piece-workers and premium bonus workers should be as follows :—

Workers 18 years and over	.	.	4d.	per hour
" 17 " under 18	.	.	3½d.	"
" 16 " " 17	.	.	3d.	"
" Under 16 years	.	.	2½d.	"

The rates for such women and girls when customarily on time were :—

Workers 18 years and over	.	.	4½d.	per hour
" 17 " under 18	.	.	4d.	"
" 16 " " 17	.	.	3½d.	"
" Under 16 years	.	.	3d.	"

with the additional proviso that women and girls working in danger zones should be paid ½d. an hour in addition to the above rates.

The guarantees to this section of female workers with regard to the introduction and operation of systems of payment by results were on similar lines to those given in Circular L2, which has been referred to on occasions as the women's charter in the engineering trades. Its terms certainly marked a substantial advance from those of any previous agreement.

Although the issue of a general Order was a step in the right direction, the terms were by no means satisfactory to the workers, principally because the rates were low and cost of living was rising steadily. The figure of 4½d. per hour was equivalent only to 3d. on a 1914 basis. Moreover, in some factories the workers were already preparing to apply to the Tribunal for rates higher than those which the Order established as the statutory standard payments.

The position, which was acute, was eased by a supplementary memorandum in September of the same year. This conceded the important amendment that piece rates should be so fixed as to allow a girl or woman of average ability to

earn at least time and a third, *i.e.*, 33 $\frac{1}{3}$ % greater than piece-workers' time rates. Overtime, night-shift, Sunday and holiday rates, which were not dealt with in the previous Order, were to be paid according to the custom of the trade.

In January 1917 a consolidating Order was issued affecting those in the "women's trades," or on work not recognised as coming within the province of the male worker. This embodied the earlier Orders, and left the rates per hour materially unchanged, but provided that the position of any female whose existing rates were already greater than those prescribed should not be prejudiced, either by a reduction taking place in the rates, or by the employer replacing the worker by one paid at lower rates.

Also in January 1917 an important change was made in the conditions and rates of payment applying to females on work customarily done by men. It was provided that the £1 weekly time wages should be paid for a week of 48 hours, with additional payments at 6*d.* per hour where the working week exceeded this number of hours, but no reduction where the hours were normally less. Time rates as well as piece rates were secured to women employed on "part of the work of a fully skilled tradesman," after a period of three months probation. During the probationary period the wages were on a specified rising scale. This Order 49 is comprehensive in character, and illustrates the attention which women's wages were receiving by this time. The term "fully skilled tradesmen" remained ambiguous, and was open, in the absence of any special ruling by the Minister of Munitions, to different interpretations adversely influencing the remuneration to certain female workers. It has been mentioned previously that so many alterations were made in methods of production and processes of manufacture during the War years, that it was extremely difficult in many cases for a woman to lay claim to having fully replaced a skilled man. Even if the claim were conceded, it was likely to be the subject of dispute within a short time as the result of an altered method of working.

The continued rise in the cost of living made it necessary soon to revise the rates which had been fixed for the two principal classes of female labour on munitions work. In April 1917 the rates per hour for time-workers on work not recognised as men's before the War were advanced to 5 $\frac{1}{2}$ *d.*, and those for piece-workers to a minimum of 4 $\frac{3}{4}$ *d.* There still remained the additional $\frac{1}{2}$ *d.* per hour for workers in

danger zones, and a lower scale for young girls. Piece-work earnings were expected to yield $33\frac{1}{3}\%$ above piece-workers' basic time rates.

The standard weekly time wage of £1 for women engaged on work not recognised as women's before the War was raised at the same time to 24s. for a week of 48 hours or less. The lower scale for girls was adjusted to give increases from the previous standards.

From this time forward, advances were granted to both classes of workers equally. These increases were principally on account of the increased cost of living, and were definitely in the category of "War bonus." In August 1917 there was an all-round bonus of 2s. 6d. granted to women over 18 years of age, including piece-workers, and a bonus of 1s. 3d. per week to girls. In December 1917 a further bonus to women was granted of 3s. 6d. per week. Then in September 1918 another all-round advance of 5s. was made.

Thus by the end of the War women on munitions work of a class which prior to the War was customarily done by men were in receipt of time wages amounting to 35s. per week of 48 hours. Women engaged on women's work in munitions, if employed by time, were guaranteed $5\frac{1}{2}$ d. per hour, and this, with the all-round bonus of 11s., gave them time wages of 33s. for a 48-hour week.

A belated recognition that the rate of $5\frac{1}{2}$ d. per hour was a minimum, and not a standard figure, and that the 24s. weekly time rate to women on men's work was also a minimum to be observed, had little effect in increasing the average earnings of women munitions workers on time payment. The minimum was in most cases the maximum, and continued to be regarded as the standard sum to be paid.

In January 1919 a further 5s. was granted to women in the engineering trades, so that when the hours were reduced to 47 per week, women on men's work in engineering received, as time-workers, 40s. per week, or the equivalent of $10\frac{1}{4}$ d. per hour. Women on women's work in these trades, if paid by time, received 38s. per week, i.e., $9\frac{3}{4}$ d. an hour.

In December 1919 another increase was secured of 3s. 6d. per week, thus bringing up the full-time weekly wages of women time-workers to 43s. 6d. if engaged on work customarily done by men and 41s. 6d. if employed on women's work. This marks the end of the increases, and to make it easier to follow the several changes in wages which have been

referred to, the principal alterations are summarised in the following table :—

Women on Work not Recognised as Women's Work Prior to the War.	Women on Work not Recognised as Men's Work Prior to the War.
<i>February 1916.</i>	<i>July 1916.</i>
£1 week for usual working hours to time-workers.	Time rate of 4d. per hour for piece-workers and premium bonus workers. 4½d. per hour for plain time-workers. Additional ½d. per hour in danger zones.
<i>January 1917.</i>	<i>September 1916.</i>
£1 for a working week not exceeding 48 hours. Pay- ment at 6d. per hour from 48 hours up to 54 hours per week. No reduction below £1 to time-workers if the normal working week is less than 48 hours. Additional payment for overtime, night-shifts, Sunday and holiday work on the same basis as men are paid.	Additional payment for over- time, night-shift, Sunday and holiday work in accord- ance with the custom of the trade. Piece rates to be fixed to allow earnings of at least 33½% above piece- workers' time rates to those of average ability.
<i>April 1917.</i>	<i>April 1917.</i>
£1 4s. per week of 48 hours or less for time-workers.	Time rate of 4½d. per hour for piece-workers and premium bonus-workers, and 5½d. per hour for plain time- workers.
August 1917 . . .	General advance 2s. 6d.
Dec. 1917 . . .	" " 3s. 6d.
Sept. 1918 . . .	" " 5s.
Jan. 1919 . . .	" " 5s.
Dec. 1919 . . .	" " 3s. 6d.

A very large number of females during the War worked on systems of payment by results—principally piece-work or premium bonus—and it is difficult to arrive at any satisfactory estimate of the average earnings of these workers. Not only did earnings vary greatly with individual workers, but considerable differences in piece rates existed in factories engaged on work of a similar character, whilst in any one factory rates changed from time to time consequent upon alterations in methods of production. Again, any consideration of the earnings of either time- or piece-workers is further

complicated by differences in the length of the working week, the amount of overtime, the extent of the three-shift system and the effect of night-shift working. Moreover, special bonuses were paid in several establishments for good time-keeping and for the maintenance of a stipulated level of output.

There were many cases of high earnings by women munitions workers on piece-work. These occurred particularly in factories which had manufactured projectiles before the War, and had piece-prices established under far different conditions, or in those factories which adopted the pre-war prices of armament firms, and were on mass production. In the "Report of the War Cabinet Committee on Women in Industry," however, it is stated that in a representative number of Government shell factories where the average time rate for all females was £1 12s. 8d. in April 1918, the average weekly earnings were then £2 2s. 4d. Also, from the returns of a number of government projectile factories which present a fair average sample of the wages obtained the average earnings of all females were stated to be £2 16s. 8d. in April 1918, when the average time rate was £1 14s. 8d. The Engineering Employers' Federation, in evidence before this Committee, estimated the actual War-time earnings of women on piece-work at 40s. per week. The figures in this Report upset the opinion commonly held that the majority of women munitions workers, and those employed on other engineering work during the War, received very high wages, though, as stated above, there were numerous instances of high individual earnings.

The Post-War Period

Large numbers of women left the engineering trades quickly after the War finished, and according to the 1921 Population Census, the total number of females in England and Wales then engaged in the manufacture of metals, machines, implements and conveyances was only 221,000. Although the principal reason for the decline in numbers was the cessation of munitions making on a grand scale, the trade depression which occurred in 1920 was an important contributory factor.

Since 1921 the number of women in the engineering trades has been increasing, particularly in the light sections of work, where repetitive hand or machine operations are carried out, and at the 1931 Census it was found that the number of females in England and Wales engaged in the

manufacture of metals, machines, implements and conveyances had increased to 276,000.

The distribution of these females has been described in Chapter I, and it was indicated that a considerable proportion of the total female labour in these industries is found in branches of work which are outside the generally accepted main sections of the engineering industry. Within the main branches of engineering most of the increase in female numbers is confined to electrical engineering and the manufacture of motor vehicles and aircraft.

It is difficult to determine to what extent, if any, the influx of women has prejudiced the position of the male workers in these trades, the numbers of whom have also shown a considerable increase since 1921. There is much new work which has, from its commencement, been carried out almost entirely by female labour. In one or two occupations males and females work side by side on identical jobs, but in most branches of these trades there is some distinction made between the light work performed by the two sexes, and they work in separate sections.

In the London area the proportion of female labour has risen at a greater rate than that for the average of the country. Heavier branches of engineering have left this district for one of easier access to the raw materials, whilst the general southward trend of industry has brought to the outskirts of London a large number of factories engaged on comparatively light metal work—much of it of a new character. Repetitive assembly or automatic machine work in connection with these manufactures has given increased employment to women, and the proportion of female labour, which was about 1 in 50 in the engineering and metal trades in the London district in 1891, had risen to more than 1 in 5 in 1929. The increase has been specially rapid in the after-War years. In Greater London in 1923 the total number of insured workers in the engineering and metal industries was 242,000, of whom 30,000 were females. By 1930 the total number of insured workers had increased to 268,000, which included 57,000 females. Owing to the exclusion from insurance^a after 1927 of persons aged over 65 years, some adjustment is necessary to the 1930 total, if strict comparison with the 1923 figure is desired. This adjustment would be very slight for female workers, and would not increase the 1930 total by 1%. In 1923 females formed 16% of the total labour force in the industry as operated in the area, whilst in 1930 this percentage had increased to 21%.

The increase in the number of women in the light engineering and allied metal trades is largely due to the tendency in those trades towards mass production, and a simplification of processes, which makes the work of a character suitable for female labour. There is little need for an extensive apprenticeship, and much of the work is of a simple routine nature, where the possession of considerable craft skill would be, perhaps, a hindrance rather than an aid to consistently high output.

Broadly speaking, the mechanisation of an industry tends to open up more avenues for female employment. In some cases it is not merely a difference in skill or manual dexterity which leads an employer to prefer a female worker for light repetitive work to a youth or male adult. Nor is it always the comparative cheapness of women's labour, although this has been an important factor in the increased engagement of females in certain sections of the engineering and metal trades. Sometimes it is a matter of temperament, and for simple operations carried out with monotonous regularity a better performance over any length of time may be given by female workers.

Women are precluded from certain processes to-day, just as in pre-War days, because of the degree of skill required, or on account of the heavy nature of the work. These determining causes for restricting their employment will continue to exist; but changed methods of production, and the supply of mechanical aids, are continually extending the sphere of their work, and giving them access to sections of manufacturing previously closed against them.

Although in different parts of the country there is considerable variation in the work allotted to women, there is fair agreement between employers and workpeople regarding the classes of work on which females may be engaged. They are an accepted part of the personnel, although the craft unions still watch carefully against the encroachment of female labour on work which comes within their special province.

Trade Union Organisation

It is not possible to ascertain the full extent of trade union organisation among female workers in engineering.

The leading engineering unions still do not admit females to membership, but there are at the present time about twenty unions, apart from the general labour unions, catering for women workers in different sections of engineering, ship-

building, other metal-working industries, and vehicle-building. The combined female membership of these unions is at present about 6,000. In the peak year of trade union membership, 1920, there were more than 15,000 women members in the corresponding group of trade unions. Numbers fell away very quickly afterwards, and in 1922 only 6,000 remained. This number remained steady until 1927, after which a decrease took place each year, and in 1932 the total was 4,500. Since then an improvement in numbers has been made each year.

The majority of female workers in engineering and the related metal trades, however, who are members of a trade union, belong to one or other of the two principal general labour unions, and there are no figures available showing the numbers of these female trade unionists.

Wages Rates

It will be remembered that the final increase of bonus in December 1919 brought up the weekly wages of women time-workers to 43s. 6d. if engaged on work customarily done by men, and to 41s. 6d. if they were employed on women's work. Despite protracted negotiations between the National Federation of General Workers and the Employers' Federation with regard to the wages of those females still employed in Engineering—the unions applying for an advance to meet the continued rise in the cost of living, and the Employers claiming a reduction in wages in view of bad trade—no agreement was reached. Moreover, the Government was no longer directly interested in fixing rates and conditions.

Shortly after the failure to reach an agreement, the Employers' Federation proceeded to reduce the rates of women workers until a level of 16s. was reached as the minimum base rate for a 47-hour week. On this there rested a bonus of 8s., making in all a minimum wage of 24s. per week for time-workers of 21 years and over. The wage at 18 years of age was 20s. inclusive of the bonus.

It will be perceived that this base rate of 16s. acknowledged little or no improvement in the status of female labour from pre-War days. The alteration of the adult age from 18 to 21 years was resented by the unions as unfair discrimination against females in engineering, since in many industries where women were employed 18 years was regarded as the adult age. Moreover, during the whole of the War period the lower age had been accepted as the dividing line.

In August 1924 the two principal unions with a female membership in the engineering industry—the National Union of General and Municipal Workers, with which the National Federation of Women Workers had now joined forces, and the Transport and General Workers' Union—asked for an agreed time rate for females of 30s. at the age of 18 years. Whilst not admitting a rate of 30s. as adequate, the unions desired an agreed rate, and in support of their application showed that with the 24s. time wages in operation, women over 21 years of age had had their wages reduced by 19s. 6d. per week if they were employed as time-workers. This reduction the unions considered excessive and unduly high compared with that which male workers had suffered.

The fact that the sections of engineering in which the majority of women were employed were among the most prosperous in the industry further encouraged the unions in their attempt to obtain a higher time rate for these workers. Their efforts met with no success, and an equally fruitless set of negotiations was carried through in December 1927. On this occasion, in addition to re-emphasising that the 24s. time wage was lower than that for most trades in which women were employed—not excepting those metal trades where wages were determined by Trade Boards—other points were brought forward in pressing for an agreed time rate of increased proportions.

It should be noticed that the unions were seeking to obtain a definite time rate, which would be the normal time wage, and not a time rate plus a bonus. The employers, on the other hand, had fixed a figure of 16s. as a time rate, from which piece-work prices and various other allowances were worked, and on top of this paid a general bonus of 8s. on account of factors which had less real incidence on the character of the work carried out. For example, changes in the cost of living, if agreed to at all as influencing wages, would result in alterations to the bonus of 8s., but not to the basic rate of 16s. This distinction between time rates and time wages must be borne in mind.

The additional points brought forward in the 1927 application by the unions included a reference to the growing practice of reducing the number of married women given employment. As the result of women marrying and voluntarily leaving the industry, the length of the industrial life of women was proportionately very much shorter than that of men. Insistence that marriage should finish their period of employment would still further reduce the possible length

of industrial life, and it was contended that this provided a further argument for returning to an adult age of 18 years, such as obtained through the War, instead of 21 years as laid down by the Employers' Federation.

One strong reason advanced for an increase in women's wages at this time was the grant of 2s. additional bonus to adult male plain time-workers, which was made in August 1927.

The subject of wages was reopened in July 1935, when the unions altered their tactics. Instead of asking for agreed time rates to be established, the request was simply for the extension to females of the 2s. increase granted on May 12th, 1935, to all adult males in engineering. This was settled by the Employers' Federation granting 1s. bonus from January 1st, 1936, to women workers of 18 years and over. It will be noticed that the bonus was granted to those over 18 years. This is of significance in connection with the adult age of women workers in engineering, which had for so many years been in dispute.

There is no doubt that the cheapness of female labour has been an important factor contributing to the increased numbers in the engineering industry, and, in this connection, it should be remembered that the agreed time rates and bonuses apply only to those firms in the Employers' Federation.

Although this Federation covers a large proportion of the women employed in the industry, yet over certain sections of work and in certain districts its influence is far from complete. For example, in the light engineering trades in the London area there is a large number of non-federated firms, and, so far as the employment of women is concerned in this area, it is doubtful whether the Federation can speak for more than half of the employers.

Although firms may remain outside the Federation the rates of payment which they adopt are frequently influenced by the basis laid down by the Employers' Federation. In the same way, the influence of trade union organisation is felt over a much wider field than that in which trade unionists are engaged.

Reference was made at an earlier point in this consideration of the position of women in engineering, to those sections of the metal trades where wages are determined by Trade Boards. The minimum rates for adult women are very much below those for adult men. For example, in the stamped and pressed metals the ordinary rate for men is 11d.

per hour, while that for women is only 6½*d.* The Trade Board minimum rates for women workers in certain metal trades are given below, for comparison with the Employers' Federation time wages, which have been shown to vary between 25*s.* and 29*s.* for most of the women employed.

<i>Trade Board.</i>	<i>Rate 1935.</i>
Cutlery	27 <i>s.</i> for women 21 years and over.
Metal hollow-ware	26 <i>s.</i> 5 <i>d.</i>
Pin, hook and eye	25 <i>s.</i> 5 <i>d.</i>
Stamped and pressed metal wares	24 <i>s.</i> 5 <i>d.</i>
Tin box	29 <i>s.</i>

Earnings

Reliance on time rates as a measure of the earnings of women and girls employed in the engineering trades is unsatisfactory, in view of the large proportion of this labour which is paid on a system of payment by results. The nature of much of the work carried out by females is such as to encourage the adoption by employers of piece-working or a premium bonus system. Whereas, taking the whole range of male workers, less than 60% of those in federated firms are on systems of payment by results, about 80% of women in these firms in the engineering trades are on piece-work or an alternative incentive system.

The 16*s.* base rate is also claimed by the Employers' Federation to be a minimum figure. This increases the difficulty of ascertaining even the actual wages of women time-workers. It was said in 1935 that slightly less than 33% of the women workers were nominally on this low rate; 24% were on scales between 16*s.* and 20*s.*; about the same percentage definitely on a 20*s.* rate, and the remainder paid an even higher basic rate. Of the 33%, by far the largest proportion was in two centres which were highly industrialised, and where piece-working was prevalent. The earnings of these workers were claimed by the employers to be greater than almost anywhere else in the country, and to exceed the average for the country by an appreciable sum.

According to a statement by the Employers' Federation, females over 18 years of age employed as time-workers received wages for the month of June 1935 which averaged 28*s.* 0½*d.* per week. Women piece-workers in federated firms received on the average 34*s.* 6*d.* weekly at this time. These figures were calculated on a 47-hours-week basis.

Earnings for a short period are open to criticism on various grounds if used to indicate the average earnings obtained by regular workers in the industry.

In some trades where women and girls are employed there has been a tendency in recent years to work at high pressure for part of the year and with depleted staffs for the remainder. This practice is noticeable in the manufacture of wireless, electric domestic appliances, electric lamps and gramophones. Not only has this a serious effect on the total year's wages of a worker, but in some instances, according to the trade unions, when the busy times come round there is an increased recruitment of younger workers—paid at lower rates—at the expense of older females dismissed when trade was slack. In individual factories the number of young girls is sometimes a very high percentage of the total of female workers. For example, in a wireless firm recently employing 250 females, 75% were between the ages of 14 and 16 years.

Summary

With the exception of the metal trades in the Midlands, female labour assumed no real importance in engineering until the beginning of this century saw the introduction of more semi-automatic machinery, and a spread of the policy of specialisation in manufacturing.

The general nature of much of the work done in the industry, and the opposing attitude of trade unions to the extension of female employment, restricted the general spread of female labour; but for repetition work, easily learnt and comparatively light in character, women were quickly employed. As a result, the total number of women employed in engineering and the allied metal trades rose from 44,000 in 1861 to 85,000 in 1901, and to 170,000 just prior to the War. In general engineering factories and machine shops there were about 17,000 females employed at the outbreak of War.

Wages were low in pre-War days, and the earnings of women of 21 years of age were in the vicinity of 12s. to 14s. a week, while in the lighter trades young girls could be obtained at wages between 3s. 6d. and 5s. weekly.

The outbreak of War, with the consequent demand for a large production of munitions, gave a great impetus to the employment of women in engineering and the allied metal trades, and it has been estimated that by January 1917 the total number employed in private firms had reached 440,000.

By July 1918 the numbers employed in private and national factories were 594,000 and 225,000 respectively, *i.e.*, a total of 819,000, which represented an increase of 376% over the July 1914 level. Time and piece rates fixed for females in the early War period were much lower than those for males on similar work, largely due to the unorganised state of female labour, and to the precedent of low pre-War wages. Failure to secure improvement led to a considerable increase in trade union membership, and the trade unions, with the assistance of various other bodies representing the interests of female workers, made a combined effort to influence the wages of women munitions workers. This effort resulted in the issue by the Minister of Munitions of an important memorandum known as Circular L2. In brief, this Circular provided that all women over 18 years of age employed on munitions work "not recognised as women's work before the War" should be paid a standard time wage of £1, and given the same general conditions of employment and terms connected with systems of payment by results as conceded to the male workers. Soon afterwards an Order was issued relating to the younger women. From time to time further Orders were issued, and increases were made until December 1919, when the weekly wages of women time-workers reached 43s. 6d. for work customarily done by men, and 41s. 6d. for work classed as women's work. Many women were engaged on piece-work during the War, and it is difficult to estimate their earnings. There were many cases of high individual earnings, but according to the "Report of the War Cabinet Committee on Women in Industry," the average weekly earnings of women in a representative number of Government shell and projectile factories were £2 2s. 4d. and £2 16s. 8d. respectively, in April 1918, when the corresponding average time rates for these workers were £1 12s. 8d. and £1 14s. 8d. Other estimates have also been made which point to the fact that the majority of women in engineering factories during the War did not obtain excessively high wages.

Large numbers of women left the engineering trades at the end of the War, and by 1921, according to the Population Census of that year, the total number of females, in England and Wales, engaged in the manufacture of metals, machines, implements and conveyances, had declined to 221,000. Since 1921 numbers have again increased, and in 1931, when the Population Census was taken, the number of females engaged had reached 276,000. The increase in female employment in

the post-War years is particularly marked in the London area, which has become a centre for many light metal industries of which repetitive work is a feature.

After the War, and despite the efforts of the trade unions, the Employers' Federation proceeded to reduce women's wages until a level of 16s. was reached as a minimum base rate. To this was added a general bonus of 8s., thus making a minimum time wage of 24s. for women over 21 years of age. The time wage at 18 years of age was reduced to 20s. inclusive of bonus. Protracted negotiations to increase women's wages proved fruitless, and it was not until the beginning of 1936 that any increase was made, and this consisted of an additional shilling on the bonus of women workers of 18 years and over.

Such a large proportion of females in engineering is employed on systems of payment by results—about 80% in federated firms—that it is difficult to assess the average earnings of all female workers, and it must be remembered that, even in the case of time workers, the 16s. rate is classed as a minimum figure at which, according to the Employers' Federation, less than 33% of the women in federated firms in 1935 were working. Moreover, of this 33%, by far the largest proportion were said to be located in two highly industrialised centres where piece-working was prevalent. Figures obtainable for June 1935 for females in federated firms show that for those over 18 years of age, employed as time-workers, the average wages were 28s. 0½d., and piece-workers received on the average 34s. 6d. at this time. These figures are calculated on the basis of a 47-hour week.

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