THE ENGINEERING, SHIPBUILDING AND VEHICLE TRADES

GENERAL REPORT

The following report summarises in comparable form the principal results of the Censuses of 1930 and 1924 for the engineering, shipbuilding and vehicle group of trades, of which detailed particulars are given in the succeeding reports on individual trades. The particulars in this report relate to the United Kingdom except where otherwise specified, and are confined to production carried out by private firms.

Principal results

The main particulars obtained for 1930 and 1924 are set out in the following table :—

Trade		Gross output (selling value of goods made and value of work done)	Cost of materials used and amount paid for work given out	Net output (excess of Col. (2) over Col. (3))	Average number of persons employed	Net output per person employed	Power available †
(1)		(2)	(3)	(4)	(5)	(6)	(7)
Engineering and Shipbuilding :—		£'000	£'000	£'000	No.	£	Thous. H.P.
Mechanical Engineering	1930	165,341	72,398	92,943	455,588	204	1,043·2
	1924	*160,532*	*74,471*	*86,061*	*448,202*	*192*	*923·9*
Electrical Engineering	1930	87,875	42,983	44,892	192,322	233	250·4
	1924	*69,117*	*36,080*	*33,037*	*150,884*	*219*	*161·4*
Shipbuilding ...	1930	62,724	35,171	27,553	133,453	206	351·7
	1924	*54,272*	*30,060*	*24,212*	*141,867*	*171*	*375·1*
Vehicles :—							
Motor and Cycle	1930	123,558	70,096	53,462	241,710	221	276·6
	1924	*93,693*	*48,988*	*44,705*	*192,708*	*232*	*186·0*
Aircraft ...	1930	8,688	3,111	5,577	21,322	262	18·8
	1924	*4,554*	*1,475*	*3,079*	*11,735*	*262*	*6·9*
Railway Carriage and Wagon ...	1930	10,735	6,339	4,396	23,339	188	78·1
	1924	*16,235*	*10,933*	*5,302*	*29,495*	*180*	*64·9*
Carriage, Cart and Wagon...	1930	2,410	1,248	1,162	7,015	166	6·3
	1924	*3,752*	*1,742*	*2,010*	*10,687*	*188*	*6·9*
TOTAL—							
UNITED KINGDOM	1930	461,331	231,346	229,985	1,074,749	214	2,025·1
	1924	*402,155*	*203,749*	*198,406*	*985,578*	*201*	*1,725·1*
England and Wales ...	1930*	395,865	196,016	199,849	925,283	216	1,588·5
	1924	*344,327*	*172,007*	*172,320*	*836,224*	*206*	*1,322·0*
Scotland ...	1930*	55,782	29,675	26,107	126,462	206	368·7
	1924	*51,616*	*28,484*	*23,132*	*130,740*	*177*	*354·9*
Northern Ireland ...	1930	9,684	5,655	4,029	23,004	175	67·9
	1924	*6,212*	*3,258*	*2,954*	*18,614*	*159*	*48·2*

† Total capacity of prime movers and of electric motors driven by purchased electricity.

* Owing to the possible disclosure of information relating to individual firms, particulars in respect of the Aircraft Trade for Scotland for 1930 have been included with those for England and Wales: the effect of this allocation on the aggregates for the two countries is negligible.

Comparability of results.—As explained in the General Report on the iron and steel group of trades (see pages 2-3), a number of engineering firms that made iron and steel castings for their own use furnished separate returns for their foundries at the 1930 Census, whereas one return covering the business as a whole was usually accepted in such cases for the year 1924. The returns made by these firms for 1924 on schedules for the Mechanical Engineering Trade thus included particulars of the employees and the power equipment at their foundries; further, the cost of the materials used at the foundries was included at the purchase price, whereas by the method followed for 1930 the foundry products themselves were included as materials used and were valued at the price at which they were transferred to the machining departments. The 1924 figures for the Mechanical Engineering Trade in respect of employment and power equipment are therefore over-stated and those for the cost of materials used are under-stated relatively to those for 1930, but the extent of the differences amounted to less than 1 per cent. of the group aggregates for these items; the figures of gross output are affected to the extent to which castings produced in the foundries were sold or added to stock.

The greater detail in which production was classified at the 1930 Census resulted in the assignment of some firms to different trades at the two Censuses, the most important case of this kind being that of a group of constructional engineering firms whose returns for 1924 were furnished on the schedule for the Iron and Steel Trades (Smelting, Rolling, etc.). For the purpose of the present reports, the returns made by these firms for 1924 have been incorporated in the results for the Mechanical Engineering Trade and this change has necessitated some adjustment of the figures published in the Final Report on the 1924 Census. The 1924 totals for the Electrical Engineering Trade include a small number of electrical contractors that were assigned to the Building and Contracting Trade at the 1930 Census but comparability between the aggregates for the group, or for the trade concerned, is not materially affected by this change.

All particulars relating to Great Britain, for both 1930 and 1924, are confined to firms employing more than ten persons, but those relating to Northern Ireland apply to firms employing more than five persons for the year 1930 and to all firms for 1924. This slight difference in scope has no appreciable effect on comparisons between the group aggregates shown for the two years.

Deficiencies due to the exclusion of small firms in Great Britain.—There will be found in the report on each trade a brief section setting out the number of persons reported to have been employed in both 1924 and 1930 by firms employing not more than ten

persons, with details of the chief classes of goods made and work done by these firms in the earlier year. In the engineering, shipbuilding and vehicle group of trades, 100,190 persons were recorded as employed by these small firms in 1930, of which over 57,000 were reported by firms in the Motor and Cycle Trade. The small firms in this trade include large numbers of owners of motor garages, the employees of which are only partially concerned in production, as defined for Census purposes, and in the Electrical Engineering Trade also there are many small firms that combine a trifling proportion of productive work (generally repairs) with a purely merchanting trade. The combination of productive with merchanting transactions is of frequent occurrence among businesses of larger scale, but, owing to the additional details required from such firms and the more precise directions contained in the schedule sent to them, it was generally possible to avoid over-statement of the staff assignable to their productive work. It is possible that the numbers of staff reported by the small firms include many employees required more for distributive than for productive trade, but the extent of the excess cannot be estimated.

In addition, there were 2,255 firms from which no information was received at the 1930 Census and the great majority of these also employed less than ten persons. Generally speaking, these businesses were similar in character to those small firms for which particulars were received and there is no reliable basis for estimating the number of their employees engaged mainly in work of manufacture or repair.

The total number of persons recorded for 1924 on returns received from firms employing not more than ten persons on the average, viz., 57,000, was probably less affected by the inclusion of distributive employees than that for 1930, as each firm was required to complete a form containing explicit directions on this point. About 9,500 firms failed to give any particulars for 1924, and these firms had, for the most part, small businesses.

It appears from the above that while the numbers of persons employed by small firms in these trades were probably larger in 1930 than in 1924, the increase is not likely to have been so great as is indicated by the employment figures actually recorded for such firms.

The work carried out by these small firms consisted very largely of repairs and their exclusion had little effect on the completeness of the survey as regards manufactured goods or new construction. At the 1924 Census, the total value of the manufacturing output recorded by these firms amounted to £5,980,000 and that of the repairs and other work done to £9,309,000, these figures representing less than 2 per cent. and over 16 per cent. respectively of the aggregates for all firms in this group of trades.

Periods covered by firms' returns

As explained in Note 1 on page xi, firms were given the option of making returns for the calendar year 1930 or for their period of account most closely corresponding thereto, provided that the ending date of that period was not later than 31st March, 1931. The following table shows, for the engineering, shipbuilding and vehicle group of trades as a whole, the total number of returns and the numbers of persons employed according to the periods covered by the returns received :—

Returns in respect of 12 months ended	Number of returns		Persons employed	
	Number	Per cent. of total	Average number	Per cent. of total
April, 1930	77	1·3	19,889	1·9
May, 1930	82	1·3	14,755	1·4
June, 1930	270	4·4	68,620	6·5
July, 1930	162	2·7	57,079	5·4
August, 1930	145	2·4	57,171	5·4
September, 1930 ...	418	6·8	63,708	6·1
October, 1930	189	3·1	16,590	1·6
November, 1930	107	1·8	7,330	0·7
December, 1930 ...	3,458	56·7	580,933	55·2
January, 1931	126	2·1	11,238	1·1
February, 1931 ...	103	1·7	9,329	0·9
March, 1931	956	15·7	145,103	13·8
TOTAL	6,093	100·0	1,051,745	100·0

The above particulars relate only to firms in Great Britain, a similar analysis of the returns furnished at the Census of Northern Ireland not being available.

Nearly 24 per cent. of the returns covered periods earlier than the calendar year. The mean terminal date of all the returns was about the middle of the first week of December, 1930, and the results as a whole represent the production of a period of twelve months of which nearly one month fell in the year 1929. About 57 per cent. of the total number of returns were for the calendar year and the firms concerned employed about 55 per cent. of the total number of employees in the whole group. The following table shows the number of returns and the numbers employed in each trade in respect of these firms :—

Returns covering the twelve months ended December 31st, 1930

Trade	Number of returns		Persons employed	
	Number	Per cent. of total	Average number	Per cent. of total
Engineering and Shipbuilding :—				
Mechanical Engineering	1,544	54	236,496	53
Electrical Engineering	375	57	129,712	68
Shipbuilding	253	63	74,721	60
Vehicles :—				
Motor and Cycle ...	1,106	58	111,837	47
Aircraft	21	55	8,514	40
Railway Carriage and Wagon	62	60	14,946	64
Carriage, Cart and Wagon	97	64	4,707	70
TOTAL ...	3,458	57	580,933	55

Production

As between one trade and another the money value of the gross output (column 2 of the table on page 197) is largely dependent on the intrinsic value of the materials from which the products are manufactured, while as between one year and another the gross output figure for the same trade is influenced by changes in the prices of those materials and in manufacturing costs and profits. Further, in certain trades duplication in the gross output value leads to a considerable over-statement of the value of the products as finally delivered, this factor affecting each trade to a different extent. For these reasons the gross output figure does not provide a satisfactory representation of the position either of different trades in relation to each other in a given year or of the same trade in different years.

The net output figure eliminates any over-statement due to the factor of duplication, but its utility as a basis of comparison between different trades in the same year is subject to the reservations mentioned in the Introductory Notes (page x); moreover, the relationship between the net output reported by a given trade for different years is affected by fluctuations in the various items which the figure comprises, viz., wages and salaries, rent, sales expenses, etc., as well as depreciation and profits. Measurement of production by net output is therefore only a rough guide and the important qualifications to which the results are subject should

not be overlooked. In this connection attention is drawn to the estimate made of the relative volume of production in the two years for the group as a whole (see page 203). Net output per head eliminates the variable factor of the numbers of persons employed, but the use of figures of net output per head for purposes of comparison is subject to the qualifications already mentioned.

Net output.—The table on page 197 shows that the value of the aggregate net output of this group of trades was greater in 1930 than in 1924 by £31,579,000, an increase of nearly 16 per cent. All the four principal trades in the group recorded higher figures for the later year, the increase shown for the Electrical Engineering Trade amounting to nearly 36 per cent. and for the Motor and Cycle Trade to nearly 20 per cent. Among the three smaller trades, the increase of 81 per cent. in the net output of the Aircraft Trade is particularly noteworthy.

There was an increase in net output per person employed in four of the trades in the group in 1930, and a decrease in two, while for the Aircraft Trade the same figure was recorded in each year. Net output per employee in this trade was higher by 22 per cent. than the average for all trades in the group in 1930, and the figures shown by the Electrical Engineering Trade and the Motor and Cycle Trade were about 9 per cent. and 3 per cent. respectively above the group average. The lowest figure in 1930 was that of the Carriage, Cart and Wagon Trade, which was about 22 per cent. below the average of the group.

Of the three divisions of the United Kingdom, net output per employee was highest in both years in England and Wales and lowest in Northern Ireland. In each division the figure shown for 1930 was greater than that for 1924, the increase in England and Wales being about 5 per cent., in Scotland about 16 per cent., and in Northern Ireland about 10 per cent.

Volume of production.—The following table shows, for each main group of commodities produced by the engineering, shipbuilding and vehicle trades (including constructional and repair work), the total output value recorded for the year 1930, and the result of a re-valuation of similar output for 1924, based so far as possible on the average factory values shown by the returns for 1930. Particulars of quantities are not available in respect of a considerable proportion of this output, and the estimates given for 1924 in terms of 1930 values should accordingly be regarded as only approximate. They are believed, however, to be correct within a comparatively small margin of error. The figures for both years represent the total recorded output, whether returned by firms in the trade chiefly concerned in the class of production specified, or by firms in other trades.

Kind of output	Total production in Great Britain			1930 as a percentage of 1924
	1930	1924		
	As returned	As returned	At 1930 average values	
	£'000	£'000	£'000	Per cent.
Machinery (other than electrical) and mechanical plant and appliances	157,528	152,647	152,430	103
Electrical machinery and apparatus	83,810	67,498	63,000	133
Ships and boats	56,788	50,682	63,352	90
Motor vehicles and cycles	118,785	93,243	78,184	152
Aircraft	9,712	5,398	3,380	287
Railway carriages and wagons ...	10,601	17,247	15,519	68
Carriages, carts and wagons ...	2,372	3,981	2,520	94
TOTAL	439,596	390,696	378,385	116

The figures shown represent the gross output value, and no allowance for duplication is made for either year. On the assumption that no marked change occurred in the amount of duplication included in the production totals the aggregate volume of production was about 16 per cent. greater in 1930 than in 1924. If the total figure shown for 1930 and that of the re-valued output for 1924 are divided by the number of persons employed in these trades in the two years, the resulting figure is £418 per employee for 1930 and £391 for 1924. This method of calculation indicates that in 1930 the output per employee in the engineering, shipbuilding and vehicle group of trades was greater than in 1924 by about 7 per cent., a figure which agrees closely with the recorded increase in net output per employee. As explained in the report on the Mechanical Engineering Trade, however, separate returns were made at the 1930 Census in respect of the iron and steel foundries of engineering establishments. This change had no effect on the volume of engineering products made but it resulted in the transference in 1930 of about 5,000 employees from this group of trades to the iron and steel group. If allowance is made for this change the increase in volume of output per employee in 1930 would be about 6 per cent.

Number of establishments

The following table shows the number of separate establishments covered by the results for 1930, and the total number of returns received for 1930 and 1924. In the case of a firm owning more than one establishment situated in the same Census area and engaged in the same Census trade, a combined return covering all

such establishments was usually accepted provided the number of operatives employed at each establishment was shown separately. The number of establishments reported was thus greater than the number of returns received.

Trade	1930		1924
	Number of establishments	Number of returns	Number of returns
Engineering and Shipbuilding :—			
Mechanical Engineering	3,343	2,838	3,128
Electrical Engineering	767	653	709
Shipbuilding	456	401	493
Vehicles :—			
Motor and Cycle	2,624	1,907	1,567
Aircraft	47	38	20
Railway Carriage and Wagon ...	154	104	101
Carriage, Cart and Wagon	176	152	297
TOTAL	7,567	6,093	6,315

These figures relate only to firms in Great Britain, the number of establishments not being recorded separately in the report on the Census of Production of Northern Ireland.

Size of firms

In the following table the main particulars recorded at the Census of 1930 for the Engineering, Shipbuilding and Vehicle Trades are grouped according to the average numbers of persons shown in the returns. The particulars given in this section relate to firms in Great Britain only.

Size of firm (average numbers employed)	Number of returns	Gross output	Cost of materials	Amount paid for work given out	Net output	Average number of persons employed	Net output per person employed
	No.	£'000	£'000	£'000	£'000	No.	£
11–24 ...	2,073	11,675	4,934	168	6,573	35,544	185
25–49 ...	1,435	17,399	7,690	179	9,530	50,064	190
50–99 ...	978	25,328	11,562	235	13,531	68,243	198
100–199 ...	646	34,935	16,268	284	18,383	90,285	204
200–299 ...	265	25,385	11,590	240	13,555	64,631	210
300–399 ...	164	24,017	11,610	166	12,241	56,920	215
400–499 ...	84	15,945	7,664	377	7,904	37,844	209
500–749 ...	156	40,090	19,289	788	20,013	95,135	210
750–999 ...	97	37,302	18,660	172	18,470	83,689	221
1,000–1,499	72	38,022	18,730	237	19,055	87,193	219
1,500 and over	123	181,549	93,290	1,558	86,701	382,197	227
TOTAL ...	6,093	451,647	221,287	4,404	225,956	1,051,745	215

This group contains a considerable number of large scale undertakings and the average number of persons recorded on each return (173) was substantially higher than in any other group of manufacturing industries. The table shows that more than one-third of the total number of persons employed by all firms in the group were recorded on the returns for the establishments of largest size (1,500 persons or more). The net output per person employed by these large undertakings was higher than the average for the remaining establishments by about 9 per cent.

There was a progressive increase in net output per employee from the first to the sixth group, and net output per employee was only above the general average in the three groups of largest size. In the smaller ranges the net output formed a higher proportion of the gross output value than among the larger firms, being highest in the smallest range (56·3 per cent.) and lowest in the group containing firms employing 1,500 or more (47·8 per cent.). The number of persons required per unit of gross output value was thus appreciably greater in the smaller than in the larger undertakings.

The following table shows, for the four principal trades included in the group, the net output per person employed by firms of the ranges of size indicated :—

Net output per person employed

Size of firm (average numbers employed)	Mechanical Engineering	Electrical Engineering	Shipbuilding	Motor and Cycle
	£	£	£	£
11–24	199	215	170	171
25–49	199	194	177	178
50–99	199	200	194	203
100–199	203	216	197	205
200–299	210	218	246	188
300–399	208	240	199	213
400–499	217	186	228	206
500–749	202	235	217	207
750–999	205	237	206	220
1,000–1,499	223	221	204	201
1,500 and over ...	198	246	210	254
TOTAL	204	234	210	222

Regional distribution.

In the following table the principal aggregates for the engineering, shipbuilding and vehicle group as a whole, as recorded at the Censuses of 1930 and 1924, are grouped according to the areas into which the United Kingdom has been sub-divided :—

Area		Number of returns	Gross output	Net output	Average number of persons employed	Net output per person employed
		No.	£'000	£'000	No.	£
1. Greater London ...	1930	1,483	91,962	48,826	205,280	238
	1924	*1,344*	*74,497*	*38,432*	*168,050*	*229*
2. Lancashire, with North Cheshire and the Glossop and New Mills district of Derbyshire ...	1930	905	74,016	38,727	181,019	214
	1924	*1,088*	*71,266*	*36,743*	*178,138*	*206*
3. The West Riding of Yorkshire and the City of York ...	1930	577	21,843	12,207	60,499	202
	1924	*665*	*27,835*	*14,715*	*71,495*	*206*
4. Northumberland, Durham and the Cleveland district of Yorkshire	1930	261	34,178	14,351	78,226	183
	1924	*276*	*29,148*	*12,542*	*77,160*	*163*
5. Warwickshire, Worcestershire and Staffordshire ...	1930	778	90,692	43,706	202,706	216
	1924	*804*	*74,394*	*35,628*	*170,149*	*209*
6. The rest of England (except Monmouthshire)	1930*	1,328	79,376	39,715	186,427	213
	1924	*1,269*	*62,242*	*31,510*	*157,288*	*200*
7. Glamorganshire, Monmouthshire and Carmarthenshire ...	1930	112	3,453	2,120	10,139	209
	1924	*121*	*4,435*	*2,516*	*11,920*	*211*
8. The rest of Wales ...	1930	23	345	197	987	200
	1924	*39*	*510*	*234*	*2,024*	*116*
TOTAL— England and Wales ...	1930*	5,467	395,865	199,849	925,283	216
	1924	*5,606*	*344,327*	*172,320*	*836,224*	*206*
9. Lanarkshire, Renfrewshire and Dumbartonshire	1930	363	47,327	21,487	101,186	212
	1924	*406*	*42,755*	*18,592*	*102,897*	*181*
10. The rest of Scotland	1930*	263	8,455	4,620	25,276	183
	1924	*303*	*8,861*	*4,540*	*27,843*	*163*
TOTAL—Scotland ...	1930*	626	55,782	26,107	126,462	206
	1924	*709*	*51,616*	*23,132*	*130,740*	*177*
TOTAL—Great Britain ...	1930	6,093	451,647	225,956	1,051,745	215
	1924	*6,315*	*395,943*	*195,452*	*966,964*	*202*
11. Northern Ireland ...	1930	181	9,684	4,029	23,004	175
	1924	*72*	*6,212*	*2,954*	*18,614*	*159*
TOTAL— UNITED KINGDOM ...	1930	6,274	461,331	229,985	1,074,749	214
	1924	*6,387*	*402,155*	*198,406*	*985,578*	*201*

* See footnote to table on page 197: the individual areas affected are areas 6 and 10.

In respect of employment, the Lancashire area declined from the first place in the group aggregate in 1924 to the fourth in 1930, there being a marked increase in the other three principal areas

and only a small increase in Lancashire. Greater London took the first place in 1930, showing an increase in employment of 22 per cent. over the 1924 total; Warwickshire, Worcestershire, and Staffordshire occupied the second place with an increase of 19 per cent. over 1924, and the " rest of England " the third place with an increase of 18 per cent. The only other change of importance in Great Britain was a decline of between 15 and 16 per cent. in the West Riding of Yorkshire. Of the three divisions of the United Kingdom, there was an increase of 24 per cent. in the numbers employed in Northern Ireland and of between 10 and 11 per cent. in England and Wales, but a decrease of about 3 per cent. in Scotland.

The net output per person employed was highest in each year in Greater London, and lowest in Northern Ireland (with the minor exception of area 8 in 1924). All the areas distinguished showed higher figures of net output per employee in 1930, with the exception of the West Riding of Yorkshire and South Wales.

Employment

The following table shows the average numbers of male and female operatives and administrative, technical and clerical staff in each of the trades in this group in the two censal years :—

Average numbers employed in 1930 and 1924 in the several Engineering, Shipbuilding and Vehicle Trades

Trade		Operatives		Administrative, technical and clerical staff		Total
		Males	Females	Males	Females	
Engineering and Shipbuilding :—						
Mechanical Engineering	1930	369,560	15,843	53,990	16,195	455,588
	1924	*370,718*	*15,140*	*48,177*	*14,167*	*448,202*
Electrical Engineering	1930	103,619	48,384	28,145	12,174	192,322
	1924	*87,036*	*34,331*	*20,547*	*8,970*	*150,884*
Shipbuilding	1930	123,508	848	7,702	1,395	133,453
	1924	*130,381*	*803*	*9,073*	*1,610*	*141,867*
Vehicles :—						
Motor and Cycle ...	1930	183,033	24,566	22,963	11,148	241,710
	1924	*148,641*	*19,230*	*17,120*	*7,717*	*192,708*
Aircraft	1930	16,545	1,050	2,911	816	21,322
	1924	*9,302*	*700*	*1,339*	*394*	*11,735*
Railway Carriage and Wagon	1930	20,196	218	2,221	704	23,339
	1924	*26,186*	*266*	*2,338*	*705*	*29,495*
Carriage, Cart and Wagon	1930	4,812	1,339	550	314	7,015
	1924	*7,864*	*1,533*	*920*	*370*	*10,687*
TOTAL—UNITED KINGDOM	1930	821,273	92,248	118,482	42,746	1,074,749
	1924	*780,128*	*72,003*	*99,514*	*33,933*	*985,578*

Trade		Operatives		Administrative, technical and clerical staff		Total
		Males	Females	Males	Females	
England and Wales	1930*	694,021	88,096	104,979	38,187	925,283
	1924	*653,377*	*67,840*	*85,861*	*29,146*	*836,224*
Scotland	1930*	106,501	4,090	11,825	4,046	126,462
	1924	*110,392*	*4,142*	*11,881*	*4,325*	*130,740*
Northern Ireland...	1930	20,751	62	1,678	513	23,004
	1924	*16,359*	*21*	*1,772*	*462*	*18,614*

* See footnote to table on page 197.

Distribution by status.—The number of *operatives* formed a slightly lower proportion of all employees in 1930 (85·0 per cent.) than in 1924 (86·5 per cent.), but increased in the aggregate by 61,390, or about 7 per cent. In the Electrical Engineering, Motor and Cycle and Aircraft Trades, the 1930 total of operatives was higher than that of 1924 by 77,957 persons, or over 26 per cent. The figures for the Mechanical Engineering Trade showed little change, but those for the remaining three trades declined by 16,112 (9·6 per cent.). *Administrative, technical and clerical* employees increased by 27,781 in 1930, or by about one-fifth of the total, the increase being most marked in the three trades contributing chiefly to the larger total recorded for operative staff. While the numbers of administrative, etc. staff in Scotland and Northern Ireland were about the same in both years, the number of operatives decreased in Scotland by 3½ per cent. and increased in Northern Ireland by 27 per cent.

Distribution by sex.—The proportion of female employees increased from 10·7 per cent. of all employees in 1924 to 12·6 per cent. in 1930, mainly owing to the expansion of the Electrical Engineering and the Motor and Cycle Trades, which provided employment for large numbers of females in both years. In the aggregate, females increased in numbers by over 29,000, or 27 per cent. of the 1924 total, while males increased by 60,000, or 7 per cent.

Distribution by age.—The following table classifies by age the numbers of persons of each class recorded as employed in the various Engineering, Shipbuilding and Vehicle Trades in the weeks ended 18th October, 1930 and 1924 :—

Number of persons employed in the weeks ended 18th October, 1930 and 1924

Trade		Operatives				Administrative, technical and clerical staff			
		Males		Females		Males		Females	
		Under 18	Total	Under 18	Total	Under 18	Total	Under 18	Total
		No.	No.	No.	No.	No.	No.	No.	No.
Engineering and Shipbuilding :—									
Mechanical Engineering ...	1930	43,430	355,914	3,506	15,259	5,241	53,990	3,024	16,195
	1924	*44,290*	*368,961*	*3,968*	*15,326*	*4,701*	*48,177*	*2,063*	*14,167*
Electrical Engineering...	1930	16,762	105,914	13,800	49,460	2,371	28,145	2,416	12,174
	1924	*17,390*	*91,830*	*12,353*	*36,970*	*2,115*	*20,547*	*1,749*	*8,970*
Shipbuilding	1930	12,203	111,600	190	766	722	7,702	163	1,395
	1924	*13,252*	*127,983*	*106*	*782*	*811*	*9,073*	*154*	*1,610*
Vehicles :—									
Motor and Cycle ...	1930	20,674	179,943	5,391	24,025	2,364	22,963	2,121	11,148
	1924	*18,410*	*147,163*	*4,237*	*18,949*	*1,903*	*17,120*	*1,520*	*7,717*
Aircraft ...	1930	2,062	16,805	174	1,067	260	2,911	188	816
	1924	*1,118*	*10,283*	*126*	*778*	*106*	*1,339*	*58*	*394*
Railway Carriage and Wagon ...	1930	2,174	19,051	27	206	214	2,221	152	704
	1924	*3,163*	*24,986*	*51*	*250*	*294*	*2,338*	*72*	*705*
Carriage, Cart and Wagon	1930	1,001	4,795	365	1,335	39	550	66	314
	1924	*1,473*	*7,985*	*575*	*1,562*	*65*	*920*	*73*	*370*
TOTAL ...	1930	98,306	794,022	23,353	92,118	11,211	118,482	8,130	42,746
	1924	*99,096*	*779,191*	*21,416*	*74,617*	*9,995*	*99,514*	*5,689*	*33,933*

The total number of young persons employed in these trades increased from 136,200 in 1924 to 141,000 in 1930, but formed a slightly smaller proportion of all employees in the later year (13·5 per cent.) than in the earlier (13·8 per cent.). Each age class distinguished in the above table showed an increase in the later year except that for juvenile male operatives.

Monthly fluctuations in employment.—Firms were required to state the actual numbers of operatives employed in the middle week of each month of the periods covered by their returns, and the following table shows the monthly aggregates for each of the trades in the engineering, shipbuilding and vehicle group :—

Operative staff (excluding outworkers) in the Engineering, Shipbuilding and Vehicle Trades in 1930 and 1924

Middle week in	1930		1924
	Total number	Number employed by firms furnishing returns in respect of the twelve months ending December*	Total number
(1)	(2)	(3)	(4)
January	951,471	519,644	811,944
February	945,605	514,600	831,509
March	944,659	512,754	836,401
April	946,523	511,283	843,554
May	941,711	510,041	857,371
June	905,084	498,365	860,334
July	917,776	490,595	864,065
August	891,305	478,892	855,856
September	881,702	476,151	858,168
October	886,140	466,535	861,789
November	879,300	458,974	866,448
December	870,972	448,438	878,127
AVERAGE FOR THE TWELVE MONTHS ...	913,521	490,522	852,131

* Great Britain only.

The figures in columns (2) and (4) represent the aggregates recorded in all returns, irrespective of the periods to which they related;† thus, for example, in the case of returns covering the 12 months ended 31st March, 1931, the figures recorded in column (2) for the first three months were the numbers employed in that period of the year 1931, while the numbers at work in the last three months of the year 1929 were stated in returns covering the 12 months ended 30th September, 1930. A more accurate representation of the fluctuations in employment in the year 1930 is provided by the figures in column (3), which show the numbers recorded on returns that related to the calendar year. The number of operatives covered by these returns represented about 55 per cent. of the total number employed in Great Britain in 1930.

A continuous decline throughout 1930 is indicated by the figures in column (3). The decline was relatively greater in the second half of the year, the quarterly average being lower by 1·8 per cent. in the second quarter, by 4·9 per cent. in the third and by 5 per

† See Introductory Notes, page xi.

cent. in the fourth than the average of the previous quarter in each case. The number of operatives in employment at the end of the year was lower by about 14 per cent. than at the beginning.

Wages

The table on pages 212 and 213 summarises the information available as to the amount of wages paid by firms in the Engineering, Shipbuilding and Vehicle Trades in 1930 and 1924. The particulars of wages shown in column (8) are those ascertained by the Ministry of Labour as a result of the voluntary inquiries undertaken by that Ministry into wages and hours of labour in the United Kingdom. Owing, however, to various causes, including the fact that certain firms owning several establishments made combined returns to one Department and separate returns to the other, it has not been found practicable to secure comparable particulars in respect of all firms that furnished particulars of wages to the Ministry of Labour.

The numbers of operatives shown in columns (1) and (3) are those returned to the Census of Production as employed by the firms concerned in the weeks ended 18th October, 1930 and 1924, and the average during the year 1930 respectively. The amount of wages paid shown in column (8) was the aggregate returned to the Ministry of Labour in respect of the same firms. The proportion of each trade represented by the firms that furnished particulars of their wage bills is shown in columns (2) and (4) based on the numbers of operatives employed and, in column (7), on net output. The average numbers of operatives employed during the year 1924, corresponding to those given in column (3) in respect of 1930, are not available.

The particulars given for the year 1924 for the Mechanical Engineering Trade are based on the classification followed at the Census of that year, as it has not been possible to make the adjustments necessary to bring them into conformity with the revised classification adopted for 1930 (see page 198). These changes may possibly affect the comparability of the wages figures given for this trade.

The figures for both years relate to firms employing on the average more than ten persons during the respective years and cover firms in Great Britain only.

About two-thirds of the total trade of the group was covered by firms whose wages returns are included in this table, the proportion being slightly higher in 1924 than in 1930.

Trade		Firms furnishing returns of wages: Operative staff employed: During week ended 18th October (1)	Proportion of trade (2)	Average during year (3)	Proportion of trade (4)	Gross output (5)	Net output: Amount (6)	Net output: Proportion of trade (7)	Wages paid: Amount (8)	Wages paid: Proportion of net output (9)	Trade
		No.	Per cent.	No.	Per cent.	£'000	£'000	Per cent.	£'000	Per cent.	
Mechanical Engineering ...	1930	242,326	67·0	252,979	67·4	106,989	59,075	65·1	33,140	56·1	1930 Mechanical Engineering.
	1924	*265,756*	*69·2*	*	*	*	*58,902*	*69·5*	*32,793*	*55·7*	*1924*
Electrical Engineering ...	1930	116,195	74·9	114,465	75·4	65,684	35,104	78·3	13,120	37·4	1930 Electrical Engineering.
	1924	*105,506*	*82·0*	*	*	*	*26,428*	*80·1*	*11,185*	*42·3*	*1924*
Shipbuilding	1930	55,447	53·3	60,685	52·7	28,316	12,433	48·0	8,526	68·6	1930 Shipbuilding.
	1924	*76,165*	*61·5*	*	*	*	*13,650*	*60·0*	*10,104*	*74·0*	*1924*
Motor and Cycle†	1930	132,509	65·3	133,714	64·8	86,639	36,541	68·6	19,776	54·1	1930 Motor and Cycle.†
Aircraft†	1930	10,697	59·9	10,319	58·6	5,246	3,312	59·4	1,562	47·2	1930 Aircraft.†
Motor, Cycle and Aircraft	1930	143,206	64·9	144,033	64·3	91,885	39,853	67·7	21,338	53·5	1930 Motor, Cycle and Aircraft.
	1924	*101,090*	*57·3*	*	*	*	*29,609*	*62·1*	*15,483*	*52·3*	*1924*
Railway Carriage and Wagon	1930	13,529	70·3	14,034	68·7	7,621	3,043	69·2	1,971	64·8	1930 Railway Carriage and Wagon.
	1924	*19,142*	*75·9*	*	*	*	*3,985*	*75·2*	*2,770*	*69·5*	*1924*
Carriage, Cart and Wagon	1930	3,620	61·2	3,643	61·4	1,521	701	62·3	405	57·8	1930 Carriage, Cart and Wagon.
	1924	*6,893*	*72·7*	*	*	*	*1,575*	*78·9*	*1,081*	*68·6*	*1924*
TOTAL	1930	574,323	66·3	589,839	66·1	302,016	150,209	66·5	78,500	52·3	1930 TOTAL
	1924	*574,552*	*67·8*	*	*	*	*134,149*	*68·6*	*73,416*	*54·7*	*1924*

* Not available.

† Separate particulars in respect of these trades are not available for 1924.

The number of operatives recorded on the wages returns as employed during the week ended October 18th was substantially the same in each year, but the average number employed during the year 1930 by these firms was about 15,500 (2·7 per cent.) more than the number employed during the week mentioned. For the group as a whole, the average number of operatives employed during the year 1924 was 1·4 per cent. less than the number employed during the week ended October 18th. These facts should be borne in mind in relating the employment figures to the wages aggregates, which show an increase of over £5,000,000 in the later year.

In only two of the trades concerned did wages form a proportion of net output higher in 1930 than in 1924, viz., the Mechanical Engineering Trade and the combined Motor, Cycle and Aircraft Trades, and for the group as a whole the proportion declined from 54·7 per cent. to 52·3 per cent. In both 1930 and 1924 the proportion of net output formed by wages was lowest in the Electrical Engineering Trade, and the average wage per operative in this trade (in which large numbers of females are employed) was considerably lower than the average of the group as a whole. The proportion of net output formed by wages was highest in each year in the Shipbuilding Trade.

Power

The particulars recorded at the Censuses of 1930 and 1924 in respect of power installed and employed in the engineering, shipbuilding and vehicle group of trades are shown in the following table :—

Power ordinarily in use and not in use in the Engineering, Shipbuilding and Vehicle Trades in 1930 and 1924

Type	Capacity ordinarily in use		Capacity in reserve or idle		Proportion in reserve or idle	
	1930	1924	1930	1924	1930	1924
PRIME MOVERS	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.	Per cent.	Per cent.
Reciprocating steam engines	101·7	147·1	40·6	64·7	28·5	30·5
Steam turbines ...	83·3	83·9	27·3	31·2	24·7	27·1
Internal combustion engines :—						
Gas	54·1	85·0	13·3	18·1	19·7	17·6
Petrol, kerosene or other light oils ...	5·2	6·4	1·8	2·5	25·4	28·7
Heavy oils	49·7	21·9	9·3	5·6	15·8	20·4
Water engines	0·8	0·9	*	—	3·8	—
TOTAL—Prime movers	294·8	345·2	92·3	122·1	23·9	26·1

Type	Capacity ordinarily in use		Capacity in reserve or idle		Proportion in reserve or idle	
	1930	1924	1930	1924	1930	1924
ELECTRIC GENERATORS Driven by	Th. Kw.	Th. Kw.	Th. Kw.	Th. Kw.	Per cent.	Per cent.
Reciprocating steam engines	41·1	46·3	26·4	35·7	39·1	43·5
Steam turbines ...	58·1	56·3	20·8	21·9	26·3	28·0
Internal combustion engines :—						
Gas	19·1	27·1	5·6	7·8	22·8	22·2
Petrol, kerosene or other light oils	1·3	1·9	0·6	1·3	32·5	40·3
Heavy oils	28·5	13·3	6·2	3·9	17·9	22·8
Water engines ...	0·3	0·2	†	†	2·9	23·1
TOTAL— Electric generators	148·4	145·1	59·6	70·6	28·7	32·7
ELECTRIC MOTORS Driven by	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.		
Electricity generated in same works ...	298·1	271·1	31·2	55·6	9·5	17·0
Electricity generated in other works under same ownership ...	9·2	3·0	1·6	0·4	14·7	13·0
Purchased electricity	1,477·4	1,033·8	160·6	224·0	9·8	17·8
TOTAL—Electric motors	1,784·7	1,307·9	193·4	280·0	9·8	17·6

* Less than 50 h.p. † Less than 50 kw.

The power generated by prime movers is required partly for direct application and partly for driving generators for the production of electrical energy. The electrical energy so produced may be used either for the purpose of driving electric motors or for heating, lighting and process purposes. Particulars of the power applied mechanically (i.e. directly) and electrically are given in the table on page 218.

By far the most important source of power in this group of trades was purchased electrical energy, the use of which appears to have become even more general in 1930 than in 1924. The capacity of motors in use driven by purchased electricity increased in 1930 by about 43 per cent. and there was an increase of about 10 per cent. in that of motors in use driven by generators situated in the same works. On the other hand a decline of about 15 per cent. is indicated in the capacity of prime movers in use.

The proportion of the total power capacity that was in reserve or idle was less in 1930 than in 1924, particularly in the case of electric motors. At the 1930 Census, firms were definitely informed that obsolete engines should not be recorded in their returns, and as no similar instruction was given at the previous Census, the figures for reserve or idle plant in the two years may not be precisely comparable. In any case, however, the proportion of reserve or idle plant does not furnish a reliable measure of the activity of trade, since all engines that were in operation during the greater part of the period in which production was carried on were recorded as "ordinarily in use," irrespective of intermittent working.

The particulars furnished at the two Censuses by each of the trades included in the engineering, shipbuilding and vehicle group, in respect of prime movers, electric generators and electric motors installed, are shown in the following table :—

Power available in 1930 and 1924

Trade		Prime movers	Electric generators	Electric motors			
				Driven by electricity			
				Generated in same works	Generated in other works under same ownership	Purchased	All electric motors
		Th. H.P.	Th. Kw.	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.
Engineering and Shipbuilding :–							
Mechanical Engineering	1930	237·9	126·0	191·0	6·4	805·3	1,002·7
	1924	*299·8*	*126·5*	*198·8*	*2·2*	*624·1*	*825·1*
Electrical Engineering	1930	34·0	22·2	33·1	1·2	216·4	250·7
	1924	*48·0*	*31·9*	*47·1*	—	*113·4*	*160·5*
Shipbuilding	1930	36·6	18·1	36·7	2·7	315·1	354·5
	1924	*44·7*	*19·3*	*28·1*	—	*330·4*	*358·5*
Vehicles :—							
Motor and Cycle ...	1930	46·3	25·3	33·5	—	230·3	263·8
	1924	*45·6*	*22·1*	*26·6*	—	*140·4*	*167·0*
Aircraft ...	1930	3·8	2·4	1·8	—	15·0	16·8
	1924	*3·0*	*1·6*	*3·6*	—	*3·9*	*7·5*
Railway Carriage and Wagon	1930	26·9	13·8	33·0	0·5	51·2	84·7
	1924	*23·2*	*14·1*	*22·4*	*1·2*	*41·7*	*65·3*
Carriage, Cart and Wagon...	1930	1·6	0·2	0·2	*	4·7	4·9
	1924	*3·0*	*0·2*	*0·1*	—	*3·9*	*4·0*
TOTAL— UNITED KINGDOM	1930	387·1	208·0	329·3	10·8	1,638·0	1,978·1
	1924	*467·3*	*215·7*	*326·7*	*3·4*	*1,257·8*	*1,587·9*

Trade		Prime movers	Electric generators	Electric motors			
				Driven by electricity			
				Generated in same works	Generated in other works under same ownership	Purchased	All electric motors
		Th. H.P.	Th. Kw.	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.
England and Wales ...	1930	329·0	174·4	282·4	5·0	1,259·5	1,546·9
	1924	*399·3*	*181·5*	*280·9*	*2·5*	*922·7*	*1,206·1*
Scotland ...	1930	46·4	26·3	38·3	5·8	322·3	366·4
	1924	*50·1*	*22·8*	*30·2*	*0·9*	*304·8*	*335·9*
Northern Ireland	1930	11·7	7·3	8·6	—	56·2	64·8
	1924	*17·9*	*11·4*	*15·6*	—	*30·3*	*45·9*

* Less than 50 h.p.

Total power in use.—The figures in the following table represent the estimated amount of power actually employed by each of the Engineering, Shipbuilding and Vehicle Trades in the two years. For the purpose of arriving at the power applied mechanically, the capacity of the prime movers required to drive electric generators has been calculated and deducted from the total capacity of the prime movers; the power applied electrically represents the capacity of electric motors driven by generators at firms' works added to that of motors driven by purchased electricity. As the basis for calculating the amount of the primary power that is converted into electrical energy, 746 kilowatts of electrical energy have been taken as equivalent to 1,000 horse-power of primary power and an average loss of 10 per cent. in transmission has been allowed except for steam turbines, in which the loss is negligible. The power capacity recorded as "ordinarily in use" has been taken as the basis of the calculation in all cases.

The horse-power of motors designed to be driven by electricity generated in the same works may be greater than that of the prime movers used (or calculated in this manner to have been necessary) to drive them, since machines required for special processes are frequently equipped with individual motors which will only be in use on those occasions when the need for those processes arises. Further, the capacity measurement which firms were instructed to state was the effective horse-power which their engines could develop and this measurement does not necessarily represent the capacity at which the engines were normally operated. For these reasons, the figures given below should not be taken as providing more than a rough indication of the actual amount of power employed by any trade or of the degree of its electrification.

Power in use in 1930 and 1924

Trade		Power applied mechanically	Power applied electrically	Total power	Per head of average number of operatives employed
		Th. H.P.	Th. H.P.	Th. H.P.	H.P.
Engineering and Shipbuilding :—					
Mechanical Engineering	1930	52·1	892·5	944·6	2·45
	1924	*101·4*	*678·2*	*779·6*	*2·02*
Electrical Engineering	1930	2·7	236·5	239·2	1·57
	1924	*3·5*	*145·6*	*149·1*	*1·23*
Shipbuilding	1930	9·2	318·1	327·3	2·63
	1924	*13·9*	*269·7*	*283·6*	*2·16*
Vehicles :—					
Motor and Cycle ...	1930	9·6	242·0	251·6	1·21
	1924	*12·4*	*147·5*	*159·9*	*0·95*
Aircraft	1930	0·3	15·9	16·2	0·92
	1924	*0·4*	*7·4*	*7·8*	*0·78*
Railway Carriage and Wagon	1930	7·4	75·0	82·4	4·04
	1924	*3·3*	*55·7*	*59·0*	*2·23*
Carriage, Cart and Wagon	1930	1·1	4·7	5·8	0·95
	1924	*2·5*	*3·8*	*6·3*	*0·67*
TOTAL	1930	82·4	1,784·7	1,867·1	2·04
	1924	*137·4*	*1,307·9*	*1,445·3*	*1·70*

A decline of 40 per cent. in the comparatively small amount of power applied mechanically was more than offset by an increase of over 36 per cent. in the power applied electrically, resulting in an increase of 20 per cent. in the aggregate amount of power in use per head of the operatives employed. The table shows that an increase occurred in 1930 in the power used per operative in each of the trades included in this group.

Consumption of fuel

Coal and coke.—At the 1930 Census, all firms were required to state the total quantity of coal and coke used for generating power (i.e., for driving engines), and were also requested to furnish particulars of the amounts used for other purposes on a voluntary basis, as the provisions of the Census of Production Act do not enable the latter to be obtained compulsorily. A few firms found difficulty in furnishing a trustworthy figure of the quantities used for these two categories separately, and, as appears from the table below, it was necessary to accept a small proportion of inclusive quantity statements without distinction as to purpose. The following particulars relate only to firms in Great Britain.

Coal and coke used

Note.—The figures in italics below the name of the trade represent respectively (1) the percentage of the total capacity of steam engines in use represented by the firms that furnished separate particulars of coal and coke used for power, and (2) the percentage of the total net output represented by the firms that furnished separate particulars of coal and coke used for other purposes.

Trade	For power		For other purposes		Unclassified	
	Coal	Coke	Coal	Coke	Coal	Coke
	Th. tons	Th. tons	Th. tons	Th. tons	Th. tons	Th. tons
Engineering and Shipbuilding :—						
Mechanical Engineering—						
(*1*) *99·8*; (*2*) *91·7*	379·8	10·4	401·2	350·1	1·0	0·2
Electrical Engineering—						
(*1*) *98·5*; (*2*) *98·8*	73·1	—	241·4	53·6	—	—
Shipbuilding—						
(*1*) *99·7*; (*2*) *95·0*	38·6	1·1	118·1	45·2	0·3	0·1
Vehicles :—						
Motor and Cycle—						
(*1*) *100·0*; (*2*) *95·1*	61·2	0·4	164·1	60·4	—	—
Aircraft—						
(*1*) *100·0*; (*2*) *100·0*	1·2	—	10·4	6·7	—	—
Railway Carriage and Wagon—						
(*1*) *99·6*; (*2*) *96·3*	43·7	0·6	154·4	26·2	1·2	0·2
Carriage, Cart and Wagon—						
(*1*) *100·0*; (*2*) *90·6*	4·3	—	1·1	2·4	—	—
TOTAL—						
(*1*) *99·7*; (*2*) *94·6*	601·9	12·5	1,090·7	544·6	2·5	0·5

It will be seen from the above figures that only a small fraction of the coal and coke used was not classified as to purpose; the quantities actually recorded can be regarded as substantially representing the consumption for power, while for other purposes the consumption of coal was about 1,150,000 tons and of coke, about 575,000 tons.

No particulars of oil, gas or other fuel used were ascertained for the year 1930. At the Census of 1924, a voluntary inquiry was made as to the amounts of coal, coke, heavy and light oils, and gas consumed and reference should be made to the Final Report on that Census for particulars of the partial information reported by each of the Engineering, Shipbuilding and Vehicle Trades.

Electricity.—Particulars of the quantity of electricity used were required from all firms, electricity produced by their own generating plant being distinguished from that purchased from outside

sources. No separate record of the purpose for which the current was used was obtained.

The following table shows for each of the Engineering, Shipbuilding and Vehicle Trades the total quantities of electricity used in 1930 :—

Electricity used

Trade	Electricity purchased	Electricity generated		Number of units generated per kilowatt of generators in use
		In same works	In other works owned by the firm	
	B.T.U. (Kw.-hrs.) '000	B.T.U. (Kw.-hrs.) '000	B.T.U. (Kw.-hrs.) '000	B.T.U. per Kw.
Engineering and Shipbuilding:—				
Mechanical Engineering ...	374,986	125,520	5,117	1,366
Electrical Engineering ...	188,584	28,152	953	2,145
Shipbuilding	95,767	16,628	4,276	1,554
Vehicles :—				
Motor and Cycle	196,497	30,075	—	1,602
Aircraft	13,239	1,332	—	827
Railway Carriage and Wagon	25,608	18,730	393	2,281
Carriage, Cart and Wagon	2,530	182	12	948
TOTAL	897,211	220,619	10,751	1,527

The figures shown for current generated represent only the amounts generated *and used*, and fall short of the total output of current in cases where electricity was sold to outside consumers.