

THE IRON AND STEEL TRADES.

GENERAL REPORT.

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Introductory.

The following general report deals with the trades engaged in the smelting, rolling and founding of iron and steel and with the other trades whose chief raw material is iron or steel. Engineering, ship-building and the construction of motor cars, motor cycles, bicycles, aircraft and railway carriages and wagons are not, however, included but are discussed as a separate group later in the present volume. The production of iron and steel goods by railway companies, local authorities and Government departments will be dealt with in the report on Public Utility Services which is to form part of a separate volume.

Measured by the numbers engaged in the various trades, the largest member of the present group is the Iron and Steel (Smelting, Rolling and Founding) Trade, which accounted in 1924 for 226,316 persons employed, or 40·6 per cent. of the group total of 557,758 persons. The next largest are the Hardware, Hollow-ware and Bedstead Trades, the Light Castings Trade and the Anchor, Chain, Nail, Screw and Rivet Trades, with 73,923, 47,912 and 33,639 persons employed, or 13·3, 8·6 and 6·0 per cent. respectively of the group total.

Each of the trades included in the group forms the subject of a separate report, in which the detailed results of the 1924 Census of Production are set out, and such comparisons as are possible with the results of the Censuses for 1912 and 1907 are made. The object of the present general report is to bring together the principal results for the whole group of trades, and, in addition, to set out certain particulars (e.g., as to fuel consumption) which are more conveniently dealt with here than in the separate trade reports.

Principal results for 1924.

The number of separate returns received from firms engaged in the Iron and Steel Trades group in 1924 was 14,173. About 4,000 firms to which schedules were sent did not furnish returns, but the great majority of these firms had very small establishments, some of which were mainly engaged in repair and jobbing work, and they included a number which were no longer carrying on business at the end of the censal year. On the basis of the information available, it is estimated that they did not employ more than about 10,000 persons in all and that their aggregate net output was probably not in excess of £1,250,000. These figures represent an omission of, at most, about 1·8 per cent. and 1·1 per cent. respectively of the total figures for the group; and the absence of returns from the firms in question does not materially affect the uses made of the figures in this general report.

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

*Iron and Steel Trades.
Output in 1924.**

Trade.	Gross output (selling value of goods made and value of work done). (1)	Cost of materials used and amount paid to other firms for work given out. (2)	Net output (excess of col. (1) over col. (2)). (3)	Persons employed (except out-workers). (4)	Net output per person employed as shown in col. (4). (5)
Iron and steel (Blast furnaces) ..	£'000 36,572	£'000 31,315	£'000 5,257	Number 26,970	£ 195
Iron and steel (Smelting, rolling and founding)	153,183	107,617	45,566	226,316	201
Tinplate	22,557	16,185	6,372	27,968	228
Light castings	17,733	6,952	10,781	47,912	225
Wrought iron and steel tubes ..	13,781	8,390	5,391	24,899	217
Wire drawing	17,453	11,316	6,137	25,453	241
Anchor, chain, nail, screw and rivet Hardware, hollow-ware and bedstead	13,091	6,871	6,220	33,639	185
.. .. .	25,138	12,502	12,636	73,923	171
Cutlery	3,505	1,669	1,836	11,406	161
Tool and implement	8,855	3,731	5,124	26,602	193
Blacksmithing	4,161	1,567	2,594	17,515	148
Needle, pin, fish-hook and button ..	3,029	1,262	1,767	12,715	139
Small arms	748	279	469	2,440	192
TOTAL FOR UNITED KINGDOM ..	319,806	209,656	110,150	557,758	197
England and Wales	285,900	187,446	98,454	494,359	199
Scotland†	33,685	22,086	11,599	62,828	185
Northern Ireland†	221	124	97	571	170

* Not including the output of, nor the persons employed by, railway companies, local authorities, Government factories, etc.; particulars relating to these establishments are given in the report on Public Utility Services, which forms part of a separate volume. The value of the iron and steel goods produced by such establishments is stated in the individual trade reports concerned (see pages 35, 112, 126, 160, 173 and 194 of this volume).

† In order to avoid the possible disclosure of information relating to individual firms, particulars relating to the Wrought Iron and Steel Tube Trade in Scotland have been combined with those for England and Wales; for the same reason particulars relating to the Wire Drawing Trade in Northern Ireland have also been included with those for England and Wales.

Comparability of results with those for 1912 and 1907.

The scope of the Census was not quite the same in the three censal years, and the comparability of the totals for 1924 with those for other years is affected by the changes referred to in the following paragraphs :—

(1) The Censuses of 1907 and 1924 extended to all firms, however small, but in 1912, firms employing not more than five persons (excluding proprietors) were required to state only the average number of persons employed by them in the year.

The exemption of the small firms in 1912 resulted in the exclusion of a substantial proportion of some of the Iron and Steel Trades and, both for that reason and because the outbreak of war interrupted the task of dealing with incomplete and incorrect returns, the information available for that year, for the group as a whole, is not sufficiently complete to warrant its use for detailed comparisons. For this reason the 1907 figures only are, in general, taken for comparison with those for 1924 in the trade reports and, except in respect of power equipment, in this general report.

(2) The Census of 1907 covered Great Britain and the whole of Ireland, but that of 1924 applied only to Great Britain and Northern Ireland. According to the Census of Production carried out by the Government of the Irish Free State in respect of the year 1926, the Metal Trades carried on in that country employed about 1,150 persons and had a gross output of about £441,000, that is to say about 0·2 per cent. of the total number of persons employed and about 0·1 per cent. of the gross output returned for the Iron and Steel Trades in the United Kingdom in 1924. Iron and steel goods returned in other trades (e.g. agricultural implements, builders' and structural ironwork, etc.) were valued at £119,000.

(3) In any comparison of figures representing money values, the changes in the level of prices which occurred in the period between the first and third Censuses should be kept in mind.

The comparability of the results of the Censuses of 1907 and 1924 for certain individual trades is affected by changes which have been made in the allocation of certain products to different trades. These changes are explained in the reports on the trades concerned. The principal examples are: (i) the isolation of blast furnace production as a separate trade; (ii) the separation of by-product recovery plant installed at blast furnaces or smelting works from the Iron and Steel Trades and its combination with coke-ovens operated at collieries to form a separate trade, which will be dealt with in another volume*; (iii) the transfer of galvanised sheet production from the Hardware, Hollow-ware and Bedstead Trades to the Iron and Steel (Smelting, Rolling and Founding) Trades and (iv) the transfer of the production of cast iron stoves and ranges from the Hardware, Hollow-ware and Bedstead Trades to a newly constituted Light Castings Trade.

Production.

It is difficult to find a satisfactory basis on which to compare production in the several trades in the same year, or in any trade or trades in different years. Obviously, no comparisons between trades

* The volume containing the reports on the Chemical group of trades.

could be based on the aggregate quantities of goods produced owing to their varied character, even if the necessary particulars were available for this purpose. The gross output values recorded in the Census of Production are affected in varying degrees by the duplication of goods or processes which they involve, and hence they do not form a practicable basis for comparisons. Some of the difficulties can be avoided by basing comparisons on net output, which, being arrived at by deducting, from the value of the gross output, the total cost of materials used and the amount paid to other firms for work given out to them, represents completely and without duplication the value added to the materials in the course of manufacture. The net output thus constitutes for any industry the fund from which wages, salaries, rent, royalties, rates, taxes, depreciation, advertisement and sales expenses, and all other similar charges have to be provided, as well as profits; and if the net output for any trade is divided by the number of persons employed by firms in that trade, the resulting figure of net output per head furnishes a basis of comparison between the positions of different trades in the same year (or the same trade in different years) which takes account of differences in the numbers of persons employed and the continuity of their work. The use of net output per head as a basis of comparison was discussed at length in the Final Report on the First Census of Production (1907), where it was pointed out that "as the net output is the fund out of which all charges on industry, except the cost of materials as delivered at the works, are met, it will naturally vary with the amount of those charges" (page 12 of Cd. 6320). The conclusion reached was that "the average net output per head gives a somewhat fictitious representation of the condition of a trade" and that it constitutes only a rough measure on which to base comparisons (pages 14, 15). Hence, while it remains true that the net output for a trade represents a fact, i.e., the value added to materials by capital and labour, and constitutes the best available basis for the comparisons in view, the qualifications to which its use for this purpose is subject must be kept in mind.

Net output per head in 1924 and 1907.—The following table shows, for each of the trades included in the Iron and Steel group, the net output per head of persons employed in 1924 and 1907.

The average net output per person employed in the Iron and Steel group increased from £103 in 1907 to £197 in 1924, or by 91 per cent. Important changes, relative to the group average, occurred in the Tinsplate Trade and the Small Arms Trade. In the first mentioned trade the net output per person employed was 6 per cent. below the group average in 1907 and 16 per cent. above the group average in 1924; in the second, the net output per person employed was 8 per cent. above the average in 1907 and 2½ per cent. below the average in 1924. In the combined Heavy Iron and Steel Trades

a relative decrease took place from 12 per cent. above the average in 1907 to only 2 per cent. above the average in 1924, while in the remaining trades in the group the net output per head compared more favourably with the corresponding figure for the whole group in 1924 than in 1907.

Net output per head of persons employed (excluding outworkers).*

Trade.	1924.	1907.
	£	£
Iron and steel (Blast furnaces)	195 } 201	115
Iron and steel (Smelting, rolling and founding)	201	
Tinplate	228	97
Light castings	225	109
Wrought iron and steel tubes	217	108
Wire drawing	241	116
Anchor, chain, nail, screw and rivet	185	83
Hardware, hollow-ware and bedstead	171	87
Cutlery	161	73
Tool and implement	193	88
Blacksmithing	148	71
Needle, pin, fish-hook and button	139	64
Small arms	192	111
ALL TRADES	197	103

* It has been ascertained from the Census records that the exclusion of particulars relating to Southern Ireland from the 1907 figures would not materially affect the calculations.

In both years the net output per head was highest in the Wire Drawing Trade, being 13 per cent. above the average in 1907 and 22 per cent. above in 1924, and lowest in the Needle, Pin, Fish-hook and Button Trades, being 38 per cent. below the group average in 1907 and 29 per cent. below in 1924.

Employment.

Employment in 1924.

Classification of persons employed in a specified week.—The following table classifies by sex, age and character of employment the numbers of persons (excluding outworkers) who were recorded as employed in the various Iron and Steel Trades in the week ended 18th October, 1924.

The proportion of female operatives was greatest in the Needle, Pin, Fish-hook and Button Trades, the Cutlery Trade, the Anchor, Chain, Nail, Screw and Rivet Trades and the Hardware, Hollow-ware and Bedstead Trades. These four trades accounted for about three-quarters of the female operatives in the whole group but for less than one sixth of the males in the whole group and about one-third of the males in trades other than the heavy Iron and Steel Trades.

Number of persons employed (excluding outworkers) in the week ended 18th October, 1924.

Trade.	Operative staff.				Administrative, technical and clerical staff.			
	Males.		Females.		Males.		Females.	
	Under 18.	Total.	Under 18.	Total.	Under 18.	Total.	Under 18.	Total.
	In thousands.				No.	No.	No.	No.
Iron and steel (Blast furnaces)	0.5	24.1	—	0.1	118	1,487	11	158
Iron and steel (Smelting, rolling and founding)	19.2	200.9	0.8	3.1	1,528	16,444	324	2,891
Tinplate	3.8	23.6	1.3	3.9	88	796	5	74
Light castings	5.8	40.3	1.0	3.2	489	4,271	185	1,337
Wrought iron and steel tubes	2.2	21.7	0.1	0.6	185	2,257	74	688
Wire drawing	2.6	18.7	1.1	3.9	268	1,845	126	636
Anchor, chain, nail, screw and rivet	3.3	18.4	3.7	12.2	134	2,142	182	1,042
Hardware, hollow-ware and bedstead	7.5	40.5	9.2	26.9	438	5,821	385	2,135
Cutlery	0.9	6.4	1.1	3.7	45	1,132	46	376
Tool and implement	3.6	20.2	0.9	3.0	175	2,644	116	883
Blacksmithing	2.0	10.2	—	0.1	32	7,116	26	126
Needle, pin, fish-hook and button	0.7	3.8	2.2	7.9	58	653	85	425
Small arms	0.3	2.0	0.1	0.1	24	287	22	87
TOTAL	52.4	430.8	21.5	68.7	3,582	46,895	1,587	10,858

Monthly fluctuations in employment.—In order to ascertain what fluctuations in employment there might be in the course of the censal year, firms were also required to state the average numbers of the operative staff employed in one week in each month. The figures for each trade are shown in the respective reports, and the following table gives the monthly aggregates for all the trades together:—

Operative staff (excluding outworkers) in the Iron and Steel Trades in 1924.

Week ended.	Males.	Females.	Total.
12th January	430,563	65,784	496,347
16th February	434,571	66,170	500,741
15th March	434,288	66,843	501,131
12th April	434,076	67,728	501,804
17th May	436,891	68,462	505,353
21st June	435,439	68,303	503,742
19th July	432,206	67,608	499,814
16th August	430,608	67,260	497,868
13th September	423,627	67,593	491,220
18th October	430,827	68,693	499,520
15th November	432,264	69,106	501,370
13th December	432,225	68,927	501,152
AVERAGE FOR THE 12 MONTHS	432,299	67,706	500,005

The total number of operatives employed was highest in May when it was 5,348, or nearly 1.1 per cent., above the average for the 12 months, and lowest in September, when it was 8,785, or nearly 1.8 per cent. below the average; the figure for the end of the year was 4,805 in excess of that for the beginning.

Employment among male operatives corresponded with that of the total of both sexes, the highest number being recorded for May (4,592 above the average for the year) and the lowest for September (8,672 below the average).

With regard to female operatives, the greatest number was recorded as being employed in November (1,400 above the average) and the lowest number in January (1,922 below the average).

The average numbers employed during the year in the group as a whole were divided between males and females in the proportion of 865 to 135, the proportion of females advancing from 132 per thousand in January to nearly 138 per thousand in December.

Employment in 1924 and 1907.

The following table shows the average numbers of male and female operatives (wage earners), and administrative, technical and clerical staff (salaried persons), in each of the Iron and Steel Trades in the two censal years. The table does not include outworkers. The average numbers shown in this table and the table on page 10 have been determined in the manner explained in Note (19) on page xi.

The greatest increase in numbers employed in 1924 as compared with 1907 is shown in the Light Castings Trade, but, as explained on page 4, the range of the trade was not the same in the two years, and the increase recorded for 1924 is offset in some degree by the apparent decrease that occurred in employment in the Hardware, Hollow-ware and Bedstead Trades. Increases occurred in the Wire Drawing Trade, 39 per cent.; the Tinsplate Trade, 36 per cent.; the Wrought Iron and Steel Tube Trade, 23 per cent.; the Anchor, Chain, Nail, Screw and Rivet Trades, 20 per cent.; and the Tool and Implement Trade, 12 per cent.

The greatest relative decrease was in the Small Arms Trade, viz., 50 per cent. Decreases were shown also in the Cutlery Trade, 23 per cent.; the Blacksmithing Trade, 16 per cent.; the Needle, Pin, Fish-hook and Button Trades, 4 per cent.; and the combined heavy Iron and Steel Trades, 3 per cent. In the last-named trade, the decrease was largely due to the separate record in 1924 of by-product recovery plant.

Average numbers (excluding outworkers) employed in 1924 and 1907 in the several Iron and Steel Trades.

Trade.		Operatives (wage earners).		Administrative, technical and clerical staff (salaried persons).		Total.
		Males.	Females.	Males.	Females.	
Iron and steel (Blast furnaces)	1924	25,233	92	1,487	158	26,970
Iron and steel (Smelting rolling and founding ..	1924	203,973	3,008	16,444	2,891	226,316
Iron and steel (Blast furnaces and smelting, casting and rolling)	1907	244,599	2,805	13,748	514	261,666
	1924	23,313	3,785	796	74	27,968
Tinsplate	1907	17,456	2,603	567	2	20,628
	1924	39,138	3,166	4,271	1,337	47,912
Light castings	1907	10,288	2,326	1,516	192	14,322
	1924	21,360	594	2,257	688	24,899
Wrought iron and steel tube	1907	18,761	146	1,246	70	20,223
	1924	19,082	3,890	1,845	636	25,453
Wire drawing	1907	15,138	1,878	1,173	140	18,329
Anchor, chain, nail, screw and rivet	1924	18,289	12,166	2,142	1,042	33,639
	1907	16,485	9,989	1,350	200	28,024
Hardware, hollow-ware and bedstead	1924	39,698	26,269	5,821	2,135	73,923
	1907	57,157	18,347	6,299	896	82,699
Cutlery	1924	6,337	3,561	1,132	376	11,406
	1907	9,724	2,767	2,050	296	14,831
Tool and implement	1924	20,046	3,029	2,644	883	26,602
	1907	18,557	1,966	2,756	432	23,711
Blacksmithing	1924	10,152	121	7,116	126	17,515
	1907	17,008	183	3,632	66	20,889
Needle, pin, fish-hook and button	1924	3,756	7,881	653	425	12,715
	1907	3,868	8,345	652	387	13,252
Small arms	1924	1,922	144	287	87	2,440
	1907	4,306	138	369	42	4,855
ALL TRADES	1924	432,299	67,706	46,895	10,858	
	1907	433,347	51,487	35,358	3,237	
TOTALS	1924	500,005		57,753		557,758
	1907	484,834		38,595		523,429

Classification of average numbers employed.—The following table shows the distribution, according to sex, age and character of employment, of the average number of persons (excluding outworkers) employed in the Iron and Steel group of trades in 1924 and 1907.

Average numbers (excluding outworkers) employed in all Iron and Steel Trades in the two censal years.

Sex and age.	1924.		1907.	
	Operative staff.	Total staff.	Wage earners.	Total staff.
<i>Males :—</i>				
Under 18	52,220	55,802	53,104	56,765
Over 18	380,079	423,392	380,243	411,940
TOTAL	432,299	479,194	433,347	468,705
<i>Females :—</i>				
Under 18	21,232	22,819	14,696	15,338
Over 18	46,474	55,745	36,791	39,386
TOTAL	67,706	78,564	51,487	54,724
<i>Males and females :—</i>				
Under 18	73,452	78,621	67,800	72,103
Over 18	426,553	479,137	417,034	451,326
TOTAL	500,005	557,758	484,834	523,429

Sex and age distribution of operatives.—Labour in the Iron and Steel Trades in each of the censal years was predominantly male; in the group as a whole male operatives formed, in 1924, 86 per cent. of the total operative staff, 71 per cent. of the total number of young persons under 18 and 89 per cent. of the adult operatives.

The total number of operatives employed in the group in 1924 was greater by 3 per cent. than in 1907, in spite of a small decrease amounting to 1,048, or less than a quarter of 1 per cent. in the number of male operatives. The number of female operatives increased by 16,219, or over 31 per cent.

The proportion of operatives under 18 differed little in the two censal years, being 15 per cent. of the total operative staff in 1924 and 14 per cent. in 1907.

Administrative, technical and clerical staff.—The increase in the administrative, technical and clerical staff in 1924 (described in 1907 as salaried persons) was 19,158, or roughly 50 per cent. Of this increase males accounted for 11,537 and females for 7,621.

The increase in males, entirely confined to adults, probably signifies an increase in management and sales staffs; the increase in females, also mainly confined to adults, probably related largely to clerical staff, reflecting a widespread adoption of more detailed

accounting methods, and to clerical labour associated with selling organisation.

The proportion of males in the administrative staff in 1924 was 81 per cent. and of females 19 per cent. as compared with 92 per cent. and 8 per cent. respectively in 1907.

The following table shows the proportions of the administrative, technical and clerical staff in 1924, and of the salaried staff in 1907, to the total staff in those years.

Trade.	Proportion of total staff represented by	
	Administrative, technical and clerical staff in 1924.	Salaried persons in 1907.
Iron and steel (Blast furnaces)	6.1	} 5.5
Iron and steel (Smelting, rolling and founding)	8.5	
Tinplate	3.1	2.8
Light castings	11.7	11.9
Wrought iron and steel tubes	11.8	6.5
Wire drawing	9.7	7.2
Anchor, chain, nail, screw and rivet	9.5	5.5
Hardware, hollow-ware and bedstead	10.8	8.7
Cutlery	13.2	15.8
Tool and implement	13.3	13.4
Blacksmithing	41.3	17.7
Needle, pin, fish-hook and button	8.5	7.8
Small arms	15.3	8.5
ALL TRADES	10.4	7.4

The high figure for the Blacksmithing Trade in 1924 is, perhaps, a reflection of the increasing dominance in that trade of very small firms, often without more than a single employee.

Outworkers.—In addition to the staff dealt with in the preceding paragraphs, employment was also given in some trades to outworkers, i.e. persons who worked in their own homes on materials given out to them by their employers. The following table shows the average numbers of such outworkers employed in the Iron and Steel Trades in 1924 and 1907 :—

Trade.	1924.			1907.		
	Males.	Females.	Total.	Males.	Females.	Total.
Anchor, chain, nail, screw and rivet	302	424	726	955	614	1,569
Hardware, hollow-ware and bedstead*	—	—	—	287	2	289
Tool and implement	—	—	—	125	48	173
Needle, pin, fish-hook and button	44	544	588	283	1,365	1,648
Small arms	324	5	329	—	—	—
TOTAL	670	973	1,643	1,650	2,029	3,679

* The outworkers shown were all employed in the Lock and Safe section of this trade.

Wages in 1924.

The following table summarises the information contained in the reports on the separate trades as to the amount of wages paid by firms in those trades in 1924. The particulars of wages shown in column (5) of the table are those ascertained by the Ministry of Labour as a result of the voluntary enquiry undertaken by that Department into wages and hours of labour in the United Kingdom in 1924. The numbers of operatives shown in column (1) are those returned to the Census of Production as employed by the firms concerned in the week ended 18th October, 1924. The proportion of each trade represented by the firms that furnished particulars of their wage-bills is shown in columns (2) and (4) on the basis of numbers of operatives employed and of net output, respectively.

Trade.	Firms furnishing returns of wages.					
	Operatives employed.		Net output.		Wages paid.	
	Number. (1)	Proportion of trade total. (2)	Amount. (3)	Proportion of trade total. (4)	Amount. (5)	Proportion of net output. (6)
	Per cent.	£'000	Per cent.	£'000	Per cent.	
Iron and steel (Blastfurnaces)	15,549	64	3,012	57	2,472	82.1
Iron and steel (Smelting, rolling and founding) ..	100,992	50	23,287	51	15,920	68.4
Tinplate	21,708	79	5,020	79	3,542	70.6
Light castings	22,662	52	5,454	51	3,026	55.5
Wrought iron and steel tube	17,641	79	4,389	81	2,390	54.4
Wire drawing	16,586	73	4,576	75	2,222	48.5
Anchor, chain, nail, screw and rivet.. .. .	18,644	61	3,852	62	1,752	45.5
Hardware, hollow-ware and bedstead	38,279	57	7,170	57	3,776	52.7
Cutlery	6,080	60	1,158	63	637	55.0
Tool and implement	13,346	58	3,091	54	1,510	48.9
Blacksmithing	1,616	16	349	13	211	60.4
Needle, pin, fish-hook and button	6,455	55	1,030	58	545	52.8
Small arms	1,586	73	296	63	215	72.6
TOTAL ..	281,144	56	62,684	57	38,218	61.0

The proportion of wages to net output was highest in the Iron and Steel (Blast Furnaces) Trade and lowest in the Anchor, Chain, Nail, Screw and Rivet Trades. In the Blacksmithing Trade the sample obtained was far too small to justify any deductions from the figures.

Mechanical Power*.

The power equipment of factories consists in the first instance of the prime movers installed in the works, part being used to apply power mechanically and part to actuate generators for the production of electric energy. Only a portion of that electric energy is used for power, i.e., to drive electric motors, the remainder being used for lighting, heating and for manufacturing processes. In addition, many factories derive part or all of their power from electricity purchased and used for driving electric motors.

Power equipment of the various Iron and Steel Trades in 1924, 1912 and 1907.—The particulars furnished at the three Censuses regarding prime movers and electric generators in factories in the Iron and Steel group of trades are shown in the following table. Particulars of electric motors were not obtained in 1907, and particulars relating to 1924 and 1912 only can be given.

The summary figures of power equipment secured at the 1912 Census are included in this and the following paragraphs, though they are omitted from most of the individual trade reports. The exclusion in that year of firms employing not more than five persons and the incompleteness of many of the returns rendered the results secured for the most part ineffective for purposes of comparison. The figures relating to power equipment are, however, likely to have been affected in a less degree than other aggregates by the omission of the small enterprises. The main interest of the figures given for 1912 lies in the indication which they afford of the increase that has occurred since that year in the use of electricity, particularly purchased electricity, as a source of power. The omission of small firms in 1912 may have had a particular importance in reference to this feature.

In connexion with the omission of the Irish Free State from the 1924 Census (*see* page 4) it may be mentioned that, according to the Census of Production conducted by the Free State Government in respect of the year 1926, the total capacity of prime movers in the Metal Trades in that year was only 287 horse-power, and the capacity of the electric motors driven by purchased electricity was only 376 horse-power. The effect of the absence of the Irish Free State from the 1924 Census may, therefore, be considered as negligible in this group of trades.

* The particulars given in the various tables in this section for individual trades do not in all cases represent the equipment available for the processes of that trade alone. The operations of many firms in this group extend to more than one trade (e.g., blast furnaces and iron and steel smelting and rolling works, operated frequently in association with collieries and the recovery of coke and by-products) and the power requirements for all the processes carried on were often derived from a central power unit, which could not be apportioned between the various trades. This qualification also affects the tables given in this section dealing with fuel and electricity (pages 18-24).

Power equipment of the several Iron and Steel Trades.

Trade.	Prime movers.			Electric generators.		
	1924.	1912.	1907.	1924.	1912.	1907.
	Thousand H.P.			Thousand Kw.		
Iron and steel (Blast furnaces)	248.1	1,413.2	1,383.6	47.9	145.4	94.0
Iron and steel (Smelting, rolling and founding) ..	1,494.3			212.4		
Tinplate	103.2	92.2	68.9	11.8	5.6	1.1
Light castings	8.7	4.1	3.5	1.9	0.5	0.5
Wrought iron and steel tube	24.1	23.8	23.0	4.9	4.0	2.1
Wire drawing	37.4	37.5	31.0	10.0	6.3	2.3
Anchor, chain, nail, screw and rivet	23.5	23.8	23.0	5.9	1.8	1.5
Hardware, hollow-ware and bedstead	19.2	26.9	29.6	3.2	3.7	3.8
Cutlery	5.0	5.2	5.2	0.6	0.6	0.6
Tool and implement ..	21.5	21.5	19.2	2.2	0.5	0.5
Blacksmithing	4.2	2.2	4.1	*	*	0.1
Needle, pin, fish-hook and button	3.8	3.5	3.3	0.5	0.3	0.2
Small arms	0.3	1.1	2.6	—	1.2	1.0
TOTAL	1,993.3	1,655.0	1,597.0	301.3	169.9	107.7

* Less than 50 Kw.

Trade.	Electric motors driven by electricity generated in same works.		Electric motors driven by purchased electricity.		All electric motors.	
	1924.	1912.	1924.	1912.	1924.	1912.
	Thousand H.P.		Thousand H.P.		Thousand H.P.	
Iron and steel (Blast furnaces)	84.5	248.9	25.1	68.1	109.6	317.0
Iron and steel (Smelting, rolling and founding) ..	472.0		458.2		930.2	
Tinplate	11.3	5.4	4.6	2.1	15.9	7.5
Light castings	1.6	0.4	24.6	3.0	26.2	3.4
Wrought iron and steel tube	15.3	5.8	68.8	9.5	84.1	15.3
Wire drawing	16.5	7.5	55.2	16.8	71.7	24.3
Anchor, chain, nail, screw and rivet	5.8	1.1	26.5	4.6	32.3	5.7
Hardware, hollow-ware and Bedstead	2.3	2.0	38.8	12.9	41.1	14.9
Cutlery	0.6	0.5	8.4	1.4	9.0	1.9
Tool and implement ..	3.2	0.5	37.4	8.4	40.6	8.9
Blacksmithing	†	†	4.5	1.4	4.5	1.4
Needle, pin, fish-hook and button	0.4	0.8	3.9	0.9	4.3	1.7
Small arms	—	1.7	2.9	0.3	2.9	2.0
TOTAL	613.5	274.6	758.9	129.4	1,372.4	404.0

† Less than 50 H.P.

The distribution of the power equipment recorded in 1924 among the three geographical areas covered by the Census was as follows:—

Area.	Prime movers.	Electric generators.	Electric motors driven by	
			Electricity generated in same works.	Purchased electricity.
	Th. H.P.	Th. Kw.	Th. H.P.	Th. H.P.
England and Wales	1,667.8	261.1	534.5	649.0
Scotland*	325.3	40.2	79.0	109.9
Northern Ireland*	0.2	*	—	*
TOTAL	1,993.3	301.3	613.5	758.9

* See footnote (†) to table on page 3.

Classification of power equipment of the Iron and Steel group.—The next table, which relates to the power equipment of all the trades taken together, classifies the prime movers according to kinds, the electric generators according to the description of prime movers by which they were driven, and the electric motors according as they were actuated by purchased electricity or by electricity generated in the same factory or works.

Power equipment.	1924.	1912.	1907.
	Th. H.P.	Th. H.P.	Th. H.P.
PRIME MOVERS:—			
Reciprocating steam engines	1,486.9	1,419.0	1,448.7
Steam turbines	350.7	94.4	33.2
Gas and oil engines	151.1	136.7	95.7
Water power	3.5	4.8	6.1
Other power	1.1	0.1	13.3
TOTAL	1,993.3	1,655.0	1,597.0
	Th. Kw.	Th. Kw.	Th. Kw.
ELECTRIC GENERATORS:—			
Driven by—			
Reciprocating steam engines	73.6	82.4	78.1
Steam turbines	178.3	53.3	10.5
Gas and oil engines	49.1	34.2	19.1
Water power	0.2		
Other power	0.1		
TOTAL	301.3	169.9	107.7
	Th. H.P.	Th. H.P.	Th. H.P.
ELECTRIC MOTORS:—			
Driven by—			
Electricity generated in same works ..	613.5	274.6	not
Purchased electricity	758.9	129.4	ascertained†
TOTAL	1,372.4	404.0	..

† The total amount of electric energy recorded as purchased for all purposes in 1907 was 35,942,000 Board of Trade units (kilowatt-hours) and it would appear that the quantity generated by the dynamos operated by the firms in this group of trades may have amounted to about 600,000,000 Board of Trade units.

In all three years steam engines formed the great bulk of the prime movers in the Iron and Steel Trades. Steam turbines increased

markedly, the main purpose for which they were installed being the driving of electric generators. The capacity of electric generators increased by 180 per cent. between 1907 and 1924, the rate of increase being greater before than after 1912.

Power equipment in use and not in use in 1924.—The firms that made returns to the Census for 1924 were required to distinguish between the prime movers, electric generators, and electric motors ordinarily in use in the course of the year and those that were in reserve or idle. The proportions not in use should not be taken as a direct measure of the inactivity of trade during the year. While some of the engines, generators, and motors were not in use on account of lack of orders for goods, some were idle because they were normally in reserve against a breakdown or sudden rush of trade, and others may have been in various stages of obsolescence, awaiting the time for being dismantled. The particulars recorded as to power ordinarily in use and not in use in 1924 are given in the following table :—

Power ordinarily in use and not in use in the Iron and Steel Trades in 1924.

Trade.	Prime movers.		Electric generators.		Electric motors.	
	(a) Ordinarily in use ; (b) not in use.	Per- centage not in use.†	(a) Ordinarily in use ; (b) not in use.	Per- centage not in use.†	(a) Ordinarily in use ; (b) not in use.	Per- centage not in use.†
	Th. H.P.		Th. Kw.		Th. H.P.	
Iron and Steel (Blast furnaces)	(a) 160.5	35.3	33.2	30.8	80.0	27.0
	(b) 87.6		14.7		29.6	
Iron and steel (Smelting, rolling and founding)	(a) 1,191.9	20.2	141.1	33.6	788.2	15.3
	(b) 302.4		71.3		142.0	
Tinplate	(a) 95.9	7.1	8.5	27.5	14.7	7.6
	(b) 7.3		3.3		1.2	
Light castings	(a) 7.7	11.1	1.7	10.2	23.0	12.0
	(b) 1.0		0.2		3.2	
Wrought iron and steel tubes	(a) 17.0	29.5	3.4	31.8	71.1	15.4
	(b) 7.1		1.5		13.0	
Wire drawing	(a) 32.9	12.1	8.2	17.7	65.5	8.7
	(b) 4.5		1.8		6.2	
Anchor, chain, nail, screw and rivet ..	(a) 21.1	10.3	4.5	24.1	29.5	8.7
	(b) 2.4		1.4		2.8	
Hardware, hollow-ware and bedstead ..	(a) 16.6	13.3	2.3	27.0	36.0	12.5
	(b) 2.6		0.9		5.1	
Cutlery	(a) 4.3	13.7	0.4	28.4	8.2	9.3
	(b) 0.7		0.2		0.8	
Tool and implement	(a) 18.2	15.4	1.6	28.0	34.9	14.1
	(b) 3.3		0.6		5.7	
Blacksmithing	(a) 3.9	8.1	*	—	4.2	5.4
	(b) 0.3		—		0.3	
Needle, pin, fish-hook, and button	(a) 3.3	12.0	0.4	20.9	3.8	11.1
	(b) 0.5		0.1		0.5	
Small arms	(a) 0.3	17.5	—	—	1.9	33.7
	(b) †		—		1.0	
TOTAL	(a) 1,573.6	21.1	205.3	31.9	1,161.0	15.4
	(b) 419.7		96.0		211.4	

* Less than 50 Kw.

† Less than 50 H.P.

‡ Based in each case upon the actual figures returned, not upon the round figures shown in this table.

Power available for mechanical and electrical application in 1924.—In order to ascertain the actual amount of power available in the several trades, and the proportion of that power applied electrically, the capacity of the prime movers used to actuate electric generators must be replaced by the capacity of the electric motors driven by the electricity so produced. How far it may be legitimate to add together the capacity of engines applying, or intended to apply, power mechanically and the capacity of the electric motors, so as to obtain the power capacity of a factory using both forms of energy, will depend on the organisation of the factory. The information supplied furnishes no guidance as to the effective capacity of the power equipment, for on the one hand actual working capacity is not necessarily identical with the indicated horse-power nor with that which an engine was originally built to develop, data which served largely as the basis of returns; and on the other hand it cannot be assumed that an engine can run uniformly at its peak load, and some engine-power is generally provided as a reserve against break-downs and not for regular use. In particular, a series of motors (whose aggregate capacity would be returned to the Census) may be installed to run on successive processes, some of which are carried on intermittently as the materials to be treated become available, so that the series always includes some units not actually in operation. In such cases the aggregate horse-power of the motors, being greater than the power called for at any moment, may be greater than the horse-power of the prime movers required to actuate the generators from which the series of motors is driven. Since, however, the mechanical power available per operative employed is regarded as significant of the efficiency of an organisation, an attempt has been made to provide such a measure, though the result can only be regarded as a rough indication claiming no high degree of precision.

In calculating this measure, the power allocated for driving electric generators has to be deducted from the total capacity of prime movers; for this purpose, 746 kilowatts of electrical energy are taken as the equivalent of 1,000 horse-power of mechanical energy, and an average loss of 10 per cent. is allowed in the conversion of mechanical into electrical energy, except in the case of steam turbines, which are usually bolted direct to the shafting of the generator. The power available to be applied mechanically is thus ascertained; and the electrical power available is the sum of the capacities of motors driven by purchased electricity and of those driven by electricity generated in the same works. Comparison with power available in 1907 is not possible, since the capacity of electric motors was not ascertained in that year.

The calculation relating to power available has been made on the basis of the power equipment installed and not on that recorded as being in use. For reasons already given, it must be recognised that the figures representing power available per operative employed are,

to some extent which cannot be determined from the data available in the Census office, in excess of the average power utilisable.

The following table sets out the result of the calculation :—

Power available in the several Iron and Steel Trades in 1924.

Trade.	Power for mechanical application.	Power for electrical application.	Total power.	Per head of average number of operatives employed.
	Th. H.P.	Th. H.P.	Th. H.P.	H.P.
Iron and steel (Blast furnaces)	180.4	109.6	290.0	11.5
Iron and steel (Smelting, rolling and founding)	1,198.4	930.2	2,128.6	10.3
Tinplate	86.7	15.9	102.6	3.8
Light castings	5.9	26.2	32.1	0.7
Wrought iron and steel tube	16.9	84.2	101.1	4.6
Wire drawing	23.3	71.7	95.0	4.1
Anchor, chain, nail, screw and rivet ..	15.3	32.3	47.6	1.6
Hardware, hollow-ware and bedstead..	14.4	41.1	55.5	0.8
Cutlery	4.1	9.0	13.1	1.3
Tool and implement	18.3	40.6	58.9	2.6
Blacksmithing	4.2	4.5	8.7	0.8
Needle, pin, fish-hook and button ..	3.0	4.3	7.3	0.6
Small arms	0.3	2.9	3.2	1.5
TOTAL	1,571.2	1,372.5	2,943.7	5.9

In the aggregate, the power for electrical application and that for mechanical application was fairly equally divided, but in this group of trades the amount of power available in the heavy Iron and Steel Trades (Blast furnaces and Smelting, rolling and founding) was more than three-quarters of the total for the group under all headings, and the aggregate figures for the group as a whole and the average power available per head of the operatives employed in the group are liable to be misleading. Excluding those two trades, the power available for mechanical application and that available for electrical application were roughly in the proportion of 4 to 7, while the power available per operative was 2.0 horse-power.

Fuel and Electricity in 1924.*

All firms that received schedules were asked to furnish voluntarily particulars of their consumption of fuel (of specified kinds) and electricity (distinguishing that purchased from that generated in the works) under two headings, namely (i) for power (driving engines), and (ii) for heating or lighting the premises, transport, etc. Firms whose aggregate net output was 67.5 per cent. of the net output of all firms in the Iron and Steel Trades in 1924 furnished information in response to this request, though, as will appear later, many of them were unable to divide their particulars into the two categories

* See footnote on page 13.

indicated. Moreover, the information returned was not equally representative of fuel consumption, of production of electricity, and of consumption of purchased electricity, as the data supplied under these three headings respectively covered 82.7 per cent. of the capacity of all the prime movers (not hydraulic) in use in the Iron and Steel group of trades, 70.4 per cent. of the capacity of the electric generators, and 74.1 per cent. of that of the electric motors driven by purchased electricity. The proportion of the trade for which particulars were furnished varied greatly between one trade and another, as will be seen from the table given on page 20.

Fuel Consumption.

In 1907, when firms were only asked to state their consumption of coal and coke without specification of purpose, the firms that furnished particulars had 51.6 per cent. of the net output of the group as a whole, and they recorded a consumption of 5,419,000 tons of coal and 360,000 tons of coke. The consumption recorded in 1924 by firms representing 67.5 per cent. of the net output of the group included 10,405,000 tons of coal and 8,158,000 tons of coke.

The heavy Iron and Steel Trades were by far the greatest consumers of coal and coke, the Blast Furnaces Trade using 15 per cent. of the total quantity of coal and 93 per cent. of the total quantity of coke returned for the group in 1924 and the Smelting, Rolling and Founding Trades using 69 per cent. of the total quantity of coal and 4 per cent. of the total quantity of coke returned. About 97 per cent. of the coal reported as consumed in 1924 and 90 per cent. of that reported in 1907 was used in the following five trades: Iron and Steel (Blast Furnaces), Iron and Steel (Smelting, Rolling and Founding), Tinplate, Wrought Iron and Steel Tube, and Wire Drawing. For these trades the proportion of firms making returns of coal and coke consumed was, in terms of net output: Iron and Steel (Blast Furnaces), 1924, 84.9 per cent.; Iron and Steel (Smelting, Rolling and Founding), 1924, 70.9 per cent.; in 1907 for the two trades combined the proportion was 41.7 per cent.; Tinplate, 1924, 87.3 per cent., 1907, 83.7 per cent.; Wrought Iron and Steel Tube, 1924, 84.0 per cent., 1907, 45.0 per cent.; Wire Drawing, 1924, 74.0 per cent., 1907, 77.2 per cent.

The table on page 20 summarises the information which was received from firms regarding the quantities of different kinds of fuel which they consumed in 1924. These quantities are divided into (a) the amounts used for power purposes, i.e., driving engines, and (b) the amounts used for the lighting or heating of premises, transport etc., so far as the particulars furnished enable the classification to be made. It appears from the returns, however, that the basis of classification adopted by the various firms which furnished information was by no means uniform; and apart from this, considerable quantities were reported for which no particulars of purpose could be assigned. These quantities are shown under heading (c) in the table.

Consumption of fuel (so far as reported) in the several Iron and Steel Trades in 1924.

NOTES.—1. The figures in italics below the name of the trade represent respectively (1) the percentage of the total net output of the trade represented by the firms giving information, and (2) the percentage of the total capacity of prime movers (not hydraulic) in use in the trade represented by the firms giving information.

2. The fuel consumed is, in each case, classified according to the purpose for which it was used, as follows: (a) for power (driving engines), (b) for heating and lighting premises and for transport, etc., (c) for purposes not separately distinguished.

Trade.	Coal and slack.	Coke and breeze.	Heavy oils.	Light oils.	Gas purchased †
	Th. tons.	Th. tons.	Th. galls.	Th. galls.	Th. therms.
Iron and steel (Blast furnaces) ..	(a) 216.4*	8.3*	37.0	—	—
	(1) 84.9; (2) 82.3	1,106.9*	7,098.5*	38.0	593.7
	(c) 19.3*	392.5*	—	4.2	—
Iron and steel (Smelting rolling and founding) ..	(a) 1,858.1	22.2	17.6	26.8	3,713.2
	(1) 70.9; (2) 84.1	4,648.6	353.6	3,224.4	365.0
	(c) 685.4	29.8	24.0	9.4	432.6
Tinplate ..	(a) 378.5	—	1.1	25.3	—
	(1) 87.3; (2) 87.7	417.1	0.8	—	20.2
	(c) 86.9	—	—	2.8	—
Light castings ..	(a) 5.7	0.3	0.1	0.2	293.0
	(1) 53.8; (2) 58.4	28.8	53.0	227.8	163.9
	(c) 12.3	4.1	1.6	0.5	324.2
Wrought iron and steel tubes ..	(a) 103.6	8.2	0.2	§	97.8
	(1) 84.0; (2) 87.9	272.0	38.2	1,323.2	50.0
	(c) 7.8	0.3	—	1.4	54.0
Wire drawing ..	(a) 65.4	0.2	30.4	0.6	206.4
	(1) 74.0; (2) 70.0	119.3	27.0	19.2	92.5
	(c) 24.8	1.5	19.2	8.3	228.9
Anchor, chain, nail, screw and rivet ..	(a) 22.5	0.9	162.0	0.3	591.0
	(1) 59.7; (2) 60.3	68.0	20.9	679.4	441.5
	(c) 9.0	1.7	2.6	5.3	298.2
Hardware, hollow-ware and bedstead ..	(a) 20.2	0.2	21.3	8.9	452.2
	(1) 51.2; (2) 53.4	66.7	39.2	114.0	195.5
	(c) 8.7	1.8	0.5	7.9	209.2
Cutlery ..	(a) 1.1	†	—	1.0	272.2
	(1) 49.2; (2) 48.0	1.8	1.9	1.6	5.9
	(c) 2.3	0.2	0.2	1.8	11.4
Tool and implement ..	(a) 26.5	2.2	12.7	2.6	565.5
	(1) 52.2; (2) 60.8	63.9	31.7	413.7	136.9
	(c) 7.3	0.3	—	0.4	140.8
Blacksmithing ..	(a) 1.1	—	12.6	10.8	80.0
	(1) 72.3; (2) 62.8	28.7	15.2	40.6	9.1
	(c) 4.5	0.1	0.1	2.6	47.1
Needle, pin, fish-hook and button ..	(a) 2.1	†	—	2.4	171.5
	(1) 65.9; (2) 67.3	4.6	2.9	1.1	7.4
	(c) 1.0	—	—	—	14.2
Small arms ..	(a) —	—	2.4	0.1	29.9
	(1) 75.5; (2) 71.9	7.9	0.7	0.5	5.0
	(c) †	†	—	—	5.1
ALL IRON AND STEEL TRADES ..	(a) 2,701.2	42.5	297.4	79.0	6,472.7
	(1) 67.5; (2) 82.7	6,834.3	7,683.6	6,083.5	2,086.6
	(c) 869.3	432.3	48.2	44.6	1,765.7
GRAND TOTAL (ALL PURPOSES)	10,404.8	8,158.4	6,429.1	2,210.2	20,705.0

* cf. table at top of page 32. † Less than 50 tons.

‡ The amount of gas purchased was, in some cases, returned in terms of cubic feet; in such cases 200 cubic feet have been taken as equivalent to 1 therm.

§ Less than 50 gallons.

The firms in the heavy Iron and Steel Trades that furnished the particulars given in the above table also stated that they produced and used 5,424 million cubic feet of blast furnace gas for power purposes, 18 million cubic feet for heating, lighting, etc., and 1,223 million cubic feet for purposes not separately distinguished. In addition, 11,090 million cubic feet of coke-oven gas was stated to have been used at blast furnaces, smelting works and rolling mills.

In most of the Iron and Steel Trades fuel is used for manufacturing purposes other than the production of power. Quantities of fuel so consumed were intended as a general rule to be included under heading (b), i.e., for lighting or heating premises, transport, etc., and have been included under that heading in the preceding table. In the following trades where such special consumption of fuel is of particular importance, information was invited as to the quantities used for special trade purposes. The particulars recorded, which relate to the same firms that supplied the information given in the table on page 20, were as follows:—

Special consumption of fuel.

Trade.	Coal.	Coke.	Heavy oils.	Light oils.	Gas.†
	Th. tons.	Th. tons.	Th. galls.	Th. galls.	Th. therms.
Iron and steel (Blast furnaces) (at furnaces)* ..	987.0	7,086.0	38.0	586.3	5.0
Iron and steel (Smelting, rolling and founding) (at furnaces, forges or cupolas) ..	4,458.7	339.0	3,168.8	52.1	2,735.4
Tinplate (at furnaces) ..	407.9	0.8	—	—	6.4
Light castings (at forges and foundries) ..	21.5	49.0	222.2	24.0	117.8
Wrought iron and steel tubes (at forges) ..	269.5	36.4	1,323.2	12.9	80.1
Wire drawing (at furnaces) ..	112.1	24.6	18.4	4.5	670.6
Anchor, chain, nail, screw and rivet (at forges) ..	53.5	19.8	675.4	388.2	475.4
Hardware, hollow-ware and bedstead (at furnaces and forges) ..	56.3	34.2	94.3	13.4	2,938.0
Tool and implement (at furnaces, forges, etc.) ..	62.1	30.6	413.6	123.6	1,040.3
Blacksmithing (at forges) ..	28.2	15.0	40.1	0.7	7.1

* In addition, 6,711 million cubic feet of blast furnace gas were consumed at blast furnaces.

† See footnote (‡) to table on page 20.

The above figures are exclusive of the quantities of any such fuel recorded under the heading "for purposes not separately distinguished."

The difficulty of drawing conclusions and making generalisations on the basis of the figures shown in the table on page 20 is due partly to the appreciable quantities of fuel for which no particulars of purpose could be specified by firms that furnished information. The following table shows these percentages for the five largest trades in the group and for the group as a whole. These trades accounted for 97 per cent. of the total consumption of coal reported.

Proportion of fuel consumption for purposes not defined.

Trade.	Coal and slack.	Coke and breeze.	Heavy oils.	Light oils.	Gas purchased.*
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Iron and steel (Blast furnaces) ..	1.4	5.2	—	0.7	—
Iron and steel (Smelting, rolling and founding)	9.5	7.3	0.7	2.4	4.9
Tinplate	9.8	—	—	5.8	—
Wrought iron and steel tube ..	2.0	0.7	—	2.7	14.6
Wire drawing	11.8	5.2	27.9	8.2	17.6
ALL IRON AND STEEL TRADES ..	8.4	5.3	0.7	2.0	8.5

* See footnote (†) to table on page 20.

Where the quantities of fuel consumed for purposes not distinguished form only small percentages of the total quantities reported it may involve no great error to distribute them, e.g., in the proportions recorded for the purposes for which consumption was specified ; but where the undistributed portion is large in proportion to the total consumption such a process might lead to erroneous conclusions. Any attempt to extend the particulars furnished so as to estimate the quantities of different kinds of fuel used by all the firms in each of the Iron and Steel Trades would encounter other difficulties, even if distinction of purpose be ignored and attention be confined to the fuel used for all purposes combined. The table on page 20 shows that the firms which furnished information represented very varying proportions of the several trades. Even where the proportion was over 75 per cent., any assumption that the firms that did not furnish information distributed their consumption among the different kinds of fuel in the proportions represented by the practice of those firms that supplied particulars would be extremely hazardous.

For the foregoing reasons, therefore, the information given in the table referred to should not be used as being of more than face value without extreme caution.

Production and consumption of electricity.

For 1907 the Census returns showed that about 176,000,000 units of electricity were generated in establishments with dynamos of 83,910 kilowatt capacity, equivalent to 78 per cent. of the total capacity of 107,745 kilowatts in the Iron and Steel Trades as a whole. In 1924, firms with generators of 144,500 kilowatt capacity (70.4 per cent. of the group total) recorded an aggregate of 349,600,000 units of electricity generated and consumed in their works. As regards purchased electricity, a return was obtained from all firms at the 1907 Census, and this showed a total of nearly 36,000,000 units purchased for all purposes. In 1924 the information received showed that about 353,400,000 units were purchased by firms owning 74.1 per cent. of the electric motors driven by purchased electricity. While the figures form an inadequate basis for generalisation, the

indications which they yield harmonise with the information available from other sources as to the increase in the use of electricity in the Iron and Steel Trades between 1907 and 1924, and possibly also with the conclusion indicated on page 13 as to the increased tendency to rely on electricity purchased from public supply undertakings rather than on the installation of generating plant in the works themselves.

The table on page 24 summarises the detailed information received from firms in the Iron and Steel group of trades as to the generation and consumption of electricity in 1924. The figures, must, however, be regarded as subject to qualifications similar to those which apply to the particulars given on pages 19-22 respecting consumption of fuel ; and for the same reason they cannot be appropriately used as the basis of generalised deductions. The percentages of the reported consumption of electricity for which no particulars of purpose could be given were as follows in the five largest trades in the group (which accounted for 91.5 per cent. of the total reported consumption) and in the group as a whole :—

Proportion of consumption of electricity for purposes not defined.

Trade.	Electricity.	
	Purchased.	Generated in own works.
	Per cent.	Per cent.
Iron and steel (Blast furnaces)	45.4	32.2
Iron and steel (Smelting, rolling and founding)	18.7	45.4
Tinplate	46.8	41.8
Wrought iron and steel tube	28.6	1.0
Wire drawing	47.4	38.0
ALL IRON AND STEEL TRADES	25.9	39.7

Reference to the table on page 24 will show that the percentage of the electric generators in use in the trade that was represented by the information furnished regarding electricity generated was generally considerably smaller than the percentage of the electric motors driven by purchased electricity that was represented by the information furnished regarding electricity purchased. This may be due in part to the predominance, among the firms replying to the voluntary question, of firms drawing the bulk of their electric power from public supply authorities and not from generators installed in their own works ; but at the same time it may reflect the fact that, while all firms necessarily know the quantity of electricity they purchase, many do not record the quantity generated in their own works.

The particulars representing the average amount of electricity generated per kilowatt capacity as shown in column (3) of the following table exhibit a wide range of variation. These variations doubtless correspond to some extent with differences in the continuity with which the electric generators were operated in the works of the firms which furnished information. The difficulty of basing general conclusions regarding the several trades as a whole on the data shown in the table applies not less to this particular aspect of the matter than to the others.

Consumption of electricity (so far as reported) in the several Iron and Steel Trades.

NOTES.—1. The figures in italics below the name of the trade represent respectively (1) the percentage of the total capacity of electric generators in use in the trade represented by the firms which stated the quantity of electricity generated in their works; and (2) the percentage of the total capacity of electric motors driven by purchased electricity in use in the trade represented by the firms which stated the quantity of electricity purchased by them.

2. The electricity generated and the electricity purchased are, in each case, classified according to the purpose for which they were used, as follows:—(a) for power (driving engines), (b) for heating and lighting premises and for transport, etc., (c) for purposes not separately distinguished.

Trade.	Electricity generated in works of firms giving information.				Electricity purchased by firms giving information.	
	Capacity of electric generators (in use). (1)	Quantity of electricity generated. (2)	Average per kilowatt capacity of generators. (3)	Capacity of electric motors (in use) driven thereby. (4)	Quantity of electricity purchased. (5)	Capacity of electric motors (in use) driven thereby. (6)
	Th. Kw.	Million B.T. units.	B.T. units.	Th. H.P.	Million B.T. units.	Th. H.P.
Iron and steel (Blast furnaces <i>(1) 86.4; (2) 88.6</i>)	28.7	(a) 42.4 (b) 19.2 (c) 29.2	3,168	64.6	(a) 9.3 (b) 0.5 (c) 8.1	8.4
Iron and steel (Smelting, rolling and founding) <i>(1) 67.4; (2) 76.9</i>)	95.1	(a) 90.7 (b) 26.5 (c) 97.3	2,254	323.8	(a) 128.8 (b) 37.0 (c) 38.1	314.0
Tinplate <i>(1) 74.4; (2) 98.1</i>	6.3	(a) 8.5 (b) 1.5 (c) 7.2	2,714	9.2	(a) 4.2 (b) 0.2 (c) 3.9	4.3
Light castings <i>(1) 21.4; (2) 63.4</i>	0.4	(a) 0.3 (b) † (c) —	795	0.8	(a) 5.6 (b) 0.6 (c) 5.4	13.7
Wrought iron and steel tube <i>(1) 99.4; (2) 87.1</i>	3.3	(a) 8.1 (b) 0.6 (c) 0.1	2,642	13.2	(a) 20.9 (b) 1.4 (c) 9.0	50.5
Wire drawing <i>(1) 66.9; (2) 87.0</i>	5.5	(a) 7.3 (b) 0.1 (c) 4.6	2,202	11.8	(a) 18.9 (b) 1.4 (c) 18.3	43.9
Anchor, chain, nail, screw and rivet <i>(1) 81.9; (2) 45.7</i>	3.7	(a) 3.5 (b) 0.4 (c) 0.2	1,104	4.6	(a) 6.3 (b) 1.0 (c) 2.3	10.9
Hardware, hollow-ware and bedstead <i>(1) 26.4; (2) 43.3</i>	0.6	(a) 0.8 (b) 0.1 (c) †	1,375	1.5	(a) 5.8 (b) 0.9 (c) 2.7	14.7
Cutlery <i>(1) 14.0; (2) 60.2</i>	0.1	(a) † (b) † (c) †	526	0.1	(a) 2.3 (b) 0.1 (c) 0.3	4.6
Tool and implement <i>(1) 44.0; (2) 52.5</i>	0.7	(a) 0.8 (b) † (c) 0.1	1,386	1.9	(a) 9.1 (b) 3.7 (c) 1.9	17.0
Blacksmithing <i>(1) 20.0; (2) 70.8</i>	*	(a) † (b) † (c) —	283	‡	(a) 0.7 (b) 0.1 (c) 0.7	3.0
Needle, pin, fish-hook and button <i>(1) 29.1; (2) 66.0</i>	0.1	(a) 0.1 (b) † (c) —	916	0.2	(a) 1.7 (b) 0.3 (c) 0.3	2.2
Small arms <i>(1) —; (2) 93.8</i>	—	(a) — (b) — (c) —	—	—	(a) 1.1 (b) 0.1 (c) 0.4	1.8
TOTAL <i>(1) 70.4; (2) 74.1</i>	144.5	(a) 162.5 (b) 48.4 (c) 138.7	2,420	431.7	(a) 214.7 (b) 47.3 (c) 91.4	489.0

* Less than 50 Kw.

† Less than 50,000 B.T.U.

‡ Less than 50 H.P.