

MINES AND QUARRIES.

GENERAL REPORT.

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Introductory.

The following general report deals with the trades engaged in mining and quarrying and in the manufacture of salt and fuel.

Measured by the numbers engaged in the various trades, the largest member of the group is Coal Mining, which accounted in 1924 for 1,198,468 persons employed, or 93 per cent. of the group total of 1,288,592 persons. The next largest is Non-metalliferous (other than Slate) Quarries, with 51,011 persons employed, or 4 per cent. 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, 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 Mines and Quarries group in 1924 was 4,108. About 200 firms to which schedules were sent did not furnish returns, but the great majority of these firms had very small establishments, and they included a number that 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 900 persons in all and that their aggregate net output was probably not in excess of £175,000. These figures represent an omission of 0·1 per cent. 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:—

*Mines and Quarries.**Output in 1924.*

Trade.	Gross output (selling value of goods made and value of work done). (1)	Cost of materials used. (2)	Net output [excess of col. (1) over col. (2)]. (3)	Persons employed. (4)	Net output per person employed, as shown in col. (4). (5)
	£'000	£'000	£'000	Number	£
Coal Mines	251,529	41,642	209,887	1,198,468	175
Manufactured Fuel ..	1,898	1,498	400	1,686	238
Metalliferous Mines and Quarries (and Oil Shale Mines) ..	5,566	1,408	4,158	22,174	188
Salt Mines, Brine Pits and Salt Works ..	1,918	783	1,135	5,138	221
Slate Mines and Quarries	2,182	153	2,029	10,115	201
Non-Metalliferous (other than Slate) Quarries	12,847	2,820	10,027	51,011	197
TOTAL—UNITED KINGDOM	275,940.	48,304	227,636	1,288,592	177
England and Wales*	242,347	42,243	200,104	1,139,402	176
Scotland	33,448	6,036	27,412	148,243	185
Northern Ireland* ..	145	25	120	947	127

* In order to avoid the possible disclosure of information relating to individual firms, the particulars relating to Salt Mines, etc., in Northern Ireland have 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 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 an appreciable proportion of some of the trades in the Mines and Quarries group and, both for that reason and because the 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, except in respect of power equipment, taken for comparison with those for 1924 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 Mines and Quarries worked in that country employed about 4,730 persons with a gross output of about £499,000, that is to say, less than 0·4 per cent. of the total number of persons employed and less than 0·2 per cent. of the gross output, as returned for the Mines and Quarries group in the United Kingdom in 1924; if Coal Mines are excluded the proportions are 4·3 per cent. and 2·0 per cent. respectively.

(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.

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 could be based on the aggregate quantities of goods produced owing to their varied character, even if the necessary information 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, 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 Mines and Quarries group, the net output per head of persons employed in 1924 and 1907.

*Net output per head of persons employed.**

Trade.	1924.	1907.
Coal Mines	175	127
Manufactured Fuel	238	174
Metalliferous Mines and Quarries (and Oil Shale Mines)	188	104
Salt Mines, Brine Pits and Salt Works	221	67
Slate Mines and Quarries	201	72
Non-metalliferous (other than Slate) Quarries	197	78
ALL TRADES	177	122

* 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 results shown.

The average net output per person employed in the Mines and Quarries group increased from £122 in 1907 to £177 in 1924, or by 45 per cent. Relatively to the group average, the greatest change took place in the Salt industry, the net output per head increasing from 45 per cent. below the group average in 1907 to 25 per cent. above the group average in 1924. The smallest change occurred in the Coal Mining industry, in which the net output per head fell from 4 per cent. above the group average in 1907 to 1 per cent. below the group average in 1924. The predominance of the Coal Mining industry in the Mines and Quarries group in both years, however, naturally leads to an approximation between the net output per head for that industry and for the group as a whole.

Non-metalliferous Quarries, Metalliferous Mines and Quarries, Salt Mines, etc., and Slate Mines and Quarries were all below the group average in 1907 and above the group average in 1924. The net output per head in the Manufactured Fuel Trade was well above the average for the group in both years.

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 who were recorded as employed in the Mines and Quarries group in the week ended 18th October, 1924:—

Number of persons employed in the week ended 18th October, 1924.

Trade.	Operative staff.				Administrative, technical and clerical staff.			
	Males.		Females.		Males.		Females.	
	Under 16.	Total.	Under 16.	Total.	Under 16.	Total.	Under 16.	Total.
Coal Mines	72·0	1,171·3	0·5	5·0	No. 705	No. 20,890	No. 40	No. 1,325
Manufactured Fuel†	0·1	1·7	*	*	2	121	—	5
Metalliferous Mines and Quarries (and Oil Shale Mines)‡	0·6	21·1	*	*	14	746	2	35
Salt Mines, Brine Pits and Salt Works§	0·2	4·3	0·1	0·6	16	338	—	60
Slate Mines and Quarries	0·6	10·0	*	*	3	318	1	9
Non-metalliferous (other than Slate) Quarries	1·1	48·4	*	*	78	3,115	14	311
TOTAL	74·6	1,256·8	0·6	5·7	818	25,528	57	1,745

* Less than 50.

† In this trade the persons employed were divided between "Under 18" and "Over 18."

‡ The underground staff at Oil Shale Mines was returned for the last week in October.

§ For Salt Works the persons employed were divided between "Under 18" and "Over 18."

The proportion of female operatives in this group was almost negligible, being less than 0·5 per cent. of the total operative staff employed.

Monthly fluctuations in employment.—In order to ascertain what fluctuations in employment there might be in the course of the census year, firms in all trades (except the Coal Mining industry) were required to state the actual numbers of the operative staff employed in one week in each month. Only for the Manufactured Fuel Trade and for Salt Works were the numbers of male and female operatives required to be shown separately, while in the other trades in the Mines and Quarries group only the total number of operatives of both sexes was asked for. The figures for each trade are shown in the respective reports and the following table gives the monthly aggregates available for the group as a whole.

Week ended	Manufactured Fuel and Salt Mines, Brine Pits and Salt Works.			Metalliferous Mines, etc., Slate Mines, etc., and Non- metalliferous Quarries.	All trades (except Coal Mines).
	Males.	Females.	Total.	Males and females.	Total.
January 12th	5,289	569	5,858	77,033	82,891
February 16th	5,609	540	6,149	77,842	83,991
March 15th	5,785	545	6,330	76,886	83,216
April 12th	6,054	590	6,644	78,089	84,733
May 17th	5,839	578	6,437	78,144	84,581
June 21st	5,856	588	6,444	79,478	85,922
July 19th	5,791	545	6,336	79,696	86,032
August 16th	5,851	569	6,420	79,158	85,578
September 13th	5,485	600	6,085	79,802	85,887
October 18th	5,990	587*	6,577	79,628†	86,205
November 15th	5,380	592	5,972	79,605	85,577
December 13th	5,730	618	6,348	79,830	86,178
ANNUAL AVERAGE	5,723	577	6,300	78,766	85,066

* All employed in the Manufactured Fuel Trade and in Salt Works.

† Of this number 93 were females (see pages 45, 61 and 73).

There were small fluctuations in the total numbers employed from month to month throughout the year, the general tendency being towards increased employment at the end of the year. The lowest figure was recorded for January and the highest for October, the difference between these two extremes being 3,314, or 3·9 per cent. of the average for the twelve months. The average for the second half of the year was 1,687 above that for the first half.

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 the Mines and Quarries group in the censal years 1924 and 1907. The average numbers shown in this table and in the other table on page 7 have been determined in the manner explained in Note (18) on page xi.

For the group as a whole, the numbers employed in 1924 exceeded the numbers employed in 1907 by 337,711, or 35·5 per cent. The Coal Mining industry showed an increase of 359,882, or 43 per cent., in the numbers employed, the Salt industry and the Manufactured Fuel Trade also showing increases of 402 (8·5 per cent.) and 149 (nearly 10 per cent.) respectively. In the other three trades in the group the numbers employed decreased considerably between 1907 and 1924, as follows:—Metalliferous Mines and Quarries, a decrease of 11,587 (34 per cent.); Slate Mines and Quarries, a decrease of 4,285 (30 per cent.); and Non-metalliferous Quarries, a decrease of 6,850 (12 per cent.).

Numbers employed in Mines and Quarries in 1924 and 1907.

Trade.	Operatives (wage earners).		Administrative, technical and clerical staff (salaried persons).		Total.
	Males.	Females.	Males.	Females.	
Coal Mines	1,171,266*	4,987*	20,890	1,325	1,198,468
	819,495	5,327	13,647	117	838,586
Manufactured Fuel	1,524	36	121	5	1,686
	1,481	—	55	1	1,537
Metalliferous Mines and Quarries (and Oil Shale Mines)	21,349	44*	746	35	22,174
	32,652	260	832	17	33,761
Salt Mines, Brine Pits and Salt Works	4,199	541	338	60	5,138
	4,006	427	291	12	4,736
Slate Mines and Quarries	9,787	1*	318	9	10,115
	14,042	—	349	9	14,400
Non-metalliferous (other than Slate) Quarries	47,537	48*	3,115	311	51,011
	55,785	29	1,996	51	57,861
ALL TRADES	1,255,662	5,657	25,528	1,745	
	927,461	6,043	17,170	207	
TOTALS	1,261,319		27,273		1,288,592
	933,504		17,377		950,881

* Number employed during week ended 18th October.

Classification of average numbers employed.—The following table shows the distribution, according to sex, age and character of employment, of the average numbers of persons employed in the Mines and Quarries group in 1924 and 1907:—

Average numbers employed in the Mines and Quarries group in the two censal years.*

Sex and age.†	1924.		1907.	
	Operative staff.	Total staff.	Wage earners.	Total staff.
<i>Males:—</i>				
Under 16	74,585	75,403	63,140	63,804
Over 16	1,181,077	1,205,787	864,321	880,827
TOTAL	1,255,662	1,281,190	927,461	944,631
<i>Females:—</i>				
Under 16	574	631	809	813
Over 16	5,083	6,771	5,234	5,437
TOTAL	5,657	7,402	6,043	6,250
<i>Males and females:—</i>				
Under 16	75,159	76,034	63,949	64,617
Over 16	1,186,160	1,212,558	869,555	886,264
TOTAL	1,261,319	1,288,592	933,504	950,881

* See footnote to previous table.

† See footnotes (†) and (§) to table on page 5.

Sex and age distribution of operatives.—Labour in the Mines and Quarries group was almost exclusively male in each of the censal years, the proportion of female operatives being less than 0·7 per cent. in 1907 and less than 0·5 per cent. in 1924.

The total number of operatives employed in the group in 1924 was greater by 35 per cent. than in 1907; the number of male operatives employed in 1924 was over 35 per cent. in excess of the number employed in 1907, but the number of female operatives was over 6 per cent. less in 1924 than in the earlier year. The number of male operatives under 16 increased by 18 per cent. and the number of female operatives under 16 decreased by 29 per cent. between the two Censuses. The proportion of all operatives under 16 differed little in the two censal years, being nearly 7 per cent. of the total operative staff in 1907 and nearly 6 per cent. in 1924.

Administrative, technical and clerical staff.—The increase in the administrative, technical and clerical staff in 1924 over the salaried persons employed in 1907 was 9,896, or 57 per cent. Of this increase males accounted for 8,358 and females for 1,538.

The increase in males, mainly confined to adults, probably signified 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 females in the administrative staff in 1924 was 6·4 per cent., as compared with 1·2 per cent. in 1907.

For the group as a whole, the proportion of administrative, technical and clerical staff to the total staff was 2·1 per cent. in 1924 and 1·8 per cent. in 1907.

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 figures shown for Coal Mines are based on information contained in the Annual Report of the Secretary for Mines. For the other trades 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, and 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 bases 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.
Coal Mines	1,094,959	93	195,195	93	151,356	77·5
Manufactured Fuel . .	704	40	208	52	109	52·4
Metalliferous Mines and Quarries*	9,377	55	1,791	55	1,120	62·5
Salt Mines, Brine Pits and Salt Works	4,663	97	1,054	93	611	58·0
Slate Mines and Quarries	3,421	34	628	31	449	71·5
Non-metalliferous (other than Slate) Quarries	26,663	55	5,353	53	3,466	64·7
TOTAL	1,139,787	91	204,229	90	157,111	76·9

* Excluding Oil Shale Mines.

Mechanical Power.

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

Power equipment in 1924, 1912 and 1907.—The particulars furnished at the three Censuses regarding prime movers and electric generators in the Mines and Quarries group 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 ineffective for the most part 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 been of particular importance in reference to this feature.

In connexion with the omission of the Irish Free State from the 1924 Census (see page 3), 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 Mines and Quarries group in that year was 2,269 horse-power, and no electric motors driven by purchased electricity were recorded. The effect on comparisons with earlier Censuses of the absence of the Irish Free State from the 1924 Census may, therefore, be considered as negligible in this group of trades.

Power equipment of the Mines and Quarries group.

Trade.	Prime movers.			Electric generators.		
	1924.	1912.	1907.	1924.	1912.	1907.
	Thousand H.P.			Thousand Kw.		
Coal Mines	3,150.6*	2,520.8*	2,294.0*	643.5	340.7	101.2†
Manufactured Fuel	8.7	6.6	5.3	3.0	1.4	0.2
Metalliferous Mines and Quarries (and Oil Shale Mines)	65.0	77.1	81.3	7.9	8.2	6.8
Salt Mines, Brine Pits and Salt Works	19.4	13.8	4.1	11.3	9.0	0.5
Slate Mines and Quarries	6.5	7.7	10.9	1.1	1.1	1.1
Non-metalliferous (other than Slate) Quarries	85.9	70.0	59.9	10.6	2.0	0.7
TOTAL	3,336.1	2,696.0	2,455.5	677.4	362.4	110.5

* Including locomotives.

† Estimated.

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.	
Coal Mines	1,055.6	376.3	463.1	115.7	1,518.7	492.0
Manufactured Fuel	3.9	1.0	1.6	—	5.5	1.0
Metalliferous Mines and Quarries (and Oil Shale Mines)	10.3	7.2	35.6	4.5	45.9	11.7
Salt Mines, Brine Pits and Salt Works	4.2	1.9	0.7	0.5	4.9	2.4
Slate Mines and Quarries	1.7	1.6	9.8	2.7	11.5	4.3
Non-metalliferous (other than Slate) Quarries	11.9	3.0	15.8	2.3	27.7	5.3
TOTAL	1,087.6	391.0	526.6	125.7	1,614.2	516.7

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.
England and Wales*	Th. H.P. 2,925.8	Th. Kw. 585.7	Th. H.P. 872.4	Th. H.P. 453.8
Scotland	409.0	91.6	215.1	72.8
Northern Ireland*	1.3	0.1	0.1	—
TOTAL	3,336.1	677.4	1,087.6	526.6

* See footnote to table on page 2.

Classification of power equipment in 1924, 1912 and 1907.—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 establishment.

Power equipment.	1924.	1912.	1907.
	Th. H.P.	Th. H.P.	Th. H.P.
PRIME MOVERS:—			
Reciprocating steam engines	2,395.2	2,461.8	2,378.6
Steam turbines	585.0	167.6	3.6
Gas and oil engines	67.8	46.6	20.8
Water power	5.0	8.4	8.3
Other power	283.1*	11.6	44.2
TOTAL	3,336.1	2,696.0	2,455.5
	Th. Kw.	Th. Kw.	Th. Kw.
ELECTRIC GENERATORS:—			
Driven by—			
Reciprocating steam engines	255.9	219.1	3.9
Steam turbines	405.3	118.1	2.6
Gas and oil engines	15.1	25.2	104.0
Water power	1.1		
Other prime movers	—		
TOTAL	677.4	362.4	110.5
	Th. H.P.	Th. H.P.	Th. H.P.
ELECTRIC MOTORS:—			
Driven by—			
Electricity generated in same works	1,087.6	391.0	(not ascertained)†
Purchased electricity	526.6	125.7	
TOTAL	1,614.2	516.7	..

* Including locomotives: 254,500 H.P.

† The total amount of electrical energy recorded as purchased for all purposes in 1907 was 3,405,000 Board of Trade units (Kilowatt-hours), excluding the Coal Mining Industry in which were recorded electric motors, driven by purchased electricity, of a capacity of 11,936 horse-power. The quantity generated by the dynamos operated by the firms in the Mines and Quarries group (excluding the Coal Mining industry) may be estimated at about 16,000,000 Board of Trade units. The generators in the Coal Mining industry were estimated to be of a capacity of 101,192 Kilowatts.

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 proportion 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, 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 Mines and Quarries group 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.	
Coal Mines	{ (a) 2,741.4 (b) 409.2	} 13.0	{ 457.2 186.3	} 28.9	{ 1,314.0 204.7	} 13.5
Manufactured Fuel ..	{ (a) 6.8 (b) 1.9	} 22.3	{ 2.2 0.8	} 25.5	{ 3.8 1.7	} 30.5
Metalliferous Mines and Quarries (and Oil Shale Mines).	{ (a) 52.6 (b) 12.4	} 19.1	{ 5.3 2.6	} 33.7	{ 40.3 5.6	} 12.3
Salt Mines, Brine Pits and Salt Works ..	{ (a) 11.0 (b) 8.4	} 43.3	{ 5.6 5.7	} 50.1	{ 3.8 1.1	} 22.4
Slate Mines and Quarries	{ (a) 5.6 (b) 0.9	} 13.3	{ 1.1 †	} 1.1	{ 10.7 0.8	} 7.1
Non-metalliferous (other than Slate) Quarries ..	{ (a) 79.3 (b) 6.6	} 7.6	{ 9.6 1.0	} 9.5	{ 26.2 1.5	} 5.3
TOTAL	{ (a) 2,896.7 (b) 439.4	} 13.2	{ 481.0 196.4	} 29.0	{ 1,398.8 215.4	} 13.3

* Based in each case upon the actual figures returned. † Less than 50 Kilowatts.

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 an establishment using both forms of energy, will depend on the organisation of the establishment. 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 breakdowns 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 results of the calculation :—
Power available in the Mines and Quarries group 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.
Coal Mines	1,996.6*	1,518.7	3,515.3*	3.0
Manufactured Fuel	4.4	5.5	9.9	6.4
Metalliferous Mines and Quarries (and Oil Shale Mines)	53.3	45.9	99.2	4.6
Salt Mines, Brine Pits and Salt Works	3.8	4.9	8.7	1.8
Slate Mines and Quarries	4.9	11.5	16.4	1.7
Non-metalliferous (other than Slate) Quarries	70.5	27.7	98.2	2.1
TOTAL	2,133.5	1,614.2	3,747.7	2.3

* Exclusive of locomotives.

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 and all other purposes. Firms whose aggregate net output was 72.0 per cent. of the net output of all firms in the Mines and Quarries group in 1924 furnished information in response to this request, though, as will appear later, some of them were unable to divide their particulars into the two categories indicated. The information returned was fairly equally representative of fuel consumption, of production of electricity, and of consumption of purchased electricity, the data supplied under these three headings respectively covering 78.9 per cent. of the capacity of all the prime movers (not hydraulic) in use in the group, 71.6 per cent. of the capacity of the electric generators, and 79.8 per cent. of that of the electric motors driven by purchased electricity. The proportion of the trade for which particulars were furnished varied rather widely, however, between one trade and another, as will be seen from the tables given below.

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 67.6 per cent. of the net output of the Mines and Quarries group as a whole, and they recorded a consumption of 12,892,500 tons of coal* and 80,300 tons of coke. The consumption recorded in 1924 by firms representing 72.0 per cent. of the net output of the group, included 15,031,000 tons of coal and 134,100 tons of coke.

* Includes any coke used in the Coal Mining industry, where separate particulars of coal and coke were not required.

The following table 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 and all other purposes, 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 that 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 Mines and Quarries group 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, transport and all other purposes; (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
Coal Mines	(a)§ 12,917.2	77.4	96.7	752.1	1,242.2
(1) 72.0; (2) 79.2	(b) 225.6	2.3	6.7	322.1	3,323.6
	(c) 718.7	2.6	—	37.7	—
Manufactured Fuel	(a) 41.4	*	†	†	—
(1) 86.0; (2) 93.2	(b) 5.7	*	†	1.2	0.4
	(c) —	*	†	†	—
Metalliferous Mines and Quarries (and Oil Shale Mines)	(a)§ 258.2	4.1	18.5	37.0	4.2
(1) 74.4; (2) 76.3	(b) 8.9	0.1	0.1	13.7	2.5
	(c) 20.6	0.6	1.2	6.5	—
Salt Mines, Brine Pits and Salt Works	(a) 52.0	1.2	1.2	13.7	23.7
(1) 82.0; (2) 86.1	(b) 386.2	1.3	—	11.4	5.4
	(c) 2.9	—	2.4	3.6	13.4
Slate Mines and Quarries	(a) 7.8	*	19.9	30.1	—
(1) 89.3; (2) 84.4	(b) 0.6	0.1	0.1	9.8	0.7
	(c) 2.5	—	—	0.8	—
Non-metalliferous (other than Slate) Quarries	(a) 181.8	6.5	288.6	235.4	156.4
(1) 65.3; (2) 67.5	(b) 141.3	30.2	14.9	161.6	10.0
	(c) 59.6	7.7	2.8	9.9	12.4
ALL TRADES	(a) 13,458.4	89.2	424.9	1,068.3	1,426.5
(1) 72.0; (2) 78.9	(b) 768.3	34.0	21.8	519.8	3,342.6
	(c) 804.3	10.9	6.4	58.5	25.8
GRAND TOTAL—(ALL PURPOSES)	15,031.0	134.1	453.1	1,646.6	4,794.9

* Less than 50 tons.

† Less than 50 gallons.

‡ 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.

§ For mining purposes, driving engines, ventilating, etc.

The difficulty of drawing conclusions and making generalisations on the basis of the figures shown in the preceding table is due primarily to the quantities of fuel consumed for which no particulars of purpose could be specified by firms that furnished information. The following table shows these quantities as percentages of the total of each class of fuel consumed in each of the trades in the Mines and Quarries group and for the group as a whole.

Proportion of fuel consumption for purposes not defined.

Trade.	Coal and slack.	Coke and breeze.	Heavy oil.	Light oil.	Gas purchased.
	Percent.	Percent.	Percent.	Percent.	Percent.
Coal Mines	5.2	3.1	—	3.4	—
Manufactured Fuel.. .. .	—	—	—	—	—
Metalliferous Mines and Quarries (and Oil Shale Mines)	7.2	12.9	5.8	11.4	—
Salt Mines, Brine Pits and Salt Works	0.7	—	67.3	12.4	31.5
Slate Mines and Quarries	22.7	—	—	1.9	—
Non-metalliferous (other than Slate) Quarries	15.6	17.4	0.9	2.4	6.9
ALL TRADES	5.4	8.1	1.4	3.6	0.5

Where the quantities of fuel consumed for purposes not distinguished from 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. The table on page 15 also shows that the firms that furnished information represented varying proportions of the several trades, and that in three of the trades this proportion, as measured by net output, was less than 75 per cent. Even in those trades where the proportion exceeded 75 per cent. it cannot fairly be assumed 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.

For these reasons, therefore, the information given in the table referred to should be used with considerable caution.

Production and consumption of electricity.

For 1907 the Census returns showed that about 13,850,000 units of electricity were generated in establishments with dynamos of 8,768 kilowatt capacity, equivalent to about 8 per cent. of the total capacity of 111,380 kilowatts in the Mines and Quarries group as a whole. In 1924, firms with generators (in use) of 344,400 kilowatt capacity (71.6 per cent. of the group total) recorded an aggregate of 1,028 million units of electricity generated and consumed in their works. As regards purchased electricity, a return was obtained

from all firms, except those engaged in Coal Mining*, at the 1907 Census, and this showed a total of over 3,400,000 units purchased for all purposes. In 1924 the information received showed that about 468,400,000 units were purchased by firms owning 79.8 per cent. of the electric motors (in use) driven by purchased electricity. While the figures form an inadequate basis for general estimates covering the entire group at both dates, they show clearly that a very large increase in the use of electrical energy took place in these trades, and appear also not to conflict with the conclusion indicated on page 9 as to an 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 18 summarises the detailed information received from firms in the Mines and Quarries group 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 14 to 16 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:—

Proportion of consumption of electricity for purposes not defined.

Trade.	Electricity.	
	Purchased.	Generated in own works.
	Per cent.	Per cent.
Coal Mines	11.5	17.1
Manufactured Fuel	30.8	0.5
Metalliferous Mines and Quarries (and Oil Shale Mines)	13.3	—
Salt Mines, Brine Pits and Salt Works	—	10.3
Slate Mines and Quarries	55.8	100.0
Non-metalliferous (other than Slate) Quarries	2.9	9.4
ALL TRADES	12.0	17.1

The following table shows that the percentage of the electric generators in use in the trade that was represented by the information furnished regarding electricity generated, was sometimes 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 Coal Mining industry, however, reported electric motors of a total capacity of 11,936 horse-power, driven by purchased electricity.

The particulars representing the average amount of electricity generated per kilowatt capacity, as shown in column (3) of the table, exhibit considerable variations. 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 that 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 Mines and Quarries group.

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 that 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 that 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, transport and all other purposes; (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).	Quantity of electricity generated.	Average per kilowatt capacity of generators.	Capacity of electric motors (in use) driven thereby.	Quantity of electricity purchased.	Capacity of electric motors (in use) driven thereby.
	(1)	(2)	(3)	(4)	(5)	(6)
	Th. Kw.	Million B.T. units	B.T. units	Th. H.P.	Million B.T. units	Th. H.P.
Coal Mines (1) 73.0; (2) 81.8	333.9	{ (a) 822.5 (b) 16.5 (c) 173.6 }	3,032.3	766.7	{ (a) 364.9 (b) 3.4 (c) 47.9 }	333.3
Manufactured Fuel .. (1) 44.7; (2) 67.2	1.0	{ (a) 2.3 (b) 0.1 (c) * }	2,491.1	2.5	{ (a) 0.4 (b) * (c) 0.1 }	0.9
Metalliferous Mines and Quarries (and Oil Shale Mines) .. (1) 18.5; (2) 58.3	0.9	{ (a) 2.5 (b) 0.2 (c) — }	2,689.9	14.0	{ (a) 34.1 (b) 0.2 (c) 5.3 }	19.2
Salt Mines, Brine Pits and Salt Works (1) 90.4; (2) 73.4	5.1	{ (a) 2.1 (b) 0.3 (c) 0.3 }	539.5	2.8	{ (a) 0.4 (b) 0.1 (c) — }	0.5
Slate Mines and Quarries (1) 93.0; (2) 82.1	1.0	{ (a) — (b) — (c) 1.2 }	1,241.8	1.7	{ (a) 2.3 (b) * (c) 2.9 }	7.4
Non-metalliferous (other than Slate) Quarries (1) 25.6; (2) 73.3	2.5	{ (a) 4.4 (b) 1.4 (c) 0.6 }	2,614.0	6.5	{ (a) 6.1 (b) 0.1 (c) 0.2 }	10.9
TOTAL (1) 71.6; (2) 79.8	344.4	{ (a) 833.8 (b) 18.5 (c) 175.7 }	2,984.8	794.2	{ (a) 408.2 (b) 3.8 (c) 56.4 }	372.2

* Less than 50,000 B.T.U.