

MANUFACTURES OF CLAY, STONE, ETC.,
AND THE
BUILDING AND CONTRACTING TRADES.

**MANUFACTURES OF CLAY, STONE, ETC., AND THE BUILDING
AND CONTRACTING TRADES.**

GENERAL REPORT.

Contents.

| | Page |
|---|------|
| INTRODUCTORY | 177 |
| Principal results for 1924 | 178 |
| Comparability of results with those for 1912 and 1907 | 179 |
| PRODUCTION | 179 |
| Net output per head in 1924 and 1907 | 180 |
| EMPLOYMENT | 181 |
| Employment in 1924 | 181 |
| Classification of persons employed in a specified week | 181 |
| Monthly fluctuations in employment | 182 |
| Employment in 1924 and 1907 | 183 |
| Classification of average numbers employed | 184 |
| Sex and age distribution of operatives | 184 |
| Administrative, technical and clerical staff | 184 |
| WAGES IN 1924 | 185 |
| MECHANICAL POWER | 185 |
| Power equipment in 1924, 1912 and 1907 | 186 |
| Classification of power equipment in 1924, 1912 and 1907 | 187 |
| Power equipment in use and not in use in 1924 | 188 |
| Power available for mechanical and electrical application in 1924 | 189 |
| FUEL AND ELECTRICITY IN 1924 | 190 |
| Fuel consumption | 190 |
| Production and consumption of electricity | 193 |

Introductory.

The following general report deals with the trades engaged in the manufacture of clay, stone and asbestos products, cement, glass, building materials and roofing felts. The Building and Contracting Trades are, for convenience, also included in this group.

Measured by the numbers engaged in the various trades, the largest member of the group is the Building and Contracting Trades, which accounted in 1924 for 514,353 persons employed, or 69 per cent. of the group total of 741,593 persons. The next largest are the Brick and Fireclay Trades, with 70,324 persons employed; the China and Earthenware Trades, with 70,008 persons employed; and the Glass, Building Materials, etc., and Roofing Felts Trades, with 64,468 persons employed, or, respectively, 9.5 per cent., 9.4 per cent. and 8.7 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 Clay, Stone, etc., and Building and Contracting group in 1924 was about 42,000. About 13,700 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 44,000 persons in all and that their aggregate net output was probably not in excess of £5,500,000. These figures represent an omission of, at most, about 6 per cent. and 4 per cent. respectively of the total figures for the group; and the absence of returns from the firms in question affects in a minor degree, at most, the uses made of the figures in this general report.

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

Manufactures of Clay, Stone, etc., and Building and Contracting 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, (4) | Net output per person employed, as shown in col. (4). (5) |
|---|---|--|---|--------------------------|--|
| | £'000 | £'000 | £'000 | Number. | £ |
| Brick and Fireclay | 21,101 | 6,527 | 14,574 | 70,324 | 207 |
| China and Earthenware | 17,620 | 6,680 | 10,940 | 70,008 | 156 |
| Cement | 8,071 | 3,172 | 4,899 | 13,590 | 361 |
| Glass, Building Materials, etc. Engine and Boiler Packing, etc. | 25,596 3,913 | 10,257 1,740 | 15,339 2,173 | 64,468 6,850 | 238 317 |
| Manufactured Abrasives | 1,368 | 750 | 618 | 2,000 | 309 |
| Building and Contracting | 193,494 | 96,977 | 96,517 | 514,353 | 188 |
| TOTAL—UNITED KINGDOM.. | 271,163 | 126,103 | 145,060 | 741,593 | 196 |
| England and Wales† | 246,017 | 114,402 | 131,615 | 667,740 | 197 |
| Scotland† | 21,724 | 10,005 | 11,719 | 63,798 | 184 |
| Northern Ireland† | 3,422 | 1,696 | 1,726 | 10,055 | 172 |

* Not including the output of, nor the persons employed by, Public Utility Services and Government Factories; particulars relating to these establishments are given on pages 291 to 439. The value of the bricks and other building materials made and of building and contracting work done by such establishments is also stated on pages 197, 239 and 278.

† In order to avoid the possible disclosure of information relating to individual firms, the particulars relating to the Cement Trade in Scotland and Northern Ireland, and to the Roofing Felts Trade in Scotland, have been combined 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 a considerable proportion of some of the trades in this 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. Further, the Building and Contracting Trades did not come within the scope of the 1912 Census. For these reasons 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 number of persons employed in the Bricks and Monumental Masonry Trades and the Building and Contracting Trades in that country was about 11,350, with a gross output of about £3,217,000; that is to say, about 1.5 per cent. of the total number of persons employed and about 1.2 per cent. of the gross output, as returned for the Clay, Stone, etc., group in the United Kingdom in 1924.

(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 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 Clay, Stone, etc., and Building and Contracting group, the net output per head of persons employed in 1924 and 1907.

*Net output per head of persons employed.**

| Trade. | 1924. | 1907. |
|---|-------|-------|
| | £ | £ |
| Brick and Fireclay | 207 | 78 |
| China and Earthenware | 156 | 68 |
| Cement | 361 | 132 |
| Glass, Building Materials, etc. | 238 | 93 |
| Engine and Boiler Packing, etc. | 317 | 137 |
| Manufactured Abrasives | 309 | † |
| Building and Contracting | 188 | 84 |
| ALL TRADES | 196 | 83 |

* 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.

† In 1907 manufactured abrasives were included in general classes of goods produced in various trades and no separate particulars regarding them are available for that year.

For the group as a whole, the net output per head of persons employed increased from £83 in 1907 to £196 in 1924, or by 136 per

cent., the greatest increase being recorded in the Cement Trade (over 173 per cent.) and the least in the Building and Contracting Trades (124 per cent.).

Relatively to the group average in each year the greatest change occurred in the Cement Trade, in which the net output per head rose from 59 per cent. above the average in 1907 to 84 per cent. above the average in 1924. Increases also took place in the Brick and Fireclay Trades (from 6.0 per cent. below the average in 1907 to 5.6 per cent. above the average in 1924), and in the Glass, Building Materials, etc., Trades (from 12.0 per cent. above the average in 1907 to 21.4 per cent. above the average in 1924). In the other trades for which figures for both years are available, the net output per person employed decreased relatively to the group average between 1907 and 1924, the most important change being in the Building and Contracting Trades, in which the net output per head fell from 1.2 per cent. above the average for the group in 1907 to 4.1 per cent. below the average 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 who were recorded as employed in the various Clay, Stone, etc., and Building and Contracting Trades 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 18. | Total. | Under 18. | Total. | Under 18. | Total. | Under 18. | Total. |
| | In thousands. | | | | No. | No. | No. | No. |
| Brick and Fireclay | 8.2 | 61.2 | 1.0 | 5.8 | 486 | 4,240 | 96 | 576 |
| China and Earthenware | 4.0 | 31.8 | 8.8 | 34.9 | 346 | 3,651 | 188 | 1,239 |
| Cement | 0.6 | 12.3 | * | 0.3 | 56 | 875 | 14 | 193 |
| Glass, Building Materials, etc. | 6.5 | 52.0 | 1.4 | 5.2 | 451 | 6,186 | 212 | 1,417 |
| Engine and Boiler Packing, etc. | 0.4 | 4.2 | 0.3 | 1.6 | 79 | 812 | 81 | 401 |
| Manufactured Abrasives | 0.2 | 1.3 | 0.1 | 0.2 | 18 | 278 | 13 | 105 |
| Building and Contracting | 38.2 | 490.9 | 0.2 | 0.8 | 2,148 | 48,888 | 931 | 6,518 |
| TOTAL | 58.1 | 653.7 | 11.8 | 48.8 | 3,584 | 64,930 | 1,535 | 10,449 |

* Less than 50.

In the China and Earthenware Trades the number of female operatives exceeded the number of male operatives and formed over 52 per cent. of the total operative staff employed in those trades.

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 actual numbers of the operative staff employed in one week in each month. In the Building and Contracting Trades the numbers of male and female operatives were not required to be shown separately for each month, and the totals returned for this industry are, therefore, shown separately below. 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 in the Clay, Stone, etc., and Building and Contracting Trades in 1924.

| Week ended. | Building and Contracting Trades. | Other Trades in the group. | | All Trades. |
|---------------------------------|----------------------------------|----------------------------|----------|-------------|
| | Males and females. | Males. | Females. | Total. |
| 12th January | 429,968 | 150,884 | 44,906 | 625,758 |
| 16th February | 448,487 | 153,737 | 45,975 | 648,199 |
| 15th March | 461,497 | 156,175 | 46,503 | 664,175 |
| 12th April | 479,504 | 159,264 | 47,215 | 685,983 |
| 17th May | 486,235 | 162,703 | 47,561 | 696,499 |
| 21st June | 489,104 | 164,799 | 47,647 | 701,550 |
| 19th July | 383,113 | 162,587 | 47,386 | 593,086 |
| 16th August | 382,883 | 159,325 | 44,464 | 586,672 |
| 13th September | 486,679 | 164,114 | 47,669 | 698,462 |
| 18th October | 491,817 | 162,732 | 47,912 | 702,461 |
| 15th November | 486,600 | 162,766 | 48,542 | 697,908 |
| 13th December | 481,483 | 163,999 | 48,328 | 693,810 |
| AVERAGE FOR THE 12 MONTHS | 458,947 | 160,258 | 47,009 | 666,214 |

The number of operatives employed in the group rose steadily from January to June. In July and August there was a considerable decline in employment, due, in the main, to the partial stoppage of work in the Building Trade in those months. Further increases in the total number of operatives at work took place in September and October, when the highest figure for the year was reached, and the numbers declined in November and again in December. Fluctuations in the numbers of male and female operatives corresponded roughly with the general movements of the total of both sexes except that the highest number of females was recorded for November. The total number employed in the middle of December exceeded the number employed in the middle of January by 68,052, or 10·9 per cent.

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 Clay, Stone, etc., Trades, and in the Building and Contracting Trades in the censal years 1924 and 1907. The average numbers shown in this table and in the table on page 184 have been determined in the manner explained in Note (18) on page xi.

Average numbers employed in 1924 and 1907 in the several Clay, Stone, etc., and Building and Contracting Trades.

| Trade. | Operatives (wage earners). | | Administrative, technical and clerical staff (salaried persons). | | Total. |
|---------------------------------------|----------------------------|----------|--|----------|---------|
| | Males. | Females. | Males. | Females. | |
| Brick and Fireclay | 1924 59,804 | 5,704 | 4,240 | 576 | 70,324 |
| | 1907 61,669 | 4,197 | 3,579 | 147 | 69,592 |
| China and Earthenware | 1924 31,092 | 34,026 | 3,651 | 1,239 | 70,008 |
| | 1907 36,523 | 27,783 | 3,477 | 385 | 68,168 |
| Cement | 1924 12,270 | 252 | 875 | 193 | 13,590 |
| | 1907 13,771 | 89 | 936 | 23 | 14,819 |
| Glass, Building Materials, etc. | 1924 51,619 | 5,246 | 6,186 | 1,417 | 64,468 |
| | 1907 43,508 | 3,153 | 3,449 | 265 | 50,375 |
| Engine and Boiler Packing, etc. | 1924 4,110 | 1,527 | 812 | 401 | 6,850 |
| | 1907 1,431 | 572 | 301 | 45 | 2,349 |
| Manufactured Abrasives | 1924 1,363 | 254 | 278 | 105 | 2,000 |
| | 1907 * | * | * | * | * |
| Building and Contracting | 1924 458,142† | 805† | 48,888 | 6,518 | 514,353 |
| | 1907 475,330 | 1,112 | 35,389 | 2,162 | 513,993 |
| ALL TRADES | 1924 618,400 | 47,814 | 64,930 | 10,449 | |
| | 1907 632,232 | 36,906 | 47,131 | 3,027 | |
| TOTALS | 1924 666,214 | | 75,379 | | 741,593 |
| | 1907 669,138 | | 50,158 | | 719,296 |

* Not available.

† Estimated on the basis of the data relating to the week ended 18th October.

The total numbers employed in the group increased by 22,297, or 3·1 per cent. All trades showed improved employment in 1924 except the Cement Trade, in which the total numbers fell by 1,229, or 8·3 per cent. The greatest actual increase occurred in the Glass, Building Materials, etc., Trades, in which the numbers employed in 1924 exceeded the numbers employed in 1907 by 14,093, or 28 per cent. : the greatest relative increase was in the Engine and Boiler Packing, etc., Trade, where the numbers increased by 4,501, or 192 per cent. All the trades for which 1907 figures are available recorded increases in the numbers of female operatives employed, with the exception of the Building and Contracting Trades ; and all showed decreases in the numbers of male operatives employed, except the Glass, Building Materials, etc., Trades, and the Engine and Boiler

Packing, etc., Trade. Apart from the Cement Trade, in which the male administrative staff declined, there was an increase in both the male and the female administrative staff in all the trades in the group.

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 employed in the Clay, Stone, etc., and Building and Contracting Trades in 1924 and 1907 :—

Average numbers employed in the Clay, Stone, etc., and Building and Contracting Trades in the two censal years.

| Sex and age. | 1924. | | 1907. | |
|-----------------------------|------------------|--------------|---------------|--------------|
| | Operative staff. | Total staff. | Wage earners. | Total staff. |
| <i>Males :—</i> | | | | |
| Under 18 | 55,382 | 58,966 | 60,150 | 63,256 |
| Over 18 | 563,018 | 624,364 | 572,082 | 616,107 |
| TOTAL | 618,400 | 683,330 | 632,232 | 679,363 |
| <i>Females :—</i> | | | | |
| Under 18 | 11,622 | 13,157 | 9,439 | 9,952 |
| Over 18 | 36,192 | 45,106 | 27,467 | 29,981 |
| TOTAL | 47,814 | 58,263 | 36,906 | 39,933 |
| <i>Males and females :—</i> | | | | |
| Under 18 | 67,004 | 72,123 | 69,589 | 73,208 |
| Over 18 | 599,210 | 669,470 | 599,549 | 646,088 |
| TOTAL | 666,214 | 741,593 | 669,138 | 719,296 |

Sex and age distribution of operatives.—Male labour predominated in this group of trades in both years. There was a decline of 2,924, or 0·4 per cent., in the total number of operatives of both sexes employed in 1924 as compared with 1907. This decline was due to a reduction in the number of males, which more than offset the increase in the number of females employed. Of the male operatives, the number of young persons under 18 decreased by 4,768, or 7·9 per cent., and the number of adults by 9,064, or 1·6 per cent. With regard to the female operatives, the number of young persons under 18 increased by 2,183, or 23 per cent., and the number of adults by 8,725, or 32 per cent. The proportion of operatives under 18 differed little in the two years, being 10·4 per cent. in 1907 and 10·1 per cent. in 1924.

Administrative, technical and clerical staff.—The increase in the administrative, technical and clerical staff in 1924 (described as salaried persons in 1907) was 25,221, or 50·3 per cent. Of this increase, males accounted for 17,799 and females for 7,422. The increase in males probably signified an increase in management and sales staffs; the increase in females 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 1907 was 94 per cent. and of females 6 per cent., as compared with 86 per cent. and 14 per cent., respectively, in 1924.

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 bases of numbers of operatives employed and of net output, respectively.

| Trade. | Firms furnishing returns of wages. | | | | | |
|---|------------------------------------|----------------------------|-------------|----------------------------|-------------|---------------------------|
| | Operatives employed. | | Net output. | | Wages paid. | |
| | Number. | Proportion of trade total. | Amount. | Proportion of trade total. | Amount. | Proportion of net output. |
| (1) | (2) | (3) | (4) | (5) | (6) | |
| | | Per cent. | £'000. | Per cent. | £'000. | Per cent. |
| Brick and Fireclay .. | 38,278 | 57 | 8,446 | 58 | 4,708 | 55·7 |
| China and Earthenware | 37,116 | 57 | 5,559 | 51 | 3,336 | 60·0 |
| Cement | 8,469 | 68 | 3,229 | 66 | 1,290 | 39·9 |
| Glass, Building Materials, etc. | 31,363 | 55 | 8,394 | 55 | 4,231 | 50·4 |
| Engine and Boiler Packing, etc. | 3,993 | 69 | 1,591 | 73 | 473 | 29·7 |
| Building and Contracting | 167,322 | 34 | 31,221 | 32 | 23,696 | 75·9 |
| TOTAL | 286,541 | 43 | 58,440 | 40 | 37,734 | 64·6 |

No separate figures are available regarding the Manufactured Abrasives Trade.

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 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, etc., and for manufacturing purposes. In addition, many factories 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 Censuses of 1924, 1912 and 1907 regarding prime movers and electric generators in factories in the Clay, Stone, etc., Trades, and in the Building and Contracting 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.

In connexion with the omission of the Irish Free State from the 1924 Census (see page 179) 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 Bricks and Monumental Masonry Trades and the Building and Contracting Trades in that year was 2,116 horse-power, which is about 0.5 per cent. of the total recorded for the United Kingdom in 1924; and the capacity of the electric motors driven by purchased electricity was 1,548 horse-power, or 0.7 per cent. of the United Kingdom figure for 1924. The effect on comparisons with earlier Censuses of the absence of the Irish Free State from the 1924 Census is, therefore, not appreciable.

Power equipment of the Clay, Stone, etc., and Building and Contracting Trades.

| Trade. | Prime movers. | | | Electric generators. | | |
|---------------------------------|---------------|--------------|--------------|----------------------|-------------|-------------|
| | 1924. | 1912. | 1907. | 1924. | 1912. | 1907. |
| | Thousand H.P. | | | Thousand Kw. | | |
| Brick and Fireclay | 132.0 | 120.1 | 138.8 | 6.6 | 2.8 | 2.7 |
| China and Earthenware .. | 33.6 | 25.1 | 26.0 | 4.3 | 2.3 | 1.3 |
| Cement | 90.4 | 76.0 | 60.1 | 43.1 | 18.0 | 6.7 |
| Glass, Building Materials, etc. | 48.4 | 39.6 | 33.5 | 18.5 | 8.2 | 5.1 |
| Engine & Boiler Packing, etc. | 6.1 | 3.7 | 2.3 | 2.0 | 1.0 | 0.2 |
| Manufactured Abrasives .. | 1.5 | * | * | 0.5 | * | * |
| Total of above | 312.0 | 264.5 | 260.7 | 75.0 | 32.3 | 16.0 |
| Building and Contracting .. | 102.5 | † | 170.5 | 4.2 | † | 3.7 |
| TOTAL—ALL TRADES | 414.5 | 264.5 | 431.2 | 79.2 | 32.3 | 19.7 |

| 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. | |
| Brick and Fireclay | 8.1 | 2.7 | 31.5 | 4.8 | 39.6 | 7.5 |
| China and Earthenware .. | 2.9 | 1.9 | 11.3 | 2.9 | 14.2 | 4.8 |
| Cement | 51.7 | 21.9 | 21.6 | 1.6 | 73.3 | 23.5 |
| Glass, Building Materials, etc. | 36.1 | 13.3 | 42.4 | 7.6 | 78.5 | 20.9 |
| Engine & Boiler Packing, etc. | 1.8 | 1.3 | 7.7 | 1.0 | 9.5 | 2.3 |
| Manufactured Abrasives .. | 0.6 | * | 1.7 | * | 2.3 | * |
| Total of above | 101.2 | 41.1 | 116.2 | 17.9 | 217.4 | 59.0 |
| Building and Contracting .. | 5.6 | † | 94.3 | † | 99.9 | † |
| TOTAL—ALL TRADES | 106.8 | 41.1 | 210.5 | 17.9 | 317.3 | 59.0 |

* Not available. † Not ascertained.

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. 382.5 | Th. Kw. 77.5 | Th. H.P. 104.9 | Th. H.P. 189.1 |
| Scotland* | 27.2 | 1.1 | 1.4 | 20.4 |
| Northern Ireland* | 4.8 | 0.6 | 0.5 | 1.0 |
| TOTAL | 414.5 | 79.2 | 106.8 | 210.5 |

* See footnote (†) to table on page 178; in addition, particulars regarding the power equipment of the China and Earthenware Trades in Northern Ireland have been combined with those for England and Wales.

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 factory or works.

| Power equipment. | 1924. | 1912. | 1907. |
|---|--------------|--------------|-----------------------|
| PRIME MOVERS:— | Th. H.P. | Th. H.P. | Th. H.P. |
| Reciprocating steam engines .. | 222.6 | 208.4 | 346.0 |
| Steam turbines | 60.6 | 7.9 | 6.3 |
| Gas and oil engines | 129.3 | 46.1 | 74.7 |
| Water power | 2.0 | 2.1 | 4.0 |
| Other power | — | — | 0.2 |
| TOTAL | 414.5 | 264.5 | 431.2 |
| ELECTRIC GENERATORS:— | Th. Kw. | Th. Kw. | Th. Kw. |
| Driven by— | | | |
| Reciprocating steam engines | 20.9 | 16.3 | 12.5 |
| Steam turbines | 43.1 | 6.3 | 4.0 |
| Gas and oil engines | 15.0 | 9.7 | 3.2 |
| Water power | 0.2 | | |
| Other prime movers | — | | |
| TOTAL | 79.2 | 32.3 | 19.7 |
| ELECTRIC MOTORS:— | Th. H.P. | Th. H.P. | Th. H.P. |
| Driven by— | | | |
| Electricity generated in same works | 106.8 | 41.1 | } (not ascertained.)* |
| Purchased electricity | 210.5 | 17.9 | |
| TOTAL | 317.3 | 59.0 | .. |

* The total amount of electrical energy recorded as purchased for all purposes in 1907 was 13,564,000 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 40,000,000 Board of Trade units.

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 for goods or structures, 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 Clay, Stone, etc., and Building and Contracting Trades in 1924.

| Trade. | Prime movers. | | Electric generators. | | Electric motors. | |
|---|--|-------------------------------|--|-------------------------------|--|-------------------------------|
| | (a) Ordinarily in use ; (b) not in use. | Percentage not in use.* | (a) Ordinarily in use ; (b) not in use. | Percentage not in use.* | (a) Ordinarily in use ; (b) not in use. | Percentage not in use.* |
| | Th. H.P. | | Th. Kw. | | Th. H.P. | |
| Brick and Fireclay.. | (a) 124.3 | } 5.8 | (a) 5.7 | } 13.4 | (a) 36.2 | } 8.7 |
| | (b) 7.7 | | (b) 0.9 | | (b) 3.4 | |
| China and Earthen- ware | (a) 30.4 | } 9.5 | (a) 3.2 | } 25.8 | (a) 12.9 | } 9.2 |
| | (b) 3.2 | | (b) 1.1 | | (b) 1.3 | |
| Cement | (a) 73.3 | } 19.0 | (a) 32.0 | } 25.8 | (a) 64.7 | } 11.7 |
| | (b) 17.1 | | (b) 11.1 | | (b) 8.6 | |
| Glass, Building Ma- terials, etc. .. | (a) 38.4 | } 20.7 | (a) 13.1 | } 29.0 | (a) 69.2 | } 11.9 |
| | (b) 10.0 | | (b) 5.4 | | (b) 9.3 | |
| Engine and Boiler Packing, etc. .. | (a) 3.8 | } 36.7 | (a) 0.7 | } 62.2 | (a) 8.2 | } 13.1 |
| | (b) 2.3 | | (b) 1.3 | | (b) 1.3 | |
| Manufactured Abra- sives | (a) 1.0 | } 33.2 | (a) 0.3 | } 40.9 | (a) 2.0 | } 15.0 |
| | (b) 0.5 | | (b) 0.2 | | (b) 0.3 | |
| Building and Con- tracting | (a) 91.1 | } 11.1 | (a) 3.6 | } 14.8 | (a) 89.7 | } 10.2 |
| | (b) 11.4 | | (b) 0.6 | | (b) 10.2 | |
| TOTAL | (a) 362.3 | } 12.6 | (a) 58.6 | } 26.0 | (a) 282.9 | } 10.8 |
| | (b) 52.2 | | (b) 20.6 | | (b) 34.4 | |

* Based in each case upon the actual figures returned.

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 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 in that year was not ascertained.

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 Clay, Stone, etc., and Building and Contracting 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. |
| Brick and Fireclay | 122.2 | 39.7 | 161.9 | 2.5 |
| China and Earthenware .. . | 27.2 | 14.2 | 41.4 | 0.6 |
| Cement | 30.2 | 73.3 | 103.5 | 8.3 |
| Glass, Building Materials, etc. . . | 23.2 | 78.5 | 101.7 | 1.8 |
| Engine and Boiler Packing, etc. . . | 3.2 | 9.4 | 12.6 | 2.2 |
| Manufactured Abrasives .. . | 0.8 | 2.3 | 3.1 | 1.9 |
| Building and Contracting .. . | 96.2 | 99.9 | 196.1 | 0.4 |
| TOTAL | 303.0 | 317.3 | 620.3 | 0.9 |

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, for manufacturing purposes, etc. Firms whose aggregate net output was 47.7 per cent. of the net output of all firms in the Clay, Stone, etc., and Building and Contracting Trades 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. 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 63.9 per cent. of the capacity of all the prime movers (not hydraulic) in use in the group, 54.1 per cent. of the capacity (in use) of the electric generators, and 56.8 per cent. of that of the electric motors driven by purchased electricity. The proportion of the trade for which particulars were furnished also varied greatly 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 72.7 per cent. of the net output of the group as a whole, and they recorded a consumption of 5,717,000 tons of coal and 764,000 tons of coke. The consumption recorded in 1924 by firms representing 47.7 per cent. of the net output of the group, included 5,153,600 tons of coal and 384,600 tons of coke.

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, for manufacturing processes, 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 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 Clay, Stone, etc., and Building and Contracting 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 manufacturing processes, 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. |
| Brick and Fireclay .. . | (a) 549.7 | 16.0 | 118.8 | 65.8 | 232.3 |
| | (b) 1,442.9 | 50.9 | 158.4 | 254.7 | 267.7 |
| | (c) 262.5 | 8.5 | 28.7 | 41.1 | 30.9 |
| (1) 62.5; (2) 61.2. | (a) 205.7 | * | 15.3 | 11.4 | 204.8 |
| China and Earthenware .. . | (b) 638.4 | 18.1 | 2.7 | 110.7 | 313.6 |
| | (c) 106.2 | 3.8 | 7.9 | 1.8 | 213.9 |
| | (1) 67.5; (2) 70.4. | (a) 329.5 | 3.1 | 240.8 | 10.8 |
| Cement | (b) 941.4 | 199.3 | 16.0 | 37.9 | 13.2 |
| | (c) 42.6 | — | — | 28.8 | 0.6 |
| | (1) 83.8; (2) 92.8. | (a) 31.2 | 1.5 | 1,534.4 | 40.4 |
| Glass, Building Materials, etc. . . | (b) 410.5 | 46.3 | 6,308.1 | 199.2 | 13,744.4 |
| | (c) 49.5 | 6.5 | 670.7 | 20.4 | 193.2 |
| | (1) 47.0; (2) 33.3. | (a) 4.7 | 0.2 | 349.9 | 4.4 |
| Engine and Boiler Packing, etc. . . | (b) 16.0 | 1.2 | 0.3 | 15.8 | 71.7 |
| | (c) 0.2 | — | † | — | 7.6 |
| | (1) 83.3; (2) 85.2. | (a) 4.4 | — | — | 26.9 |
| Manufactured Abrasives .. . | (b) 6.3 | 1.0 | — | 2.6 | 48.9 |
| | (c) — | — | — | — | — |
| | (1) 77.0; (2) 91.2. | (a) 77.1 | 9.1 | 63.6 | 576.0 |
| Building and Contracting .. . | (b) 26.3 | 18.1 | 58.9 | 2,384.0 | 1,760.2 |
| | (c) 8.5 | 1.0 | 2.8 | 73.7 | 32.0 |
| | (1) 40.5; (2) 54.1. | (a) 1,202.3 | 29.9 | 2,322.8 | 708.8 |
| ALL TRADES .. . | (b) 3,481.8 | 334.9 | 6,544.4 | 3,004.9 | 16,219.7 |
| | (c) 469.5 | 19.8 | 710.1 | 165.8 | 478.2 |
| | (1) 47.7; (2) 63.9. | (a) 1,202.3 | 29.9 | 2,322.8 | 708.8 |
| GRAND TOTAL (ALL PURPOSES) .. . | 5,153.6 | 384.6 | 9,577.3 | 3,879.5 | 19,341.3 |

* 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.

In some of the trades in this group, 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), 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 summarised in the preceding table, were as follows:—

Special consumption of fuel (so far as returned).

| Trade. | Coal and slack. | Coke and breeze. | Heavy oils. | Light oils. | Gas* purchased. |
|---|-----------------|------------------|-------------|-------------|-----------------|
| | Th. tons. | Th. tons. | Th. galls. | Th. galls. | Th. therms. |
| Brick and Fireclay (at kilns or ovens) | 1,414·0 | 49·6 | 153·5 | 117·7 | 185·8 |
| China and Earthenware (at kilns or ovens) | 624·8 | 15·1 | 1·5 | 32·4 | 29·3 |
| Cement (at kilns) | 924·8 | 197·7 | 1·7 | 2·7 | — |
| Glass, Building Materials, etc. (at furnaces and tar boilers) | 396·4 | 30·9 | 6,298·9 | 2·4 | 12,373·6 |
| Manufactured abrasives (at furnaces, forges, etc.) | 6·1 | 0·9 | — | — | 19·5 |

* See footnote (‡) to preceding table.

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 191 is due primarily to the quantities of fuel consumed for which no particulars of purpose could be specified by the firms that furnished information. The following table shows these quantities as percentages of the total of each class of fuel consumed in the more important trades in the group and for the group as a whole:—

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. |
| Brick and Fireclay | 11·6 | 11·2 | 9·4 | 11·4 | 5·8 |
| China and Earthenware | 11·2 | 17·3 | 30·6 | 1·4 | 29·2 |
| Cement | 3·2 | * | — | 37·2 | 4·8 |
| Glass, Building Materials, etc. | 10·1 | 11·9 | 7·9 | 7·9 | 1·4 |
| Building and Contracting | 7·6 | 3·8 | 2·2 | 2·4 | 0·9 |
| ALL TRADES | 9·1 | 5·2 | 7·4 | 4·3 | 2·5 |

* Negligible.

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. The table on page 191 also shows that the firms that furnished information represented varying proportions of the several trades, and only in three of the trades was this proportion, as measured by net output, over 70 per cent. Even in these cases, however, it cannot 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 35,980,000 units of electricity were generated in establishments with dynamos of 17,908 kilowatt capacity, equivalent to 91·0 per cent. of the total capacity of 19,672 kilowatts in the trades as a whole. In 1924, firms with generators (in use) of 31,800 kilowatt capacity (54·1 per cent. of the group total) recorded an aggregate of 134,261,000 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 over 13,550,000 units purchased for all purposes. In 1924 the information received showed that over 104,000,000 units were purchased by firms owning 56·8 per cent. of the electric motors (in use) driven by purchased electricity. While the 1924 figures form an inadequate basis for general estimates covering the entire group, they show clearly that a very large increase in the use of electrical energy took place in these trades.

The table on page 194 summarises the detailed information received from firms in the Clay, Stone, etc., and Building and Contracting 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 190 to 192 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. |
| Brick and Fireclay | 19·9 | 4·9 |
| China and Earthenware | 29·1 | 20·3 |
| Cement | 38·4 | 50·3 |
| Glass, Building Materials, etc. | 33·5 | 23·7 |
| Engine and Boiler Packing, etc. | 13·6 | 33·9 |
| Manufactured Abrasives | 0·7 | 100·0 |
| Building and Contracting | 6·5 | 17·1 |
| ALL TRADES | 27·0 | 46·9 |

Reference to the table on page 194 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, in most cases, 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 undertakings 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 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 Clay, Stone, etc., and Building and Contracting 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 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 and for manufacturing processes, 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. | Th. B.T. units. | B.T. units. | Th. H.P. | Th. B.T. units. | Th. H.P. |
| Brick and Fireclay .. <i>(1) 13.1; (2) 54.4.</i> | 0.8 | (a) 1,716 (b) 356 (c) 106 | 2,916 | 3.6 | (a) 11,229 (b) 665† (c) 2,964 | 15.9 |
| China and Earthenware .. <i>(1) 40.6; (2) 54.8.</i> | 1.3 | (a) 4,224 (b) 1,962 (c) 1,576 | 5,938 | 1.9 | (a) 3,691 (b) 276 (c) 1,630 | 5.7 |
| Cement .. <i>(1) 83.8; (2) 69.6.</i> | 26.8 | (a) 47,413 (b) 11,680‡ (c) 59,872 | 4,442 | 44.5 | (a) 18,833 (b) 284 (c) 11,893 | 12.6 |
| Glass, Building Materials, etc. .. <i>(1) 3.1; (2) 52.0.</i> | 0.4 | (a) 643 (b) 126 (c) 239 | 2,455 | 1.0 | (a) 18,273 (b) 1,122§ (c) 9,775 | 19.2 |
| Engine and Boiler Packing, etc. .. <i>(1) 92.4; (2) 79.3.</i> | 0.7 | (a) 1,505 (b) 57 (c) 801 | 3,365 | 1.6 | (a) 4,399 (b) 89 (c) 706 | 5.3 |
| Manufactured Abrasives <i>(1) 14.5; (2) 79.0.</i> | * | (a) — (b) — (c) 99 | 2,250 | 0.2 | (a) 843 (b) 39 (c) 6 | 1.2 |
| Building and Contracting .. <i>(1) 49.7; (2) 55.1.</i> | 1.8 | (a) 923 (b) 640 (c) 323 | 1,065 | 1.7 | (a) 13,942 (b) 2,259 (c) 1,119 | 46.6 |
| ALL TRADES .. <i>(1) 54.1; (2) 56.8.</i> | 31.8 | (a) 56,424 (b) 14,821 (c) 63,016 | 4,227 | 54.5 | (a) 71,210 (b) 4,734 (c) 28,093 | 106.5 |

* Less than 50 kw.

† Of this quantity, 390,000 units were used at kilns or ovens.

‡ Of this quantity, 10,185,000 units were used at kilns or ovens.

§ Of this quantity, 38,000 units were used at furnaces and tar boilers.

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