PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS.

PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS.

GENERAL REPORT.

Contents.

Introductory.

The following general report deals with the productive operations of gas, electricity and water undertakings, railway, tramway and light railway companies, canal, dock and harbour companies, local and other public authorities (in so far as their activities have not already been dealt with in the preceding services) and Government departments.

Each of the services 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 individual reports.

Principal results for 1924.

The number of separate returns received from companies, undertakings, etc., in the Public Utility Services and Government Departments group in 1924 was 5,688. Returns were not obtained from certain small authorities that employed little or no direct labour, but the absence of these returns is believed to have no material effect on the uses made of the figures in this general report.

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

Public Utility Services and Government Departments. Output in 1924.

Public Utility Services and Government Departments.	Gross output (value of work done and selling value of goods made). (1)	Cost of materials used. (2)	Net output (excess of col. (1) over col. (2)). (3)	Persons employed. (4)	Net output per person employed. (5)
	£'000	£'000	£'000	Number.	£
Gas Undertakings	65,583	35,507	30,076	110,661	272
Electricity Undertakings ..	43,510	17,390	26,120	50,893	513
Waterworks Undertakings ..	20,844	4,192	16,652	32,541	512
Railway Companies ..	71,414	27,859	43,555	250,829	174
Tramway and Light Railway Companies	1,639	737	902	6,226	145
Canal, Dock and Harbour Companies	875	267	608	4,106	148
Local Authorities	58,068	26,111	31,957	199,342	160
TOTAL—Public Utility Services	261,933	112,063	149,870	654,598	229
Admiralty	13,577	4,953	8,624	47,159	183
War Office	4,133	1,426	2,707	13,473	201
General Post Office	11,177	3,752	7,425	31,934	233
Other Government Departments*	1,406	254	1,152	6,044	191
TOTAL—Government Departments	30,293	10,385	19,908	98,610	202
TOTAL FOR UNITED KINGDOM —PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS	292,226	122,448	169,778	753,208	225
England and Wales†‡ ..	262,870	111,198	151,672	673,929§	225
Scotland†	25,962	9,954	16,008	68,447	234
Northern Ireland†	3,394	1,296	2,098	10,832	194

* H.M. Office of Works, H.M. Stationery Office, Air Ministry, Ordnance Survey Department and Lighthouse Authorities.

† In order to avoid the possible disclosure of information relating to individual companies, the particulars relating to Water Companies in Scotland and to Canal, Dock and Harbour Companies in Scotland and Northern Ireland have been combined with those for England and Wales.

‡ The figures for England and Wales contain particulars regarding Army Ordnance Workshops in Northern Ireland, Jersey and Guernsey, not given separately (see page 421).

§ Including employees in Scotland of H.M. Office of Works, not given separately (see page 435).

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 Census of 1912 did not cover building and contracting work, whether carried out by Local Authorities, railway companies, etc., employing direct labour, or by builders and contractors. The omission of such work from the 1912 results has an appreciable effect on their comparability with those for the other two censal years and the 1907 figures only are, therefore, 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 gross output of the Public Utility Services and Government Departments in that country was valued at nearly £6,600,000 and the number of persons employed was about 28,100, that is to say, about $2\frac{1}{4}$ per cent. of the gross output and about $3\frac{3}{4}$ per cent. of the total number of persons employed, as returned for the 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.

The difficulty of finding a satisfactory basis on which to compare production in different trades in the same year, or in any trade or trades in different years, has already been discussed in the general reports on other groups of trades. The conclusion reached was that a factor which took account of differences in the numbers of persons employed and the continuity of their work, was provided by the net output per head, and that this constituted the best available basis of comparison, though not an entirely satisfactory one.

In the present group, the limitations to which the use of net output per head is normally subject are accentuated by the different methods of output valuation adopted in the various industries and services that make up the group. On the one hand, the productive services carried out by employees of railway companies, tramway and light railway companies, canal, dock and harbour companies, Local Authorities and Government Departments were valued at cost, i.e., at a sum calculated to cover the cost of labour and materials, together with such proportion of the general establishment charges as was properly applicable to the service concerned. The element of profit is, therefore, absent from the value both of the gross output and of the net output. On the other hand, the gross output value

of gas and electricity undertakings, whether controlled by companies or by Local Authorities, represented, in the main, the selling value of the gas and electricity supplied and included the profits derived from their sale ; and in the case of water undertakings, the revenues of which are frequently obtained by the levy of a rate on the annual value of the premises served, the receipts for water supplied may not invariably yield a profit on the year's working.

The value of constructional, alteration and repair work done by employees of gas, electricity and water undertakings was not treated as forming part of the gross output of those undertakings, since, in so far as the cost of such work was chargeable to revenue, it was, as in the case of similar work done by employees of private manufacturing firms, contained in the selling value of the products sold. The cost of materials, as returned by these undertakings, included, however, the cost of the materials used in the work of construction, alteration and repair and was, therefore, overstated relatively to the gross output value in so far as those materials were used in work of new construction. The effect was to reduce, by a similar amount, the net output value for each of these industries.

The above considerations, largely or entirely absent from other groups of trades, render the net output per head still less satisfactory as a basis for comparison in the present group than for general use, and should be especially borne in mind in comparing production in any of the above industries or services with that in other trades. On the other hand, since a similar method of valuing the net output of these industries and services was followed in each Census, the figures of net output per head for 1924 and 1907 may be regarded as comparable.

Net output per head in 1924 *and* 1907.—The following table shows, for 1924 and 1907, the net output per head of persons employed in each of the industries and services in the Public Utility group :—

Net output per head of persons employed.

Public Utility Services and Government Departments.	1924.	1907.
	£	£
Gas Undertakings	272	211
Electricity Undertakings	513	253
Waterworks Undertakings	512	411
Railway Companies	174	71
Tramway and Light Railway Companies	145	68
Canal, Dock and Harbour Companies	148	79
Local Authorities	160	64
Public Utility Services	229	109
Admiralty	183	92
War Office	201	96
General Post Office	233	65
Other Government Departments	191	94
Government Departments	202	87
PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS	225	107

For the group as a whole the net output per person employed increased from £107 in 1907 to £225 in 1924, or by 110 per cent. The increase for Public Utility Services was from £109 in 1907 to £229 in 1924, or 110 per cent., and for Government Departments, from £87 in 1907 to £202 in 1924, or 132 per cent.

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 Public Utility Services and Government Departments in the week ended 18th October, 1924 :—

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

Public Utility Services and Government Departments.	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.
Gas Undertakings	3·1	93·5	*	0·9	802	16,094	149	1,819
Electricity Undertakings	1·2	43·1	*	0·2	465	8,170	93	1,253
Waterworks Undertakings	0·4	26·7	*	0·2	158	5,020	17	400
Railway Companies	8·7	237·5	0·4	2·1	489	11,298	134	1,226
Tramway and Light Railway Companies	0·2	5·5	*	*	33	424	6	83
Canal, Dock and Harbour Companies	0·1	3·9	—	*	3	206	—	9
Local Authorities	2·8	187·1	*	0·4	319	9,852	36	636
TOTAL—Public Utility Services	16·5	597·3	0·4	3·8	2,269	51,064	435	5,426
Admiralty	1·2	43·9	*	0·4	59	2,770	7	143
War Office	0·8	11·6	0·1	1·2	57	1,013	33	202
General Post Office	1·1	27·1	*	0·2	167	4,545	20	200
Other Government Departments	0·1	4·5	0·1	0·4	10	555	2	82
TOTAL — Government Departments	3·2	87·1	0·2	2·2	293	8,883	62	627
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS	19·7	684·4	0·6	6·0	2,562	59,947	497	6,053

* Less than 50.

The proportion of female operatives employed in the group as a whole was less than 1 per cent.; in the Public Utility group the proportion was just over ½ per cent. and in Government Departments about 2½ per cent.

Monthly fluctuations in employment.—In order to ascertain what fluctuations in employment there might be in the course of the censal year, the actual numbers of the operative staff employed in one week in each month were required to be stated. The figures for each of the industries and services in this group are shown in the respective reports (with the exception of some of the less important Government Departments), and the following table gives the monthly aggregates for the group as a whole :—

Operative staff in Public Utility Services and Government Departments in 1924.

Week ended	Males.	Females.	Total.
12th January	671,362	5,820	677,182
16th February	677,467	5,775	683,242
15th March	681,026	5,840	686,866
12th April	676,191	5,969	682,160
17th May	680,677	6,070	686,747
21st June	683,824	6,055	689,879
19th July	682,971	6,015	688,986
16th August	681,924	5,943	687,867
13th September	681,766	6,021	687,787
18th October	684,370	6,005	690,375
15th November	684,947	6,005	690,952
13th December	688,463	5,994	694,457
AVERAGE FOR THE 12 MONTHS	681,249	5,959	687,208

Apart from a reduction in April and the usual falling-off in the months of July, August and September, employment increased slowly throughout the year, the total number employed in December being 17,275 greater than in January.

Variations in the numbers of male operatives employed conformed to the movement in the totals of both sexes; but, for females, the variations were somewhat irregular and the highest number was recorded for May.

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 Public Utility Services and Government Departments in the two censal years. The average numbers shown in this table and in the table on page 298 have been determined in the manner explained in Note (18) on page xi.

Average numbers employed in 1924 *and* 1907 *in Public Utility Services and Government Departments.*

Public Utility Services and Government Departments.		Operatives (wage-earners).		Administrative, technical and clerical staff (salaried persons).		Total.
		Males.	Females.	Males.	Females.	
Gas Undertakings	1924	91,896	852	16,094	1,819	110,661
	1907	*74,650*	*234*	*8,464*	*92*	*83,440*
Electricity Undertakings	1924	41,211	259	8,170	1,253	50,893
	1907	*18,717*	*107*	*3,710*	*84*	*22,618*
Waterworks Undertakings	1924	26,891	230	5,020	400	32,541
	1907	*18,448*	*83*	*3,535*	*38*	*22,104*
Railway Companies	1924	236,272	2,033	11,298	1,226	250,829
	1907	*231,250*	*1,790*	*8,772*	*28*	*241,840*
Tramway and Light Railway Companies	1924	5,692	27	424	83	6,226
	1907	*4,220*	*3*	*261*	*13*	*4,497*
Canal, Dock and Harbour Companies	1924	3,890	1	206	9	4,106
	1907	*6,981*	*5*	*360*	*1*	*7,347*
Local Authorities	1924	188,461	393	9,852	636	199,342
	1907	*174,912*	*733*	*9,523*	*118*	*185,286*
TOTAL—Public Utility Services	1924	594,313	3,795	51,064	5,426	654,598
	1907	*529,178*	*2,955*	*34,625*	*374*	*567,132*
Admiralty	1924	43,871	375	2,770	143	47,159
	1907	*29,599*	*286*	*1,118*	*1*	*31,004*
War Office	1924	11,109	1,149	1,013	202	13,473
	1907	*13,180*	*1,653*	*1,492*	*17*	*16,342*
General Post Office	1924	26,991	198	4,545	200	31,934
	*1907**	*14,592*	*151*	*2,491*	*2*	*17,236*
Other Government Departments	1924	4,965	442	555	82	6,044
	1907	*1,483*	*135*	*196*	*10*	*1,824*
TOTAL — Government Departments	1924	86,936	2,164	8,883	627	98,610
	1907	*58,854*	*2,225*	*5,297*	*30*	*66,406*
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS	1924	681,249	5,959	59,947	6,053	
	1907	*588,032*	*5,180*	*39,922*	*404*	
TOTALS	1924	687,208		66,000		753,208
	1907	*593,212*		*40,326*		*633,538*

* Including the National Telephone Company.

The total numbers employed in the group increased between 1907 and 1924 by 119,670, or 18·9 per cent.; for Public Utility Services as a whole the increase was 87,466, or 15·4 per cent.; and for Government Departments as a whole, 32,204, or 48·5 per cent. The largest absolute increase was recorded for Electricity Undertakings and represented an expansion by 125 per cent. A falling-off took place in the numbers employed by Canal, Dock and Harbour Companies (44 per cent.) and by the War Office (18 per cent.).

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 1924 and 1907 in Public Utility Services and Government Departments :—

Average numbers employed in Public Utility Services and Government Departments in 1924 *and* 1907.

Sex and age.	1924.		1907.*	
	Operative staff.	Total staff.	Wage earners.	Total staff.
Males :—				
Under 18	19,498	22,060	21,536	23,584
Over 18	661,751	719,136	566,496	604,370
TOTAL	681,249	741,196	588,032	627,954
Females :—				
Under 18	589	1,086	309	330
Over 18	5,370	10,926	4,871	5,254
TOTAL	5,959	12,012	5,180	5,584
Males and females :—				
Under 18	20,087	23,146	21,845	23,914
Over 18	667,121	730,062	571,367	609,624
TOTAL	687,208	753,208	593,212	633,538

* Including the National Telephone Company.

Sex and age distribution of operatives.—Labour in the Public Utility Services and Government Departments group was almost exclusively male in both years. The total number of operatives employed in the group increased between 1907 and 1924 by 93,996, or 14·8 per cent. The number of male operatives under 18 decreased by 2,038 while the number of female operatives under 18 increased by 280, the net effect being a reduction in the total of operatives under 18 of 1,758, or 8·0 per cent. Increased employment was recorded in the other classes of operatives shown in the table.

The proportion of young persons employed in 1924 was 2·9 per cent. of the total operative staff, as compared with 3·7 per cent. in 1907.

Administrative, technical and clerical staff.—The increase in the number of administrative, technical and clerical staff in 1924 over the number of salaried persons in 1907 was 25,674, or 63·7 per cent. Of this increase, males accounted for 20,025 and females for 5,649.

The proportion of males in the administrative staff in 1924 was 91 per cent., and of females, 9 per cent., as compared with 99 per cent. and 1 per cent. respectively in 1907.

The proportion of administrative, etc., staff to the total employed increased in the case of Electricity Undertakings from 16·8 per cent. in 1907 to 18·5 per cent. in 1924, and in the case of Gas Undertakings from 10·3 per cent. in 1907 to 16·2 per cent. in 1924. For other enterprises included in the sub-group of Public Utility Services the increase was from 4·9 per cent. in 1907 to 5·9 per cent. in 1924, and for the productive operations of Government Departments from 8·0 per cent. in 1907 to 9·6 per cent. in 1924.

Wages in 1924.

Separate information regarding the total amount of wages paid to employees engaged in the productive operations of the various Public Utility Services and Government Departments are not available from the particulars obtained by the Ministry of Labour in the enquiry undertaken by that Department into wages and hours of labour in the United Kingdom in 1924.

Mechanical Power.

Power equipment 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. A portion, large or small according to circumstances, 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 establishments derive part or all of their power from electricity purchased and used for driving electric motors.

Power equipment in 1924 *and* 1907.—The particulars furnished at the two Censuses regarding prime movers and (except for certain Public Utility Services in 1907) electric generators in this group are shown in the following table. Particulars of electric motors were not obtained in 1907, and particulars relating to 1924 only can be given.

In connexion with the omission of the Irish Free State from the 1924 Census (see page 293), 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 Public Utility Services and Government Departments group in

that year was 71,200 horse-power (including Electricity Undertakings), which is about 1·1 per cent. of the total recorded for the United Kingdom in 1924; and the capacity of the electric motors driven by purchased electricity was 6,000 horse-power,* or about 2·3 per cent. of the United Kingdom figure for 1924. The effect on comparisons with the earlier Census of the absence of the Irish Free State from that of 1924 is, therefore, not important.

Power equipment of Public Utility Services and Government Departments.

Public Utility Services and Government Departments.	Prime movers.		Electric generators.	
	1924.	1907.	1924.	1907.
	Thousand H.P.		Thousand Kw.	
Gas Undertakings	171·3	89·9	24·8	*
Electricity Undertakings	5,609·6	1,560·1	4,041·3	1,020·3
Waterworks Undertakings	179·7	138·1	2·7	*
Railway Companies	324·4	273·3	164·9	85·2
Tramway and Light Railway Companies	0·1	‡	†	‡
Canal, Dock and Harbour Companies	7·4	19·5	0·6	0·9
Local Authorities	184·5‖	192·6‖	3·4	*
TOTAL—Public Utility Services. (Excluding Electricity Undertakings)	867·4	713·4	196·4	86·1
TOTAL—Public Utility Services. (Including Electricity Undertakings)	6,477·0	2,273·5	4,237·7	1,106·4
Admiralty	94·8	64·6	36·2	13·2
War Office	20·2	12·8	14·1	1·7
General Post Office	5·0	7·9	2·5	3·4
Other Government Departments	9·4	0·3	5·7	—
TOTAL—Government Departments§	129·4	85·6	58·5	18·3
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS. (Excluding Electricity Undertakings§)	996·8	799·0	254·9	104·4
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS. (Including Electricity Undertakings)	6,606·4	2,359·1	4,296·2	1,124·7

* Not ascertained.

† Less than 50 kw.

‡ The power equipment used for purposes other than traction was not ascertained for 1907.

§ Including the power equipment of electricity undertakings controlled by the Admiralty, the War Office and the General Post Office. The particulars so included for 1924 are as follows :—

	Prime movers.	*Electric generators.*
	Th. H.P.	Th. Kw.
Admiralty	45·8	32·7
War Office	5·5	3·8
General Post Office	5·0	2·5
Total	56·3	39·0

Corresponding information for 1907 is not available.

‖ Including road rollers, dredgers, etc.

* Includes motors of a capacity of 2,700 horse-power, for which the source of the current was not distinguished.

Public Utility Services and Government Departments.	1924. Electric motors driven by electricity generated in same works.	1924. Electric motors driven by purchased electricity.	1924. All electric motors.
	Th. H.P.	Th. H.P.	Th. H.P.
Gas Undertakings	38·5	17·2	55·7
Electricity Undertakings	270·2	9·5	279·7
Waterworks Undertakings	4·6	20·2	24·8
Railway Companies	85·0	52·7	137·7
Tramway and Light Railway Companies	—	3·2	3·2
Canal, Dock and Harbour Companies	0·2	9·4	9·6
Local Authorities	9·6	40·3	49·9
TOTAL—Public Utility Services. (Excluding Electricity Undertakings)	137·9	143·0	280·9
TOTAL—Public Utility Services. (Including Electricity Undertakings)	408·1	152·5	560·6
Admiralty	10·1	97·5	107·6
War Office	32·3	11·4	43·7
General Post Office	0·4	0·3	0·7
Other Government Departments	8·1	2·7	10·8
TOTAL—Government Departments	50·9*	111·9	162·8
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS (Excluding Electricity Undertakings)	188·8	254·9	443·7
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS (Including Electricity Undertakings)	459·0	264·4	723·4

* Including motors installed at electricity undertakings controlled by the Admiralty (3,300 horse-power) and the General Post Office (400 horse-power)

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.	Electric motors driven by: Purchased electricity.
	Th. H.P.	Th. Kw.	Th. H.P.	Th. H.P.
England and Wales*†	5,846·7	3,803·1	417·8	216·2
Scotland*	680·4	447·3	36·9	47·5
Northern Ireland*	79·3	45·8	4·3	0·7
TOTAL	6,604·6	4,296·2	459·0	264·4

* See footnote (†) to table on page 292.

† See footnote (‡) to table on page 292.

Classification of power equipment in 1924 *and* 1907.—The next table, which relates to the power equipment of all the services in the group 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 works.

Power equipment.	1924. Excluding Electricity Undertakings.†	1924. Including Electricity Undertakings.	1907.* Excluding Electricity Undertakings.†	1907.* Including Electricity Undertakings.
	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.
PRIME MOVERS :—				
Reciprocating steam engines ..	582·1	1,094·7	652·1	1,765·9
Steam turbines	232·1	5,210·2	40·6	462·7
Gas and oil engines	138·3	242·0	63·2	77·7
Water power	3·4	18·6	19·2	28·9
Other	40·9	40·9	23·9	23·9
TOTAL	996·8	6,606·4	799·0	2,359·1
ELECTRIC GENERATORS :—	Th. Kw.	Th. Kw.	Th. Kw.	Th. Kw.
Driven by—				
Reciprocating steam engines..	74·2	422·7	73·3	782·6
Steam turbines	151·9	3,766·4	24·3	318·5
Gas and oil engines	28·3	96·8	6·8	23·6
Water power	0·5	10·3		
Other prime movers	—	—		
TOTAL	254·9	4,296·2	104·4	1,124·7
ELECTRIC MOTORS :—	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.
Driven by—				
Electricity generated in same works	188·8	459·0	(not ascertained‡)	
Purchased electricity	254·9	264·4		
TOTAL	443·7	723·4	..	..

* See footnotes (*) and (‡) to table on page 300.

† But including those controlled by the Admiralty, War Office and General Post Office. The power equipment of these undertakings in 1924 was as follows :—

Prime movers :—	H.P.
Reciprocating steam engines	12,900
Steam turbines	43,400
Electric generators :—	Kw.
Driven by reciprocating steam engines	9,200
Driven by steam turbines	29,800
Electric motors :—	H.P.
Driven by electricity generated in same works ..	3,700

Corresponding information for 1907 is not available.

‡ The quantity of electricity purchased and generated for all purposes in 1907 by Government Departments was 18,557,000 Board of Trade units (kilowatt-hours) and the quantity purchased and generated in 1907 by Public Utility Services (other than Gas and Water Undertakings and Local Authorities from which such information was not required) and used for all purposes except traction and general supply was probably in the neighbourhood of 200,000,000 Board of Trade units.

Power equipment in use and not in use in 1924.—The Census of 1924 required a distinction to be made 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 description "in reserve or idle" was intended to cover engines, generators and motors normally held in reserve against a breakdown or other emergency as well as those that were out of operation through lack of need of their services and those that 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 1924.

Public Utility Services and Government Departments.	Prime movers. (a) Ordinarily in use; (b) not in use.	Prime movers. Percentage not in use.*	Electric generators. (a) Ordinarily in use; (b) not in use.	Electric generators. Percentage not in use.*	Electric motors. (a) Ordinarily in use; (b) not in use.	Electric motors. Percentage not in use.*
	Th. H.P.		Th. Kw.		Th. H.P.	
Gas Undertakings ..	(a) 127·5	25·6	17·9	28·1	46·8	16·0
	(b) *43·8*		*6·9*		*8·9*	
Waterworks Undertakings	(a) 132·6	26·2	2·2	17·8	15·0	39·5
	(b) *47·1*		*0·5*		*9·8*	
Railway Companies	(a) 283·4	12·6	137·9	16·3	129·8	5·7
	(b) *41·0*		*27·0*		*7·9*	
Tramway and Light Railway Companies	(a) 0·1	—	†	—	3·0	7·3
	(b) —		—		*0·2*	
Canal, Dock and Harbour Companies	(a) 5·7	23·4	0·6	2·3	9·5	0·5
	(b) *1·7*		†		*0·1*	
Local Authorities ..	(a) 177·4	3·9	2·9	13·6	45·3	9·2
	(b) *7·1*		*0·5*		*4·6*	
TOTAL—Public Utility Services other than Electricity Undertakings.	(a) 726·7	16·2	161·5	17·7	249·4	11·2
	(b) *140·7*		*34·9*		*31·5*	
Admiralty	(a) 43·2	11·9	1·9	45·1	97·3	6·7
	(b) *5·8*		*1·6*		*7·0*	
War Office	(a) 6·8	53·0	4·9	52·6	30·6	30·2
	(b) *7·8*		*5·4*		*13·1*	
General Post Office	(a) —	—	—	—	0·3	7·8
	(b) —		—		‡	
Other Government Departments.	(a) 8·8	6·8	5·4	7·0	10·1	5·9
	(b) *0·6*		*0·3*		*0·7*	
TOTAL — Government Departments except Electricity Undertakings ..	(a) 58·8	19·5	12·2	37·8	138·3	13·1
	(b) *14·2*		*7·3*		*20·8*	
Electricity Undertakings.						
Companies and Local Authorities ..	(a) 4,408·3	21·4	3181·4	21·3	239·4	14·4
	(b) 1,201·3		*859·9*		*40·3*	
Admiralty	(a) 34·3	25·1	24·5	25·1	2·4	27·8
	(b) *11·5*		*8·2*		*0·9*	
War Office	(a) 3·7	33·3	2·5	33·6	—	—
	(b) *1·9*		*1·3*		—	
General Post Office	(a) 4·0	20·0	2·0	20·0	0·2	55·2
	(b) *1·0*		*0·5*		*0·2*	
TOTAL — Electricity Undertakings ..	(a) 4,450·3	21·5	3,210·4	21·3	242·0	14·6
	(b) *1,215·6*		*869·9*		*41·4*	
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS—						
Other than Electricity Undertakings ..	(a) 785·5	16·5	173·7	19·5	387·7	11·9
	(b) *154·9*		*42·2*		*52·3*	
Including Electricity Undertakings ..	(a) 5,235·8	20·7	3,384·1	21·2	629·7	12·9
	(b) *1,370·6*		*912·1*		*93·7*	

* Based in each case upon the actual figures returned.

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

Power available for mechanical and electrical application in 1924.—In order to ascertain, for the various classes of services, the actual amount of power available, 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 that 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 in connexion with the efficiency of an organisation, an attempt has been made, in the case of other groups of factories or works, to provide such a measure, and a similar calculation is given below for Public Utility and other public services.

In carrying out this calculation 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 1924.

Public Utility Services and Government Departments (other than Electricity Undertakings).	Power for mechanical application.	Power for electrical application.	Total power.	Per head of average numbers of operatives employed.
	Th. H.P.	Th. H.P.	Th. H.P.	H.P.
Gas Undertakings	134·8	55·7	190·5	2·1
Waterworks Undertakings ..	175·6	24·8	200·4	7·4
Railway Companies	96·4	137·7†	234·1	1·0
Tramway and Light Railway Companies	0·1	3·2	3·3	0·6
Canal, Dock and Harbour Companies	6·4	9·6	16·0	4·1
Local Authorities	138·9*	49·9	188·8	1·0
TOTAL—Public Utility Services ..	552·2	280·9	833·1	1·5
Admiralty	44·3	104·3	148·6	3·4
War Office	0·1	43·7	43·8	3·6
General Post Office	—	0·3	0·3	0·3
Other Government Departments ..	0·8	10·8	11·6	2·1
TOTAL—Government Departments	45·2	159·1	204·3	3·3
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS	597·4	440·0	1,037·4	1·7

* Excluding road rollers, dredgers, etc. † Including generating stations.

Fuel and Electricity in 1924.

All undertakings, etc., 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 and for manufacturing processes, etc. In the present group, undertakings, etc., with an aggregate net output representing 86·1 per cent. of the total net output of the 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. 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 92·0 per cent. of the capacity of all the prime movers (not hydraulic) in use in the group, 74·7 per cent. of the capacity of the electric generators, and 86·0 per cent. of that of the electric motors driven by purchased

electricity. The proportion of each service or department for which particulars were furnished also varied considerably, as will be seen from the tables given below.

Fuel Consumption.

In 1907, when undertakings, etc., were only asked to state their consumption of coal and coke without specification of purpose, those that furnished particulars had 93 per cent. of the net output of the group as a whole, and they recorded a consumption of 21,480,000 tons of coal and 3,324,000 tons of coke for purposes other than transport. The consumption recorded in 1924 by undertakings, etc., representing 86·1 per cent. of the net output of the group, included 26,829,000 tons of coal and 4,822,000 tons of coke. The corresponding figures for works other than those of Gas and Electricity Undertakings were 2,448,000 tons of coal and 291,000 tons of coke in 1907 and 2,477,000 tons of coal and 256,000 tons of coke in 1924.

The following table summarises the information received regarding the quantities of different kinds of fuel 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 undertakings, etc., that furnished information was by no means uniform ; and, apart from this, certain quantities were reported for which no particulars of purpose could be assigned. These quantities are shown under heading (*c*) in the table.

Fuel consumed (so far as reported) in connexion with the productive work carried out by Public Utility Services and Government Departments in 1924.

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

2. The fuel consumed is, in each case, shown in the following three classes :—

(*a*) For power (driving engines) ; (*b*) for heating and lighting premises and for manufacturing processes ; (*c*) for purposes not separately distinguished.

Public Utility Services and Government Departments.		Coal and slack.	Coke and breeze.	Heavy oils.	Light oils.	Gas* purchased.
		Th. tons.	Th. tons.	Th. galls.	Th. galls.	Th. therms.
Gas Undertakings ..	(*a*)	100·7	1,279·6	—	—	—
(*1*) *96·7* ; (*2*) *95·5*.	(*b*)	17,573·4	3,172·4	47,198·6†	—	—
Electricity Undertakings	(*a*)	5,934·7	111·6	5,478·0	53·1	9,297·4
	(*b*)	11·7	2·6	—	120·3	16·2
(*1*) *84·5* ; (*2*) *91·6*.	(*c*)	731·7	—	—	0·1	2·1
Waterworks Undertakings	(*a*)	526·6	26·2	798·3	196·6	439·1
	(*b*)	21·3	5·3	17·0	260·3	262·8
(*1*) *87·9* ; (*2*) *89·5*.	(*c*)	2·6	—	—	4·9	8·9

Public Utility Services and Government Departments.		Coal and slack.	Coke and breeze.	Heavy oils.	Light oils.	Gas* purchased.
		Th. tons.	Th. tons.	Th. galls.	Th. galls.	Th. therms.
Railway Companies ..	(*a*)	795·9‡	19·3	430·3	19·5	361·3§
(*1*) *98·0* ; (*2*) *100·0*.	(*b*)	326·0	100·5	2,348·1	119·9	6,032·1§
	(*c*)	—	–	—	—	74·0
Tramway and Light Railway Companies	(*a*)	‖	—	—	0·2	2·4
	(*b*)	0·7	2·6	—	1·6	59·9
(*1*) *72·4* ; (*2*) *51·3*.	(*c*)	0·2	0·2	—	1·2	6·3
Canal, Dock and Harbour Companies ..	(*a*)	7·6	0·3	—	0·1	6·5
(*1*) *51·0* ; (*2*) *30·7*.	(*b*)	1·0	0·2	0·4	1·6	11·4
Local Authorities ..	(*a*)	285·8	15·6	59·7	400·5	111·5
(*1*) *56·6* ; (*2*) *90·4*.	(*b*)	55·3	37·4	79·3	1,101·8	373·8
	(*c*)	73·4	13·3	100·5	753·3	2,463·5
TOTAL—Public Utility Services.	(*a*)	7,651·3	1,452·6	6,766·3	670·0	10,218·2
(*1*) *85·1* ; (*2*) *91·9*.	(*b*)	17,989·4	3,321·0	49,643·4	1,605·5	6,756·2
	(*c*)	807·9	13·5	100·5	759·5	2,554·8
Admiralty	(*a*)	186·6	2·8	38·1	55·5	20·2
(*1*) *100·0* ; (*2*) *100·0*.	(*b*)	64·5	12·6	222·5	166·3	419·8
War Office	(*a*)	8·6	—	—	¶	—
(*1*) *80·6* ; (*2*) *91·0*.	(*b*)	0·6	1·3	7·3	20·0	21·4
	(*c*)	100·7	17·6	102·2	—	—
General Post Office ..	(*a*)	11·7	—	—	—	—
(*1*) *100·0* ; (*2*) *100·0*.	(*b*)	2·1	0·1	—	—	35·5
Other Government Departments.	(*a*)	1·1	—	6·0	0·3	2·2
	(*b*)	1·8	0·8	27·9	16·5	4·5
(*1*) *44·0* ; (*2*) *99·0*.	(*c*)	3·0	—	1·2	—	3·1
TOTAL—Government Departments.	(*a*)	208·0	2·8	44·1	55·8	22·4
	(*b*)	69·0	14·8	257·7	202·8	481·2
(*1*) *94·1* ; (*2*) *99·0*.	(*c*)	103·7	17·6	103·4	—	3·1
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS.	(*a*)	7,859·3	1,455·4	6,810·4	725·8	10,240·6
	(*b*)	18,058·4	3,335·8	49,901·1	1,808·3	7,237·4
(*1*) *86·1* ; (*2*) *92·0*.	(*c*)	911·6	31·1	203·9	759·5	2,557·9

* 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.

† Gas oil.

‡ Including 270,000 tons of coal used for the generation of electricity for non-productive purposes.

§ Railway Companies also generated, in their own works, 232,124,600 cubic feet of gas for power purposes and 779,053,200 cubic feet for other purposes.

‖ Less than 50 tons.

¶ Less than 50 gallons.

In addition to the fuel shown in the above table, the Railway Companies that furnished information stated that they used 13,881,500 tons of coal and 13,200 tons of coke for transport purposes.

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

Special consumption of fuel (*so far as returned*).

Public Utility Services and Government Departments.	Coal and slack.	Coke and breeze.	Heavy oils.	Light oils.	Gas* purchased.
	Th. tons.	Th. tons.	Th. galls.	Th. galls.	Th. therms.
Gas Undertakings :—					
Carbonised in retorts ..	17,482·6	—	—	—	—
Used under retorts in production of coal gas ..	35·4	2,356·0	—	—	—
Used in generators in production of water gas ..	55·4	816·4	—	—	—
In gas production ..	—	—	47,198·6†	—	—
Railway Companies :—					
At forges and foundries ..	275·4	87·5	2,233·0	119·5	2,889·2‡
Admiralty :—					
At forges, furnaces and cupolas at Dockyards and Ordnance Depots ..	5·9	9·5	213·5	2·8	204·7
Other Government Departments :—					
Under retorts for the production of oil gas for lighthouses	§	0·1	27·9†	—	—

* See footnote (*) to preceding table.

† Gas oil.

‡ Not including 560,611,400 cubic feet of gas produced by Railway Companies at their own works.

§ Less than 50 tons.

Production and Consumption of Electricity.

The following statement affords a comparison, so far as the available data permit, of the quantities of electricity consumed in 1907 and 1924 by Public Utility Services and Goverment Departments in connexion with the productive work carried out by them.

Public Utility Services and Government Departments.	1924.					1907.	
	Proportion of total.*		Electricity consumed.			Proportion of total* (*a*)	Total of electricity consumed.
	(*a*)	(*b*)	Generated in own works.	Purchased.	Total.		
	Per cent.	Per cent.	Mill. B.T.U.	Mill. B.T.U.	Mill. B.T.U.	Per cent.	Mill. B.T.U.
Electricity Undertakings	68·9	68·9	422·1	1·9	424·0	87·7†	78·6
Railway Companies ..	100·0	100·0	50·5	26·5	77·0	98·9	90·4
Other Public Utility Services and Government Departments..	77·5	85·5	46·5	72·5	119·0	100·0	47·8
			519·1	100·9	620·0		216·8

* (*a*) Based on capacity of electric generators (in use) ; (*b*) based on capacity of electric motors (in use) driven by purchased electricity.

† Based on total quantity of electricity generated and purchased.

Comparisons between the data for 1907 and 1924 are affected by the following considerations. Electricity undertakings controlled by the Admiralty, War Office and General Post Office are included with *Electricity Undertakings* in 1924 and with *Other Public Utility Services, etc.*, in 1907. The generating stations operated by certain railway companies are included with *Electricity Undertakings* in 1924, whereas all such stations are included with *Railway Companies* in 1907. Gas and water undertakings and Local Authorities are included with *Other Public Utility Services, etc.*, in 1924, but are excluded from the 1907 figures, since no information regarding electricity generated or purchased was obtained from them at the 1907 Census. Allowing for the absence of particulars regarding the latter services in 1907, it is clear that a very large increase in the use of electrical energy took place in this group between the two censal years.

The following table summarises the detailed information received from the various Public Utility Services and Government Departments regarding the consumption of electricity for productive purposes. The table does not include electricity undertakings or railway companies because the electric generators installed in such establishments were used almost entirely for the generation of electricity for public supply or for traction, and cannot, therefore, be directly related to the quantity of electricity used in productive work only.

The particulars representing the average amount of electricity generated per kilowatt capacity, as shown in column (3) of the table, exhibit a wide range of variation, doubtless corresponding to a large extent with differences in the continuity with which the electric generators were operated in the establishments of the undertakings, etc., that furnished information.

Electricity consumed (so far as reported) in connexion with the productive work carried out in 1924 by Public Utility Services and Government Departments (excluding Electricity Undertakings and Railway Companies.)

Notes.—1. The figures in italics below the name of the service or department represent respectively (*1*) the percentage of the total capacity of electric generators in use in the service or department represented by the undertakings, etc. that stated the quantity of electricity generated in their works and used for the purpose of their productive operations; and (*2*) the percentage of the total capacity of electric motors, driven by purchased electricity, in use in the service or department represented by the undertakings, etc. that stated the quantity of electricity purchased by them for use in their productive operations.

2. The electricity generated and the electricity purchased represent, in each case, the quantities used for the purposes of the productive work carried out and are shown in the following three classes: (*a*) For power (driving engines); (*b*) for heating and lighting premises, etc.; (*c*) for purposes not separately distinguished.

Public Utility Services, etc., (other than Electricity Supply Undertakings and other central stations).	Electricity generated in works of undertakings, etc., giving information.				Electricity purchased by undertakings, etc., giving information.	
	Capacity of electric generators (in use). (1)	Quantity of electricity generated. (2)	Average per kilowatt capacity of generators. (3)	Capacity of electric motors (in use) driven thereby. (4)	Quantity of electricity purchased. (5)	Capacity of electric motors (in use) driven thereby. (6)
	Th. Kw.	Million B.T. units.	B.T. units.	Th. H.P.	Million B.T. units.	Th. H.P.
Gas Undertakings .. *(1) 73·3; (2) 94·5.*	13·0	(*c*) 26·9	2,061·8	31·8	(*c*) 9·6	13·4
Waterworks Undertakings .. .. *(1) 73·6; (2) 89·6.*	1·7	(*a*) 2·2 (*b*) 0·5 (*c*) 0·3	177·1	3·8	(*a*) 17·2 (*b*) 0·3 (*c*) 0·6	10·0
Tramway and Light Railway Companies *(1) —; (2) 81·3.*	—	—	—	—	(*a*) 1·2 (*b*) 0·7 (*c*) 0·3	2·4
Canal, Dock and Harbour Companies .. *(1) 28·8; (2) 20·3.*	0·2	(*a*) — (*b*) *	263·3	—	(*a*) 0·3 (*b*) *	1·9
Local Authorities .. *(1) 48·1; (2) 63·1.*	1·4	(*a*) 0·5 (*b*) 0·5 (*c*) —	675·1	6·1	(*a*) 3·0 (*b*) 1·3 (*c*) 0·1	22·7
Admiralty† .. .. *(1) 100·0; (2) 100·0*	1·9	(*a*) 5·0 (*b*) 0·6	2,898·0	6·0	(*a*) 19·9 (*b*) 13·5	91·3
War Office† .. .. *(1) 56·3; (2) 84·7.*	4·2	(*a*) 9·2 (*b*) 0·8	2,403·0	23·7	(*a*) 3·0 (*b*) 0·4 (*c*) 0·1	5·8
General Post Office† .. *(1) 100·0; (2) 100·0.*	—	—	—	—	(*a*) 0·3 (*b*) 0·1	0·3
Other Government Departments .. .. *(1) 100·0; (2) 54·3.*	5·4	(*a*) 0·1 (*b*) —	20·3	8·1	(*a*) 0·8 (*b*) 0·1	1·1
TOTAL—PUBLIC UTILITY SERVICES AND GOVERNMENT DEPARTMENTS .. *(1) 77·5; (2) 85·5.*	27·8	(*a*) 17·0 (*b*) 2·4 (*c*) 27·2	1,676·4	79·5	(*a*) 45·7 (*b*) 16·4 (*c*) 10·7	148·9

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

† The particulars given above do not cover the central generating stations maintained by the Admiralty, the War Office and the General Post Office.

The quantities of electricity (so far as returned) used in connexion with the productive operations of electricity undertakings and railway companies in 1924 are shown in the following table:—

Electricity Undertakings and Railway Companies.		Quantity of electricity consumed.	
		Generated in own works.	Purchased.
		Million B.T. units.	Million B.T. units.
Electricity Undertakings:—			
Supply Companies and Local Authorities.. *(1) 67·2; (2) 67·2.*	(*a*)	72·3	0·3
	(*b*)	7·2	0·1
	(*c*)	338·3	1·1
Admiralty .. .. *(1) 100·0; (2) 100·0.*	(*a*)	3·0	—
	(*b*)	0·9	—
General Post Office .. .. *(1) 100·0; (2) 100·0.*	(*a*)	0·4	0·3
	(*b*)	*	0·1
Railway Companies .. .. *(1) 100·0; (2) 100·0.*	(*a*)	43·4	22·9
	(*b*)	7·0	3·7
TOTAL	(*a*)	119·1	23·5
	(*b*)	15·1	3·9
	(*c*)	338·3	1·1

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

No information was given regarding consumption of electricity at the War Office generating station.

In addition to the electricity shown above, railway companies reported that they used 460,100,000 units for transport purposes; of this quantity 243,200,000 units were generated at their own power stations and 226,900,000 units were purchased.

The total quantity of electricity generated by the power station operated by the General Post Office was 7,600,000 units and the quantity generated at the power stations maintained by the Admiralty was 71,978,000 units.

As shown on pages 335 and 339, the total amount of electricity generated at the public supply stations of Supply Companies and Local Authorities was 6,436 million units and at the generating stations of Railway Companies, 615,569,000 units.