

THE CHEMICALS, DYESTUFFS AND DRUGS TRADES.

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Introductory.*

The tables on pages 46 to 54 are based on returns received from firms in Great Britain and Northern Ireland whose business consisted wholly or mainly in the manufacture of chemicals, the distillation of tar and the manufacture or compounding of drugs and medicinal preparations. The number of such separate returns was 1,013. About 120 firms to which schedules were sent did not furnish returns, but these firms for the most part had very small establishments or had ceased manufacturing operations before the end of the censal year. On the basis of the information available it is estimated that they did not employ more than 600 persons in all and that their total net output probably did not exceed £200,000.

Summary of results.—The following statement shows the main results of the Censuses of 1924, 1912 and 1907, comparisons between the figures for the three years being subject to the qualifications mentioned in the next paragraph.

Particulars.	Unit.	1924.	1912.	1907.
Value of goods made and work done (Gross output)	£'000	56,204	28,841	24,025
Cost of materials used	"	30,768	17,534	14,448
Paid for work given out to other firms	"	11	9	9
Net output	"	25,425	11,298	9,568
Average number of persons employed	No.	69,245	61,299	52,257
Net output per person employed ..	£	367	184	183
Mechanical power available:—				
Prime movers	H.P.	168,654	117,426	110,721
Electric motors driven by purchased electricity	"	68,013	16,665	(not recorded).

Qualifications affecting comparisons.—In considering the above table and the other tables in this report which show figures for different censal years, the following qualifications should be borne in mind:—

(1) The comparability of figures relating to value or cost is affected by the changes which have taken place in the general purchasing power of money and in the duties on certain materials used in chemical manufacture, and by the doubling of the stamp duties which are included in the value of patent medicines.

(2) The Censuses of 1907 and 1912 covered Great Britain and the whole of Ireland, but that of 1924 applied only to Great Britain and Northern Ireland. The exclusion of Southern Ireland does not seriously affect the comparability of the figures

* See also the Notes on pages vii to xv.

since the total value recorded for production in the whole of Ireland in 1907 was only 5.5 per thousand of the aggregate for the United Kingdom, and according to the Census of Production taken by the Government of the Irish Free State in respect of the year 1926, the value of chemical products made in that year was returned as only £65,000.

(3) The Censuses of 1907 and 1924 extended to all firms, however small, but in 1912 firms employing not more than five persons (excluding the proprietors) were merely required to state the average number of persons employed by them in the year. According to the information so furnished, the average number of persons employed in the establishments thus excluded was 1,705, or 2.8 per cent. of the numbers employed by the remaining firms, as shown in the above table.

(4) The particulars for 1907 and 1912 cover a considerably greater proportion of the total production of perfumery (including perfumed spirits) and toilet preparations and of photographic materials, than do those for 1924, the main output of these commodities being included in the latter year in the returns relating to the Soap, Candle and Perfumery Trades (pages 104 to 120) and the Scientific Instruments and Appliances Trades (pages 426 to 440) respectively. The value of the output of perfumery, perfumed spirits and toilet preparations recorded on schedules for the Chemicals, Dyestuffs, etc., Trades was £812,000 (89 per cent. of the total) in 1907; £1,045,000 (94 per cent. of the total) in 1912; and £301,000 (10 per cent. of the total) in 1924. For photographic materials the corresponding figures were £581,000 (64 per cent.) in 1907; and £456,000 (52 per cent.) in 1912; in 1924 no production of this kind was returned on schedules for the Chemicals, etc., Trades.

Value of output and cost of materials.—The figures in the above table representing the value of goods made and work done and the cost of materials used are the aggregates of the figures recorded by the firms that made returns and, for the reasons explained in paragraphs (i) and (ii) on page xiii they overstate the value of the output of, and the cost of materials used by, the Chemicals, etc., Trades considered as a whole. The matter is discussed on pages 41 to 43, where it is estimated that the value, free from duplication, of the output of these trades in 1924 lay between £46 and £52 millions, and the cost of the materials purchased from sources outside these trades and worked up into their products lay between £21 and £27 millions.

Divisions of the industry.—It will be seen from tables appearing later in this report that the range of the schedule for the Chemicals, Dyestuffs and Drugs Trades was very wide, covering classes of production sufficiently distinct in nature from each other for their manufacture to be regarded as separate trades. The industry

includes, however, a number of important firms engaged in the manufacture of a wide range of products, and a division into its many component parts would involve much overlapping. In the following table the general aggregates given in the preceding summary are divided among the four main groups:—

- (a) Drugs and medicinal preparations.
- (b) Dyes and dyestuffs.
- (c) Other tar distillation products.
- (d) Other chemical manufactures.

The figures given for each group represent an aggregation of the returns made by firms that were wholly or mainly engaged in the class of manufactures covered by the group.

Particulars.	Unit.	Firms whose output consisted mainly of			
		Drugs and medicinal preparations.	Dyes and dyestuffs.	Other tar distillation products.	Other chemical manufactures.
Value of goods made and work done (Gross output)	£'000.	15,983	6,310	6,728	27,183
Cost of materials used	"	6,921	3,606	4,845	15,396
Paid for work given out to other firms	"	6	2	—	3
Net output	"	9,056	2,702	1,883	11,784
Average number of persons employed	No.	19,706	7,029	5,205	37,305
Net output per person employed ..	£	460	384	362	316
Mechanical power available:—					
Prime movers	H.P.	3,733	11,988	10,509	142,424
Electric motors driven by purchased electricity	"	6,698	14,102	2,962	44,251

Of the figures given above for the value of gross output in the several subdivisions, the characteristic products of those divisions account for about 77 per cent. in the case of drugs and medicaments, 93 per cent. in the case of dyes and dyestuffs, and 84 per cent. in the case of other tar distillation products, percentages which might be varied somewhat were complete details available of the goods covered by indefinite descriptions in the returns. Of the drugs and medicaments distinguished as such in the records on the Census schedules, the group of establishments represented in the first subdivision of the above table returned nearly 98 per cent. of the total value; for dyes and dyestuffs, similarly, nearly 94 per cent. of the aggregate value is represented in the second subdivision; for the other tar distillation products, with which the third subdivision is concerned, a very large part of the aggregate value was recorded in respect of coke producing establishments and gasworks, and less than 39 per cent. of the total value of such products is covered by the returns summarised in that subdivision of the table. Of the chemical products other than those with which the first

three subdivisions are concerned (apart from those that were insufficiently defined), about five-sixths of the value was recorded on schedules returned by firms in the fourth subdivision.

The following statement summarises the position:—

Group.	Value of total output of characteristic products returned by		
	Firms in the group.	Other firms in the Chemicals, etc., Trades.	Firms in other trades.
Drugs and medicinal preparations	£'000. 12,246	£'000. 74	£'000. 208
Dyes and dyestuffs	5,855	423	40
Other coal tar products (including coal tar and pitch)	5,655	451	8,567
Other chemical manufactures	20,411	1,324	2,153*

* Exclusive of ammonium sulphate returned by firms in other trades.

The figures in the first two columns in the above table do not include goods of a total value of over £6,000,000, for which specific headings were not provided in the Census schedule and which were accordingly shown under headings for miscellaneous products. A substantial proportion of these unclassified chemicals cannot be definitely allocated to any one of the four specified groups. Thus, the figures shown in the two preceding tables, while furnishing an indication of the considerable relative importance of certain outstanding branches of manufacture, cannot be used as affording an accurate analysis of the several divisions of the industry that are there indicated.

In the paragraphs which follow, the classification adopted is based on the character of the goods and is not primarily concerned with the range of activity of the establishments in which those goods were produced.

Production.

Detailed information regarding the output of the Chemicals, Dyestuffs and Drugs Trades in 1924 will be found in Table II on pages 47 to 52.

Principal products.

On account of the restricted character of the Import and Export List in 1907 and 1912, it was possible to specify only a limited number of chemical products whose output was to be stated by quantity and value at the Censuses for those years. By the time the Census for 1924 was taken the list of chemical products set out in the Import and Export List had been substantially expanded and, in the schedule for that Census, 147 headings were specified under which products or groups of products manufactured in the chemical industry were to be recorded. The information received is only

partially available for publication on account of the risk of disclosing particulars relating to individual firms, but nearly 100 headings are used in the table of output in 1924 appended to this report as compared with 53 headings under which the output of 1907 and of 1912 was recorded. These changes in classification, and especially the disappearance from the 1924 schedule of the heading *Fine and pharmaceutical chemicals* (since a clear line of division between "heavy" and "fine" chemicals could not be maintained) make comparisons between the results of the three Censuses very difficult. The following short table, comparing the values returned on schedules for all trades, will, however, give some general indications of the changes over the seventeen years:—

Kind of products.	1924.		1912.		1907.	
	Quantity.	Selling value.	Quantity.	Selling value.	Quantity.	Selling value.
	Th. tons.	£'000.	Th. tons.	£'000.	Th. tons.	£'000.
Hydrochloric acid ..	208.5	714	287.2	326	200	242
Sulphuric acid ..	793.6	2,672	1,185.4	1,315	548	972
Bleaching materials (including bleaching powder) ..	98.0†	1,170	129.4	534	126	527
Borax ..	7.6	169	17.1	255	14	205
Compressed gases ..	..	915	..	233	..	125
Soda compounds ..	1,531.2	10,355	952.0	3,711	707	3,390
Coal tar dyes and intermediates ..	29.2	5,233	..	477	7	373
Other coal tar products* ..	..	9,821	..	3,101	..	2,526
Extracts for dyeing and tanning ..	..	1,085	..	390	..	322
Drugs and medicinal preparations ..	..	15,567	..	4,009	..	4,866
Other chemical products†	..	12,188	..	7,378	..	7,199
Total value ..	..	59,889	..	21,729	..	20,747

* Inclusive of coal tar, pitch and ammoniacal liquor returned on schedules for the Chemicals, Dyestuffs and Drugs Trades, but exclusive of that returned on schedules for other trades (see page 31).

† Inclusive of ammonium sulphate returned on schedules for the Chemicals, etc., Trades, but exclusive of that returned on schedules for other trades (see pages 34 and 35).

‡ Includes the estimated weight of small quantities not so recorded.

More detailed particulars relating to production in 1924 are given in the paragraphs which follow; the first three of the groups distinguished in the table on page 24 are first examined and the fourth group is then dealt with in sections.

(i) *Drugs and Medicinal Preparations.*

The production for sale or for stock of drugs and medicinal preparations in 1924 is shown in the following table, together with the exports and retained imports, so far as available, of goods similarly described.

Drugs and medicines.	Returned on schedules for				Exports.	Net imports.
	The Chemicals, etc., Trades.		All trades.			
	Quantity.	Selling value.	Quantity.	Selling value.	Quantity.	Quantity.
	Th.lb.	£'000.	Th.lb.	£'000.	Th.lb.	Th.lb.
Glycero-phosphates ..	42.8	5	42.8	5	5.1	7.9
Novocain, eucain and similar local anaesthetics ..	13.9	42	13.9	42	0.3	2.1
Other drugs* ..	518.3	531	518.3	531	252.4	201.5
	†	16	†	16		
	Th.cwts.		Th.cwts.		Th.cwts.	Th.cwts.
Medicinal oils, not elsewhere specified ..	4.8	36	4.8	36	9.8	16.0
Ointments and liniments	24.6	320	32.7	326	7.3	7.8
Prepared foods for infants and invalids ‡ ..	..	1,955	..	2,744	(Not separately recorded).	
					£'000.	£'000.
Druggists' sundries ..	..	239	..	295	§	§
Proprietary medicines, not elsewhere specified	..	6,694	..	6,694	1,143	160
Galanical preparations, not elsewhere specified	..	4,676	..	4,878	1,424||	365||
TOTAL VALUE ..	..	14,514	..	15,567	..	..

* Includes cocaine and cocaine salts, morphia and morphia salts, quinine and quinine salts, acetyl-salicylic acid (aspirin), menthol, salvarsan, etc., so far as separately recorded.

† Quantity not stated.

‡ Recorded as such: the figure shown for *all trades* includes certain breakfast foods recorded on schedules for the Bread and Biscuit Trades (see page 53 of the volume dealing with the Food, Drink and Tobacco Trades).

§ Not shown in the Import and Export returns. The most nearly corresponding particulars relate to "Druggists' wares not elsewhere specified," of which the exports in 1924 were valued at £559,000 and the retained imports at £97,000.

|| "Other descriptions" together with phenacetin and sugar of milk, of which no production was recorded in 1924.

Owing to the indefinite descriptions used for some of the classes of goods shown in the table, it is probable that there was, on the part of manufacturers, some lack of uniformity in assigning particular goods to the appropriate schedule headings. There is thus likely to be some overlapping, so far as the figures of production are concerned, between these various classes of goods.

The following statement compares the production of, and the trade in, drugs and medicines, as shown in the preceding table with corresponding figures for 1907:—

	1924.	1907.
	£'000.	£'000.
Production (value at factory) ..	15,567	4,866
Exports (value f.o.b.) ..	3,650	1,889
Retained imports (value c.i.f.) ..	1,011	1,073*

* Including some raw drugs, but excluding druggists' wares, not elsewhere specified.

After allowing for any duplication between proprietary medicines and galenical preparations on the one hand and named drugs on the other, and for the increased stamp duties on patent medicines, it is clear that there was a very large increase in production in 1924 over 1907.

(ii) *Dyes and Dyestuffs.*

Intermediate coal tar products for the manufacture of dyes were not recorded as such at the Census of 1907, but exports of aniline oil and toluidine in 1908 were 948 tons; in 1924 about 8 per cent. (45,000 cwts.) of the total make recorded under the heading *Intermediate coal tar products used in the manufacture of dyes (including aniline oil and salts, and phenyl-glycine)* was exported, while imports were unimportant.

Synthetic dyestuffs.—In 1907 about 6,950 tons of coal tar dyes were produced; in 1924 the output had grown to 19,000 tons. Details of the kinds of dyes made (in the classification shown in the Import and Export List) cannot be given without disclosing the business of individual firms. Particulars furnished to the Dyestuffs Industry Development Committee permit of a classification of output in certain groups and the following table summarises the information thus compiled for 1924:—

Dyestuffs.	1924.
	Th. lb.
Direct cotton colours	5,059
Acid wool colours	5,193
Chrome and mordant colours (including alizarine)	6,940
Basic colours	1,561
Sulphur colours	7,833
Vat colours (including indigo)	5,004
Dyestuffs for lake-making	754
Oil, spirit, wax and miscellaneous colours	899
TOTAL	33,243

It will be noted that the quantities of finished dyestuffs returned to the Census exceeded by over 25 per cent. the total shown above.

Retained imports of dyes and dyestuffs obtained from coal tar amounted to 16,117 tons in 1907 and of finished dyes to 3,511 tons in 1924, while British exports were 2,563 tons in 1907 and 2,871 tons in 1924, excluding 85 tons consigned to the Irish Free State.

Production for sale.—The following table shows the production for sale (including additions to makers' stocks) in 1924 (as returned to the Census Office on schedules for all trades) of dyes, dyestuffs and extracts for dyeing, tanning, etc.; particulars of the exports and retained imports in that year are also shown.

Dyes, dyestuffs, etc.	Production.		Exports.	Net imports.
	Quantity.	Selling value.	Quantity.	Quantity.
	Th.cwts.	£'000.	Th.cwts.	Th.cwts.
Intermediate coal tar products used in the manufacture of dyes (including aniline oil and salts and phenyl-glycine)	204.4	1,200	45.3	0.6
Finished dyestuffs obtained from coal tar	379.4*	4,033*	59.1	70.2
Extracts for dyeing	78.4	159	6.1	115.1
Extracts for tanning:—				
Quebracho	514.7	286	29.7	352.1
Other descriptions	821.7†	524†	31.0	760.0
Extracts for dyeing, tanning and printing, unclassified .. .. .	..	116	—	—
TOTAL VALUE .. .. .	..	6,318	..	..

* Includes 700 cwts., valued at £40,000, returned on schedules for trades other than the Chemicals, etc., Trades.

† Includes 500 cwts., valued at less than £500, returned on schedules for other trades.

In addition to the output shown above, 359,800 cwts. of intermediate coal tar products were recorded as having been used by the makers in their own works.

Extracts for dyeing and tanning were returned in 1907 by value only and the recorded production amounted to £322,000, in addition to which the returns showed *dyewoods and tanning materials, ground or prepared*, to the value of £98,000. The latter heading does not appear in the 1924 Census, but the value returned for tanning and dyeing extracts was £1,085,000. Retained imports of dyewoods in 1924 were 2,181 tons against 24,690 tons in 1907. The retained imports of tanning substances were, in the aggregate, but little less in 1924 than in 1907, so far as the available particulars for the earlier year suffice for a comparison.

It would appear that the direct extraction of dyestuffs from dyewoods has declined largely since 1907, and that the direct extraction of tanning material from barks, etc., has not increased. On the other hand the retained imports of extracts for dyeing and tanning, which were recorded by value only in 1907 at £727,000, were valued in 1924 at £1,331,000. Exports of dyestuffs (other than those derived from coal tar) were 9,227 tons in 1907; exports of tanning extracts were not then shown separately. In connexion with the production in 1924 of synthetic organic chemicals for tanning purposes (see page 39). The development of this manufacture may be set against any possible stagnation in the production of natural extracts. The greater use of tanning materials not of vegetable origin must also be taken into account in any comparison.

(iii) *Other Coal Tar Products.*

In this group are included the by-products recovered in the course of the manufacture of gas and coke at gasworks and coke ovens and the by-products recovered from the distillation of crude tar and

ammoniacal liquor by chemical manufacturers. The output of intermediate products for the manufacture of dyes and of finished coal tar dyes has been dealt with in the preceding section.

Total make.—The following table shows, for 1924, the total production of the chief classes of coal tar products (other than dyes and intermediates), together with particulars of exports and retained imports:—

Coal tar products (other than dyes and intermediates).	Unit of quantity.	Returned on schedules for		Exports.	Net imports.
		The Chemicals, etc., Trades.	All trades.		
		Quantity.	Quantity.		
Anthracene	Tons	994	5,718	118	279
Benzol	Th.galls.	11,796	51,776	1,159*	4,713*
Toluol	Th.galls.	373	741†	55‡	§
Carbolic acid (phenol)	Th.galls.	938	1,108	—	—
Naphtha	Tons	5,683	7,191	5,702	49
Naphthalene	Th.galls.	3,438	5,841	170	17
Tar oils, creosote oils and other heavy coal tar oils	Tons	6,282	16,480	2,114	546
	Th.galls.	50,870	90,548||	45,322¶	403§§

* Exclusive of any benzol which may have formed part of the exports or imports recorded as *motor spirit*.

† Includes 395,500 gallons stated to weigh 1,725 tons.

‡ Equivalent to 214 tons.

§ Negligible.

|| Includes 34,097,300 gallons stated to weigh 164,416 tons.

¶ Equivalent to 208,595 tons.

§§ Equivalent to 1,970 tons.

A substantial output of all these products was returned on schedules for other trades, mainly the Coke and By-products Trade and Gas Works.

Production for sale or for stock.—The production in 1924 of coal tar products for sale or for stock is shown in the following table:—

Coal tar products (other than finished dyes and intermediate dyestuffs).	Unit of quantity.	Returned on schedules for			
		The Chemicals, etc., Trades.		All trades.	
		Quantity.	Selling value.	Quantity.	Selling value.
Anthracene	Tons	994	£11,000.	5,718	£44,000.
Benzol	Th.galls.	11,460	861	51,440	2,808
Toluol	Th.galls.	305	26	673	55
Carbolic acid (phenol)	Th.galls.	938	81	1,108	100
Naphtha	Tons	5,486	208	6,994	235
Naphthalene	Th.galls.	3,355	205	5,758	318
Tar oils, creosote oils and other heavy coal tar oils	Tons	6,282	54	16,480	117
Other coal tar products* } Quantity stated	Th.galls.	50,336	1,594	90,014	2,756
.. .. .	Th.galls.	1,827	230	2,475	275
.. .. .	Tons	6,520	157	14,044	251
.. .. .	—	—	—	..	182
TOTAL VALUE .. .. .	..	..	3,427	..	7,141

* Not including coal tar, pitch or ammoniacal liquor.

It will be seen that only a small part of the output of the Chemicals, etc., Trades represented above was subjected by the makers to further processes prior to sale.

In addition to the output shown in the preceding table, the following production for sale or stock was recorded for 1924 by firms that made their returns on schedules for the Chemicals, Dyestuffs and Drugs Trades:—

	Quantity.	Selling value.
Coal tar	{ 16,890,000 galls. 218,000 tons	£547,000 1,182,000
Pitch	306,000 tons	950,000
Ammoniacal liquor .. .. .	..	1,000
Total value .. .. .	..	2,680,000

Large quantities of coal tar and pitch are also produced at gasworks* and at coke ovens†; the total production of these commodities in 1924, as returned on schedules for all trades, was as follows:—

	Quantity.	Selling value.
Coal tar	{ 41,239,000 galls. 1,390,000 tons	£1,038,000 4,672,000
Pitch	603,000 tons	1,822,000

Of the value of coal tar products (other than dyes, coal tar, pitch and ammoniacal liquor) made for sale in 1924, about 52 per cent. represented products made outside the Chemicals, etc., Trades: in 1907 the proportion was only 19 per cent. This change reflects the development of by-product recovery work at coke-ovens; the following comparisons are also of interest:—

	Production for sale.	
	1924.	1907.
Anthracene	5,718 tons	1,614 tons.
Benzol and toluol	52,113,000 galls.	6,327,000 galls.
Carbolic acid	{ 1,108,000 galls. 6,994 tons	689,000 galls. 8,550 tons.
Naphthalene	16,480 tons	14,950 tons.

The particulars recorded in 1907 in respect of exports and imports of the products of coal tar were, in most cases, not comparable with those available for 1924. Details additional to those available for

* See separate volume containing reports on Public Utility Services.

† See pages 56 and 57.

1907 were secured in respect of 1908, but the changed conditions of trade in that year render these particulars of doubtful significance in respect of the trade of 1907 in many instances.

(iv) *Other chemical manufactures.*

The remaining products of the Chemicals, Dyestuffs and Drugs Trades have been divided into classes with a view to convenience in presenting the particulars, but this division has had no other purpose. Manufacturers were, in general, required to state not only the quantity of any product made for sale or stock, but also their total make of that product, including any used in their own works for further manufacture.

(a) *Inorganic acids.*—The following table gives the particulars recorded for 1924:—

Inorganic acids.	Total make.		Made for sale or for stock.			
	Returned on schedules for		Returned on schedules for			
	The Chemicals, etc., Trades.	All Trades.	The Chemicals, etc., Trades.		All trades.	
	Quantity.	Quantity.	Quantity.	Selling value.	Quantity.	Selling value.
	Th.tons.	Th.tons.	Th.tons.	£'000.	Th.tons.	£'000.
Hydrochloric acid*	222.4	222.4	208.5	714	208.5	714
Sulphuric acid†	802.4	1,103.0	619.5	2,149	793.6	2,672
Boric acid	2.9	2.9	2.9	117	2.9	117
Nitric acid	19.2	20.4	8.0	186	13.7	354
Other descriptions‡	19.2	20.4	4.5	128	13.7	354
TOTAL	1,046.9	1,348.7	843.4	3,294	1,018.7	3,857

* At 1.14 specific gravity.

† At 1.7 specific gravity.

‡ Including certain organic acids (formic, lactic and pyrogallic).

Manufacturers of chemicals, dyes, explosives, and fertilisers were required to state their total make of sulphuric acid but the operators of gasworks and coke ovens were not similarly required to state the quantity of acid made by them for use in their recovery work, and it is understood that the inclusion of such production might add about one-fifth to the total returned to the Census office. It should also be noted that the returns made to the Census office were not in all cases made for the calendar year 1924 but for the business year most closely corresponding thereto in the case of the individual firms. There must, therefore, be discrepancies between the Census aggregate and any trade estimates made for the calendar year. The output of sulphuric acid in 1907 was estimated to be 1,459,000 tons at 140° Tw.,* and the reduction in output is connected

* Equivalent to 1.7 specific gravity.

with the decrease in the production of superphosphate fertilisers. The output of 62 firms making hydrochloric acid in 1907 was 419,325 tons at 29° Tw.,* and 46,922 tons of unknown strength, while the output of five firms making only for their own use was not known. Exports in 1924 were 134 tons of hydrochloric acid and 1,561 tons of sulphuric acid, the strengths not being recorded; retained imports of hydrochloric acid were nil and those of sulphuric acid were 37 tons.

(b) *Potassium and Sodium Compounds.*—Manufacturers were asked in 1924 to state their output, under thirteen headings, of potassium compounds and as many of soda compounds, but, in order to avoid the risk of disclosing information regarding the output of individual firms, only limited details are given. The following table shows the total make and the production for sale or stock, as returned on schedules for all trades:—

Potassium and sodium compounds.	Total make.		Made for sale or stock.	
	Quantity.		Quantity.	Selling value.
	Tons.	Tons.	Tons.	£'000.
Potassium compounds:—				
Chloride	640	640	4	
Cyanide	150	150	20	
Iodide	100	100	197	
Sulphate	870	570	6	
Other	5,360*	6,350§	214§	68‡
	Th.tons.	Th.tons.		
Sodium compounds	1,561||	1,531||	10,355||	
TOTAL VALUE	..	..	..	10,864

* Returned on schedules for the Chemicals, etc., Trades only.

† No quantity stated.

‡ Returned on schedules for other trades.

§ Includes 1,030 tons, valued at £15,000, returned on schedules for other trades.

|| Includes 27,000 tons, valued at £509,000, returned on schedules for other trades.

Potassium compounds were not shown separately in 1907; the quantity of sodium compounds returned as made for sale or stock was 707,000 tons in 1907, excluding chromates and cyanides, which are included in the figures for 1924 shown above.

Exports of potassium compounds in 1924 were about 4,400 tons, of which chromates and bichromates were nearly 1,800 tons, refined saltpetre about 900 tons and refined kainite about 600 tons. Excluding crude kainite and saltpetre, the retained imports were 35,900 tons in 1924, the chief being chloride, 18,700 tons, and sulphate, 8,500 tons; imports of chromates, cyanide and iodide were negligible. The overseas trade in sodium compounds other than sodium nitrate was as follows in 1924:—

* Equivalent to 1.145 specific gravity.

Sodium compounds.	Exports.	Retained imports.
	Th. tons.	Th. tons.
Carbonate, soda ash, crystals, and bicarbonate ..	305.4	5.0
Caustic	88.2	2.4
Chromate and bichromate	2.8	1.7
Cyanide	7.4	—
Silicate	14.8	0.1
Sulphate and salt cake	73.1	2.2
Other sorts	8.2	6.0
TOTAL	499.9	17.4

Of the exports in 1924 shown above, 13,000 tons were consigned to the Irish Free State. Exports of sodium compounds were 285,200 tons in 1907 and 339,700 tons in 1912; exports of soda ash, carbonate and bicarbonate, and crystals were 133,000 tons in 1907 and 183,300 tons in 1912 and, after deducting 11,500 tons exported to the Irish Free State, the comparable figure of exports in 1924 was 293,900 tons. There was less expansion in the exports of caustic soda, which were 77,300 tons in 1907 and 78,200 tons in 1912, but there was a substantial rise in exports of sulphate and salt cake from 50,600 tons in 1907 and 50,000 tons in 1912.

(c) *Ammonium compounds.*—Details of the production of ammonia and ammonium compounds in 1924 are given below as returned on schedules for all trades:—

Ammonium compounds.	Total make.		Made for sale or stock.	
	Quantity.	Quantity.	Quantity.	Selling value.
	Tons.	Tons.	Tons.	£,000.
Ammonium compounds:—				
Carbonate	3,650	3,650	120	
Chloride	8,930	8,830	245	
Other (including anhydrous ammonia but excluding ammonium sulphate)	29,770*	26,210*	404*	
TOTAL	42,350	38,690	769	

* Including 600 tons, valued at £42,000, returned on schedules for other trades.

In addition to the ammonium compounds shown above, a total production of 41,650 tons of ammonium sulphate was recorded on schedules for the Chemicals, Dyestuffs and Drugs Trades; 670 tons were used for further manufacture in the works in which it was produced and the remainder, 40,980 tons, was valued at £498,000. Ammonium sulphate is the only ammonium compound which was separately specified in 1907, when 28,000 tons were produced by chemical manufacturers. Up till recent years the chief source of this fertiliser has been the by-product recovery plants at gasworks, at coke-ovens and blast furnaces, and at oil-refining works. With the development of the extraction of nitrogen from the air the chemical industry proper has come to play a very much more important part in the production of sulphate of ammonia. That

development has taken place since 1924*, but it may be useful to put on record here the sources of the output in that year and in 1907 as far as stated:—

	1924.	1907.
	Tons.	Tons.
Gasworks	129,400	105,000
Coke ovens at collieries and blast furnaces	186,000	72,000
Oil refineries	51,600	52,000
Chemical works	41,650	28,000
Fertiliser works	5,380	7,000
Other works	5,270	
TOTAL	419,750	264,000

The increase since 1907, shown above as about 55 per cent., has been mainly due to the substitution of coke-ovens with by-product recovery plant for beehive ovens.

Exports of sulphate of ammonia were 231,000 tons in 1907, 285,000 tons in 1912, and, in 1924, 278,000 tons, or, excluding exports to the Irish Free State, 263,000 tons to places outside the British Isles. The quantity retained for use in the British Isles has, therefore, risen from 31,000 tons in 1907 to 148,000 tons (together with the production in the Irish Free State†) in 1924. Imports were negligible in all three years.

Exports and imports in 1924 of ammonium compounds other than ammonium sulphate were as follows:—

Ammonium compounds.	Exports.	Net imports.
	Tons.	Tons.
Carbonate	2,684	—
Chloride (muriate)	3,854	1,620
Nitrate	526	2,552
Phosphate	30	20
Other sorts (except sulphate)	341	16
TOTAL	7,435	4,208

Exports of ammonium chloride were 7,720 tons in 1907 and 6,506 tons in 1912, retained imports being 241 tons in the former year and 369 tons in the latter.

* The total output of ammonium products, expressed as the equivalent of sulphate of ammonia, in 1929, as reported by the Inspector under the Alkali Acts, was more than double that in 1924.

† In 1926 the recorded output of the Irish Free State was 1,270 tons.

(d) *Compounds of other metals.*—The production for sale or for stock of the products of this miscellaneous group is shown in the following table. Particulars of exports and imports in 1924 are, for convenience of reference, given in the same table. It is not known whether the figures of output recorded on schedules for trades other than the Chemicals, etc., Trades cover, in all cases, the total production.

Metallic compounds, not elsewhere specified.	Production for sale or for stock.				Exports.	Net imports.
	Returned on schedules for					
	The Chemicals, etc., Trades.		All trades.			
	Quantity.	Selling value.	Quantity.	Selling value.		
	Tons.	£'000.	Tons.	£'000.	Tons.	Tons.
Aluminium compounds:						
Sulphate of alumina (including potash and ammonia alum)	58,960	337	58,960	337	16,530	11,750
Other sorts (excluding bauxite and abrasives)	37,770	428	37,770	428	11,380	290
Barium compounds (including binoxide and natural sulphate) ..	17,780	193	18,680†	203	5,850||	1,132||
Borax	7,560	169	7,560	169	6,380	3,540
Lead compounds:—						
Red and orange lead	7,360	302	13,620	561	7,320	1,750
Litharge	6,070	249	10,140	412	2,100	330
Other sorts	¶	116	¶	138	180‡	480‡
Lime compounds:—						
Acetate	1,100 Th.galls.	13	1,100 Th.galls.	13	90	2,000
	52	2	52	2		
Bleaching powder ..	65,750	574	66,000	591	14,840	3,360
Other sorts	¶	62	¶	63	5	9,900
Magnesium compounds (including chloride and sulphate)	21,760	313	22,010†	322	4,360	21,360
Tin salts	170	21	¶	70	30	120
Zinc compounds (oxide and sulphate)	16,110	482	16,110	482	3,580	8,550
Other metallic compounds*	¶	270	¶	270	**	**
	800	226	2,360	284	470	41,140§
TOTAL VALUE .. .. .	..	3,757	..	4,345	..	..

* Arsenic compounds (other than white arsenic), calcium carbide, nickel oxide, rare earth compounds and silver nitrate.

† Including small estimated quantities, for which only values were returned.

‡ Lead acetate: the value of the exports was £8,500 and of the retained imports, £21,100.

§ Of which calcium carbide amounted to 39,479 tons.

|| Excluding natural sulphate: the exports of barytes, ground, were 2,750 tons and the retained imports 36,110 tons.

¶ Quantities not recorded.

** The exports of zinc oxide and sulphate were valued at £112,200 and the retained imports at £288,900.

In addition to the output shown above the following products were recorded as having been used by the makers in their own works:—

	Tons.
Sulphate of alumina	10
Barium compounds	12,110
Borax	780
Litharge	1,980
Acetate of lime	500
Bleaching powder	20
Magnesium compounds	3,190

Particulars of the manufacture in 1907 of this group of metallic compounds were included under the general heading of *Chemicals, not otherwise enumerated*, with the exception of acetate of lime, the output for sale of which was valued at £11,000; bleaching powder, 109,000 tons; and borax, 14,000 tons.

Potash and ammonia alums were not separated from sulphate of alumina in the Import and Export List till 1925; and a considerable change in the volume of the trade deprives the figures for that year of serious value for the purpose of comparison with domestic production. About half the bleaching powder made in 1907, or 53,900 tons, was exported, and the reduction of the exports by about 39,000 tons accounts for nearly the whole of the decrease in production. The large imports of magnesium compounds are of different kinds from the British exports, the imports averaging only £3 per ton, c.i.f., and the exports nearly £34 per ton, f.o.b., while the average value at factory of the compounds made for sale was about £14.6 per ton.

(e) *Other inorganic products.*—The following table shows the production in 1924 of certain chemical products which cannot conveniently be assigned to more specific classes.

Other inorganic products.	Production for sale or for stock.			
	Returned on schedules for			
	The Chemicals, etc., Trades.		All trades.	
	Quantity.	Selling value.	Quantity.	Selling value.
	Tons.	£'000.	Tons.	£'000.
Bleaching materials (other than bleaching powder)*	30,530 Tons.	543	30,890 Tons.	552
	493 Th.galls.	27	493 Th.galls.	27
Compressed gases:—				
Carbonic acid	4,910 Tons.	136	5,440 Tons.	150
Other gases	†	757	†	765
Iodine and iodides, not elsewhere specified	90	173	90	173
Sulphur	7,340	58	9,800	78
Other	310	21	310	21
TOTAL VALUE .. .. .	..	1,715	..	1,766

* Hydrosulphites, perborates, peroxides, etc.

† Quantity not stated.

The total make of bleaching materials returned, as shown above, by weight exceeded the production for sale by 3,810 tons, this output being further manufactured in the establishments in the Chemicals, etc., Trades, in which it was produced.

The output for sale of bleaching materials, other than bleaching powder, in 1907 was 17,000 tons; in 1924 it was nearly double this amount and this increase may be one factor in the reduction in the home consumption of bleaching powder (see page 37). Imports and exports were both trifling at the time of the first Census. The output of compressed gases, valued at £125,000 in 1907, was over seven times as great in value in 1924, indicating a large increase in the quantity made. Retained imports of iodine and iodides (450 tons) were much in excess of the British production. The production of sulphur shown above is that of refined sulphur, valued at an average of £8 per ton while the retained imports (108,000 tons) valued at an average of £4.3 per ton c.i.f. were crude sulphur. In 1907 the output of sulphur by chemical manufacturers was returned as 31,000 tons, valued at an average of £4.8 per ton, and the imports of 17,000 tons were valued at £5.1 per ton c.i.f.

(f) *Organic chemicals, other than medicinal.*—The table on page 39 gives particulars of production, exports and retained imports in 1924 of various organic chemicals which have not already been included in the sections dealing with drugs, dyes, etc. The particulars shown are, wherever necessary, inclusive of the output returned by firms in trades other than the Chemicals, Dyestuffs and Drugs Trades.

In addition to the quantities shown as made for sale or for stock, the following were recorded as being used for further manufacture in the works in respect of which returns were made:—

Acetic acid (including acetic anhydride)	10 tons.
Salicylic acid and salicylates	220 tons.
Chloroform	24,000 lb.
Ether, acetic and butyric	156,500 lb.

In addition to the output of organic acids shown in the table below the output of formic, lactic, pyrogallic and other acids is included in the table on page 32.

The export and import trade in 1924 in these other organic acids, whose output could not be shown separately without risk of disclosing the business of individual firms, was as follows:—

	Exports.		Retained imports.	
	Tons.	Tons.	Tons.	Tons.
Formic acid	4	1,082		
Lactic acid	64	233		
Pyrogallic acid	2	3½		

Organic chemicals, other than medicinal.	Production for sale or for stock.		Exports.	Retained imports.
	Quantity.	Selling value.	Quantity.	Quantity.
	Tons.	£'000.	Tons.	Tons.
Acids:—				
Acetic (including acetic anhydride)	3,120§	109§	100	8,820
Citric, tartaric and tartrates, not elsewhere specified	4,090	496	1,180	1,700
Oxalic and oxalates	30	4	10	790
Salicylic (including salicylates not elsewhere specified but excluding aspirin)	540	84	80	30
	Th.lb.		Th.lb.	Th.lb.
Chloroform	545	91	130	0.4
	Th. galls.		Th. galls.	Th. galls.
Collodion	6.8	14	1.2	0.1
	Th.lb.		Th.lb.	Th.lb.
Ether, acetic and butyric	271||	11||	9*	1.2†
	Th.galls.		Th.galls.	
Ether, sulphuric	119	62	1.7	‡
	Tons.		Tons.	Tons.
Formaldehyde	740	40	260	1,080
Synthetic organic chemicals for tanning (excluding dyes) and photographic purposes	3,730	110	80	40
Tartar, cream of	2,490	214	2,320	2,270
Wood distillation products, not elsewhere specified:—	Th. galls.		Th. galls.	Th. galls.
Methyl alcohol	211	50	21	408
Other		105¶		
	Tons.		£'000.	£'000.
Other organic chemicals	260	33	9	125
TOTAL VALUE		1,423		

* Not including 116 gallons of butyric ether.

† Not including 70 gallons of butyric ether.

‡ Negligible.

§ Including 90 tons, valued at £14,000, returned on schedules for other trades.

|| Including 212,500 lb., valued at £5,000, returned on schedules for other trades.

¶ Including £2,000 returned on schedules for other trades.

The imports of oxalic acid were greater than the home production; over 60 per cent. of the home supplies of citric and tartaric acids were of British manufacture and British-made salicylic acid and salicylates commanded the home market for those products.

Chloroform, collodion, ethers and formaldehyde were not recorded separately at the Census of 1907. Two-thirds of the requirements of the home market in formaldehyde were supplied in 1924 from imported supplies.

In 1907 an output of 6,000 tons of acetic acid was recorded; in 1924 little more than half of this amount was produced. Imports of acetic acid were first recorded in 1908, when 2,990 tons were retained. The quantity available for use in the United Kingdom

in 1907 appears to have been about 9,000 tons, of which about two-thirds was of British make; in 1924 the quantity available had risen to 11,840 tons, of which a little more than one-quarter was made in the United Kingdom. The output of wood distillation products (other than acetic acid), including mordants, was valued at £98,000 in 1907, of which £80,000 was returned on schedules for the Chemical Trades, and the output in 1924 was valued at £155,000 (including methyl alcohol). The retained imports of non-potable methyl alcohol fell from 446,000 gallons in 1907 to 408,000 gallons in 1924; at the same time British exports of non-potable methyl alcohol, which amounted to 130,000 gallons in 1907, were reduced to 21,000 gallons in 1924.

(g) *Miscellaneous chemical products*—The following table shows the production for sale in 1924 of miscellaneous chemicals for industrial use and of unspecified chemical products:—

Kind of chemical products.	Output returned on schedules for	
	The Chemicals, etc., Trades.	All trades.
	Selling value.	Selling value.
Essential oils and camphor	£'000. 130	£'000. 240
Boiler composition and disinfectants	301	346
Brewers' finings	188	252
Finishing materials for the textile trades (gums, starches, etc.) not elsewhere specified	257	272
Flavouring essences, colours, etc., for confectionery and other culinary purposes	460	460
Purple iron ore	55	127
Unspecified and unenumerated chemicals	2,729	2,964
TOTAL	4,120	4,661

Exports of essential oils in 1924 were valued at £255,000 f.o.b. and retained imports at £828,000 c.i.f., while exports of camphor were valued at £9,000 and retained imports at £145,000. No separate particulars of imports and exports are available for the following five classes of products shown in the table.

Other products.

In addition to the output shown in the preceding sections, firms that made their returns on schedules for the Chemicals, Dyestuffs and Drugs Trades also recorded an output of goods which, being of kinds mainly produced by other trades, are dealt with in the reports on those trades. Particulars of these goods, for 1924 and 1907, are given below.

Kind of goods.	1924.	1907.
	Selling value.	Selling value.
Coke	£'000. 170	£'000. 126
Copper regulus, matte, etc.	(140,000 tons) 55	} 1,326
Copper, unwrought	(1,500 tons) 27	
Copper sulphate	(400 tons) 183	
Disinfectants, insecticides, etc.	(8,700 tons) 458	(26,000 tons) 137
Fertilisers:—		
Superphosphates	208	} 205
Other sorts	(72,000 tons) 424	
Glue and size	59	28
Oils and greases	149	125
Paints, colours, varnishes, etc.	364	38
Perfumed spirits	4	302*
Perfumery and toilet preparations	297	510*
Soap	226	201
Tarred macadam and other road materials	282	21
Other goods	554	991†
TOTAL	3,460	4,608

* See page 23.

† Including photographic materials valued at £581,000 (see page 23).

Work done for the trade.

The sum of £60,000 was recorded as received in 1924, £18,000 in 1912, and £25,000 in 1907, for drug grinding and other work done for the trade.

Value of output free from duplication.

The gross value of the output returned on schedules for the Chemicals, Dyestuffs and Drugs Trades amounted to £56,204,000 for 1924 as against £24,025,000 for 1907. Taking into consideration the change in the level of values and the reduction in the weekly hours of labour on the one hand, and, on the other, an increase of about one-third since 1907 in the number of persons employed and of about one-half in the capacity of prime movers installed, it appears certain that there was a considerable increase in the volume of output recorded for the third Census compared with that recorded either at the second or at the first Census. The exact amount of this increase could only be determined if it were possible to eliminate the duplication resulting from the sale by some firms in these trades of products to be converted into other products or compounds by other firms also in the Chemicals, etc., Trades. To do this with any degree of precision is impossible. The preceding paragraphs have shown that where the total make of a product is entered (including that used by the makers) as well as that made for sale or for stock, in

most cases the great bulk of the product is sold by the makers. The quantities so sold may be disposed of (a) to final consumers (e.g., sulphate of ammonia or patent medicines); (b) to firms in other trades for use in their manufactures or work (e.g., sulphuric acid or bleaching powder); (c) to other firms that made returns on schedules for the Chemicals, etc., Trades, for use in their manufactures (e.g., coal tar products sold to dye makers or drugs to makers of galenical preparations); or (d) for export. Leaving out the *other products* shown in the table on page 41 an output of chemical products valued at £52,684,000 was returned on schedules for the Chemicals, etc., Trades, and of that output exports of goods described by the same names as the goods produced (except sulphate of ammonia, coal tar and pitch) accounted for £15,943,000 f.o.b., or perhaps about £14,500,000 at factory. The materials required to produce the remaining chemicals (valued at about £38,200,000) would, at the average ratio of materials to output for the industry as a whole, cost about £21,000,000. This figure represents the extreme upper limit of possible duplication, but the actual duplication is far less, since it is obvious that by no means all these materials were the products of other firms in the trade.

The groups of output which possibly contribute most to the goods involved, either as materials or as products, in such duplication as exists, are the following, taking the values returned on schedules for the Chemicals, etc., Trades:—

	Made for sale.	Exported.
	£	£
Inorganic acids	3,294,000	175,000
Organic acids	679,000	197,000
Intermediate coal tar products.	1,200,000	233,000
Coal tar dyes	3,993,000	691,000
Other coal tar products (excluding coal tar and pitch)	3,427,000	2,327,000
Proprietary medicines	6,694,000	1,143,000
Ointments and liniments	320,000	94,000
Galenical preparations	4,676,000	1,422,000
Chemicals not elsewhere specified	2,729,000	..

The table on page 24 shows that the total cost of all materials used in the manufacture of drugs and medicinal preparations was £6,921,000 and in the manufacture of dyes and dyestuffs, £3,606,000. Neither of these sums represents exclusively chemical products made by chemical manufacturers who furnished returns on schedules for the Chemicals, Dyestuffs and Drugs Trades. With regard to the duplication of acids, the alkali manufacturers, who would be the largest users of sulphuric acid in the chemical industry, probably made most of their acid (182,900 tons were reported to have been used by the makers). Coal tar products are largely not final products, being materials in the manufacture of dyes and fine chemicals, but, taking the largest items in the total value of £3,427,000, benzol

(valued at £861,000) was sold as a fuel as well as to the dye manufacturers; tar oils, etc. (valued at £1,594,000), are mainly used for fuel, road-making, and impregnating timber. The intermediate coal tar products valued at £1,200,000 may represent duplication with finished coal tar products, but not necessarily with dyes, while after deduction of exports a good part of the remainder may represent additions to stocks of makers; this last consideration affects all products. So far as regards the groups of proprietary medicines, galenical preparations, ointments and liniments, and unspecified chemicals there is no obvious basis for an estimate of the degree of duplication which may exist between them and other products discussed in this report. They include chemicals produced from raw materials bought from outside the Chemicals, Dyestuffs and Drugs Trades and also preparations made from chemicals bought from other chemical manufacturers, with or without materials bought from outside trades or imported.

It will be clear from the foregoing that the materials on which an estimate of duplication has to be based are both insufficient and confusing, but it is perhaps permissible to say that, after taking all the available information into account, the duplication is not likely to have been in excess of £10,000,000 and was probably not less than £4,000,000. The value of the output returned on schedules for the Chemicals, Dyestuffs and Drugs Trades for 1924 would therefore appear to lie between £46,000,000 and £52,000,000.

Cost of materials and work given out.

The cost of materials used by firms that made their returns on schedules for the Chemicals, Dyestuffs and Drugs Trades was returned as £30,768,000 in 1924, a sum which, by the exclusion of purchases of the products of other firms in the same trades, may be reduced to an amount lying between £21,000,000 and £27,000,000, the corresponding figure for 1907 was estimated to be between £9,500,000 and £14,000,000.

The amount paid to other firms for work given out to them was returned as £11,000 in 1924, £9,000 in 1912, and £9,000 in 1907.

Net output.

The net output in 1924 of the firms that made their returns on schedules for the Chemicals, Dyestuffs and Drugs Trades (whose gross output was valued at £56,204,000) was £25,425,000, that sum representing, without duplication, the total amount by which the value, as delivered, of the aggregate output exceeded the cost, as purchased, of the materials used and the amount paid to other firms for work given out to them.

The net output per head of persons employed in the censal year 1924 was £367 as compared with £184 in 1912, and £183 in 1907.

Wages in 1924.

Under the Census of Production Act, 1906, the powers of the Board of Trade to require information do not extend to particulars of the amount of wages paid, and, consequently, no information on this head was secured in connexion with the Census of 1924. As a result, however, of the voluntary enquiry undertaken by the Ministry of Labour into wages and hours in the United Kingdom in 1924, information was obtained as to the total wage-bill of a group of firms in the Chemicals, Dyestuffs and Drugs Trades that made returns both to the Ministry of Labour and to the Census of Production office. According to the Census records this group of firms employed, in the week ended 18th October, 1924, 37,773 operatives, or 66 per cent. of the total of 57,271 operatives for the trades as a whole, and their net output totalled £15,425,000, or 61 per cent. of the aggregate net output of £25,425,000 for the trades as a whole. The total wage-bill of these firms, as returned to the Ministry of Labour, was £5,402,000, representing about 35 per cent. of their aggregate net output.

Employment.

The detailed information relating to employment in 1924 is summarised in Table III on page 53. The following table sets out certain particulars for that year together with those relating to the two previous censal years. For the purpose of this comparison, the average numbers of operatives of each sex returned for 1924 have been divided between the two age-groups in the proportions shown by the data relating to the week ended 18th October.

Average number.	Males.		Females.		Males and females	
	Under 18.	All ages.	Under 18.	All ages.	Under 18.	All ages.
	1924.					
Operatives	2,842	47,741	2,672	9,513	5,514	57,254
Administrative, etc. ..	548	8,699	403	3,292	951	11,991
TOTAL	3,390	56,440	3,075	12,805	6,465	69,245
1912.						
Wage earners	3,185	44,346	2,603	8,345	5,788	52,691
Salaried	499	7,197	251	1,411	750	8,608
TOTAL	3,684	51,543	2,854	9,756	6,538	61,299
1907.						
Wage earners	3,002	40,118	1,559	5,922	4,561	46,040
Salaried	552	5,572	88	645	640	6,217
TOTAL	3,554	45,690	1,647	6,567	5,201	52,257

The numbers of operatives recorded month by month in 1924 ranged from 632 above the average, in May, to 1,043 below the average, in January (see Table IIIB, page 53).

Mechanical Power.

The detailed information relating to mechanical power in 1924 is summarised in Table IV on page 54. The following table sets out the particulars for the three censal years relating to the capacity and kinds of *prime movers* and the capacity of *electric generators* installed.

Power equipment.	1924.			1912.	1907.
	Ordinarily in use.	In reserve or idle.	Total.	Total.	Total.
	H.P.	H.P.	H.P.	H.P.	H.P.
PRIME MOVERS :—					
Reciprocating steam engines	67,760	22,013	89,773	78,405	92,619
Steam turbines	24,575	15,250	39,825	2,938	435
Gas engines	8,470	27,986	36,456	31,914	} 15,469
Petrol and light oil engines	681	197	878	551	
Heavy oil engines	705	700	1,405	} 3,597	
Water power	317	—	317			1,924
Other	—	—	—	21	274
TOTAL	102,508	66,146	168,654	117,426	110,721
	Kw.	Kw.	Kw.	Kw.	Kw.
ELECTRIC GENERATORS :—					
Driven by—					
Reciprocating steam engines	12,124	6,674	18,798	7,457	10,776
Steam turbines	17,800	11,130	28,930	1,470	301
Gas engines	2,519	19,341	21,860	} 17,799	} 8,126
Petrol and light oil engines	69	30	99		
Heavy oil engines	172	440	612		
Water power	54	—	54		
Other prime movers	—	—	—		
TOTAL	32,738	37,615	70,353	26,726	19,203

The capacity of *electric motors* recorded in 1924 and in 1912 was as shown below :—

Electric motors.	1924.			1912.
	Ordinarily in use.	In reserve or idle.	Total.	Total.
	H.P.	H.P.	H.P.	H.P.
Driven by—				
Electricity generated in own works	35,993	16,006	51,999	11,050
Purchased electricity	55,524	12,489	68,013	16,665

Corresponding information was not required for 1907. The total number of Board of Trade units of electricity purchased for power and lighting purposes in that year was returned as 35,901,000.

TABLES.

I.—Summary of results.

Particulars.	Unit.	England and Wales and Northern Ireland.*	Scotland.	United Kingdom.
Value of goods made and work done (Gross output)	£'000.	52,230	3,974	56,204
Cost of materials used	"	28,174	2,594	30,768
Paid for work given out to other firms	"	11	—	11
Net output	"	24,045	1,380	25,425
Average number of persons em- ployed	No.	64,550	4,695	69,245
Net output per person employed ..	£	373	293	367
Mechanical power available :—				
Prime movers	H.P.	162,510	6,144	168,654
Electric motors driven by pur- chased electricity	"	62,901	5,112	68,013

* In order to avoid the possible disclosure of information relating to individual firms, the particulars for Northern Ireland have been combined with those for England and Wales.

II.—Production.

A.—TOTAL MAKE OF CERTAIN CHEMICAL PRODUCTS, AS RETURNED ON SCHEDULES FOR THE CHEMICALS, DYESTUFFS AND DRUGS TRADES.

Kind of product.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
Acids :—				
Acetic (including acetic anhy- dride)	Tons	*	*	3,040
Boric (boracic)	Th. tons.	*	*	2.9
Hydrochloric (at 1.14 s.g.) ..	"	203.2	19.2	222.4
Oxalic and oxalates	Th. lb.	66	—	66
Salicylic (including salicylates not elsewhere specified)	"	1,703	—	1,703
Sulphuric (at 1.7 s.g.)	Th. tons	709.1	93.3	802.4
Alumina, sulphate of (including potash and ammonia alum) ..	Tons	*	*	58,970
Ammonium compounds :—				
Carbonate	Th. tons.	*	*	3.7
Chloride (muriate)	"	*	*	8.9
Sulphate	"	38.7	3.0	41.7
Bleaching powder (chloride of lime)	Tons	*	*	65,770
Borax	"	8,340	—	8,340
Carbonic acid gas, compressed ..	"	4,910	—	4,910
Chloroform	Th. lb.	*	*	569
Coal tar products :—				
Anthracene	Tons	994	—	994
Benzol	Th. galls.	*	*	11,796
Carbolic acid (phenol)	Th. galls.	*	*	938
Naphtha	Tons	*	*	5,683
Naphthalene	Th. galls.	3,122	316	3,438
Tar oil, creosote oil and other heavy coal tar oils	Tons	*	*	6,282
Toluol	Th. galls.	47,563	3,307	50,870
Collodion	"	*	*	373
Copper sulphate	"	6.7	0.1	6.8
Ether, sulphuric	Th. tons.	8.7	—	8.7
Formaldehyde	Th. galls.	*	*	119
Intermediate coal tar products used in the manufacture of dyes (in- cluding aniline oil and salts and phenyl-glycine	Tons	*	*	740
Litharge	Th. cwt.	564.2	—	564.2
Lead compounds :—				
Litharge	Tons	*	*	8,050
Red lead and orange lead	"	*	*	7,360
Lime, acetate of	Th. galls.	*	*	52
Methyl alcohol	Tons	*	*	1,600
Potassium compounds :—	Th. galls.	183	28	211
Chloride (muriate)	Tons	*	*	640
Cyanide	"	150	—	150
Iodide	"	*	*	100
Sulphate	"	*	*	870
Sodium compounds	Th. tons.	*	*	1,534
Tartar, cream of	Tons	2,490	—	2,490

* In order to avoid the possible disclosure of information relating to individual firms, figures are given only for the United Kingdom as a whole.

† See footnote to Table I.

B.—OUTPUT FOR SALE OR FOR STOCK AND WORK DONE.

Kind of products.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
<i>Chemical manufactures</i> :—				
Acids :—				
Acetic (including acetic anhydride)	Tons	*	*	3,030
	£'000	*	*	95
Boric (boracic)	Th. tons	*	*	2.9
	£'000	*	*	117
Hydrochloric (at 1.14 s.g.)	Th. tons	189.3	19.2	208.5
	£'000	650	64	714
Oxalic and oxalates	Th. lb.	66	—	66
	£'000	4	—	4
Salicylic (including salicylates not elsewhere specified)	Mill. lb.	1.2	—	1.2
	£'000	84	—	84
Sulphuric (at 1.7 s.g.)	Th. tons	547.9	71.6	619.5
	£'000	1,925	224	2,149
Citric, tartaric and tartrates (not elsewhere specified)	Tons	4,090	—	4,090
	£'000	496	—	496
Nitric	Th. tons	*	*	8.0
	£'000	*	*	186
Other descriptions	Th. tons	4.5	†	4.5
	£'000	125	3	128
TOTAL VALUE—Acids	£'000	*	*	3,973
Aluminium compounds :—				
Sulphate of alumina (including potash and ammonia alum)	Tons	*	*	58,960
	£'000	*	*	337
Other sorts (excluding bauxite and abrasives)	Tons	*	*	37,770
	£'000	*	*	428
Ammonium compounds :—				
Carbonate	Th. tons	*	*	3.7
	£'000	*	*	120
Chloride (muriate)	Th. tons	*	*	8.8
	£'000	*	*	245
Sulphate	Th. tons	38.0	3.0	41.0
	£'000	460	38	498
Other sorts (including anhydrous ammonia)	Th. tons	25.3	0.3	25.6
	£'000	354	8	362
TOTAL VALUE—Ammonium compounds	£'000	*	*	1,225
Barium compounds (including binoxide and natural sulphate)	Tons	*	*	17,780
	£'000	*	*	193
Bleaching materials :—				
Bleaching powder (chloride of lime)	Tons	*	*	65,750
	£'000	*	*	574
Other sorts (hydrosulphites, peroxides, perborates, etc.)	Th. galls.	*	*	493
	£'000	*	*	27
	Tons	*	*	30,530
	£'000	*	*	543
Borax	Tons	7,560	—	7,560
	£'000	169	—	169
Compressed gases :—				
Carbonic acid	Tons	4,910	—	4,910
	£'000	136	—	136
Other	£'000	*	*	757

For notes see page 52.

B.—OUTPUT FOR SALE OR FOR STOCK AND WORK DONE—continued.

Kind of products.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
<i>Chemical manufactures</i> —continued.				
Chloroform	Th. lb.	*	*	545
	£,000	*	*	91
Coal tar products not elsewhere specified :—				
Anthracene	Tons	994	—	994
	£'000	11	—	11
Benzol	Th. galls.	*	*	11,460
	£'000	*	*	861
	Th. galls.	*	*	938
	£'000	*	*	81
Carbolic acid (phenol)	Tons	*	*	5,486
	£'000	*	*	208
Naphtha	Th. galls.	3,039	316	3,355
	£'000	188	17	205
Naphthalene	Tons	*	*	6,282
	£'000	*	*	54
Tar oil, creosote oil and other heavy coal tar oils, etc.	Th. galls.	47,029	3,307	50,336
	£'000	1,498	96	1,594
Toluol	Th. galls.	*	*	305
	£'000	*	*	26
	Th. galls.	1,827	—	1,827
	£'000	230	—	230
Other sorts	Tons	*	*	6,520
	£'000	*	*	157
TOTAL VALUE—Coal tar products	£'000	*	*	3,427
Collodion	Th. galls.	6.7	0.1	6.8
	£'000	14	§	14
Ether, acetic (ethyl acetate) and ether, butyric (ethyl butyrate)	Th. lb.	58.1	0.4	58.5
	£'000	6	§	6
	Th. galls.	*	*	119
Ether, sulphuric	£'000	*	*	62
	Tons	*	*	740
Formaldehyde	£'000	*	*	40
Iodine and iodides, not elsewhere specified	Th. lb.	141.2	58.2	199.4
	£'000	130	43	173
Lead compounds :—				
Red lead and orange lead	Tons	*	*	7,360
	£'000	*	*	302
Litharge	Tons	*	*	6,070
	£'000	*	*	249
Other sorts	£'000	112	4	116
Lime compounds, not elsewhere specified :—				
Acetate	Th. galls.	*	*	52
	£'000	*	*	2
	Tons	*	*	1,100
	£'000	*	*	13
Other sorts	£'000	56	6	62
Magnesium compounds (including chloride and sulphate)	Tons	*	*	21,760
	£'000	*	*	313
Potassium compounds :—				
Chloride (muriate)	Tons	*	*	640
	£'000	*	*	4

For notes see page 52.

B.—OUTPUT FOR SALE OR FOR STOCK AND WORK DONE—*continued.*

Kind of products.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
<i>Chemical manufactures—continued.</i>		Quantity	and selling	value.
<i>Potassium compounds—continued.</i>				
Cyanide	Tons	150	—	150
	£'000	20	—	20
Iodide	Tons	*	*	100
	£'000	*	*	197
Sulphate	Tons	*	*	570
	£'000	*	*	6
Other sorts	Tons	2,950	2,370	5,320
	£'000	96	103	199
TOTAL VALUE—Potassium compounds	£'000	*	*	426
Sodium compounds.. ..	Th. tons.	*	*	1,504
	£'000	*	*	9,846
Sulphur	Tons	7,340	—	7,340
	£'000	58	—	58
Synthetic organic chemicals for tanning (except dyes) and photo- graphic purposes, not elsewhere specified	Tons	3,730	—	3,730
	£'000	110	—	110
Tartar, cream of	Tons	2,490	—	2,490
	£'000	214	—	214
Tin salts	Tons	*	*	170
	£'000	*	*	21
Wood distillation products, not elsewhere specified :—				
Methyl alcohol	Th. galls.	183	28	211
	£'000	43	7	50
Other	£'000	85	18	103
Zinc compounds } <i>Quantity stated</i>	Tons	16,110	—	16,110
(oxide and } <i>Quantity not stated</i>	£'000	482	—	482
sulphate)	£'000	270	—	270
Other metallic compounds.. ..	Tons	800	—	800
	£'000	226	—	226
Other inorganic compounds	Tons	310	—	310
	£'000	21	—	21
Other organic compounds	Tons	*	*	260
	£'000	*	*	33
TOTAL VALUE—CHEMICAL MANUFACTURES	£'000	*	*	25,092
<i>Dyes and dyestuffs :—</i>				
Intermediate coal tar products used in the manufacture of dyes (including aniline oil and salts, and phenyl-glycine)	Th. cwts.	204.4	—	204.4
	£'000	1,200	—	1,200
Finished dyestuffs obtained from coal tar	Th. cwts.	*	*	378.7
	£'000	*	*	3,993
Extracts for dyeing	Th. cwts.	*	*	78.4
	£'000	*	*	159
Extracts for tanning (solid or liquid) :—				
Quebracho	Th. cwts.	*	*	514.7
	£'000	*	*	286
Other descriptions	Th. cwts.	*	*	821.2
	£'000	*	*	524

For notes see page 52.

B.—OUTPUT FOR SALE OR FOR STOCK AND WORK DONE—*continued.*

Kind of products.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
<i>Dyes and dyestuffs—continued.</i>		Quantity	and selling	value.
Extracts for dyeing, tanning and printing, not separately distin- guished	£'000	116	—	116
TOTAL VALUE—DYES AND DYESTUFFS	£'000	*	*	6,278
<i>Drugs, medicines and medicinal preparations :—</i>				
Glycero-phosphates	Th. lb.	42.8	—	42.8
	£'000	5	—	5
Novocain, eucain and similar local anæsthetics	Th. lb.	13.9	—	13.9
	£'000	42	—	42
Other drugs (cocaine, morphia and quinine and their salts, acetyl-salicylic acid, menthol, salvarsan, etc.)—				
<i>Quantity stated</i>	Th. lb.	*	*	518.3
<i>Quantity not stated</i>	£'000	*	*	531
Medicinal oils, not elsewhere specified	Th. cwts.	4.8	—	4.8
	£'000	36	—	36
Ointments and liniments	Th. cwts.	23.8	0.8	24.6
	£'000	310	10	320
Prepared foods for infants and invalids	£'000	1,913	42	1,955
Druggists' sundries, so far as separately returned	£'000	213	26	239
Proprietary medicines, not else- where specified	"	6,680	14	6,694
Galenic preparations, not else- where specified	"	4,482	194	4,676
TOTAL VALUE—DRUGS, MEDICINES, ETC.	£'000	*	*	14,514
<i>Miscellaneous chemical products :—</i>				
Ammoniacal liquor	£'000	1	—	1
	Mill. galls.	16.8	0.1	16.9
Coal tar	£'000	545	2	547
	Th. tons	187.3	30.7	218.0
	£'000	981	201	1,182
Boiler composition and disincrus- tants	£'000	297	4	301
Brewers' finings	£'000	186	2	188
Camphor	Th. tons	0.21	—	0.21
Essential oils	£'000	130	—	130
Finishing materials for the textile trades (gums, starches, etc.) not elsewhere specified	£'000	*	*	257
Flavouring essences, colours, etc., for confectionery and other culinary purposes	£'000	447	13	460
Pitch	Th. tons	287.0	19.0	306.0
	£'000	892	58	950
Purple iron ore	£'000	*	*	55

For notes see page 52.

B.—OUTPUT FOR SALE OR FOR STOCK AND WORK DONE—*continued.*

Kind of products.	Unit.	England and Wales and Northern Ireland.†	Scotland.	United Kingdom.
		Quantity	and selling	value.
<i>Miscellaneous chemical products—continued.</i>				
Unspecified and unenumerated chemicals	£'000	2,425	304	2,729
TOTAL VALUE—MISCELLANEOUS CHEMICAL PRODUCTS ..	£'000	*	*	6,800
<i>Other products :—</i>				
Coke	Th. tons	139.6	—	139.6
	£'000	170	—	170
Copper regulus, matte, precipitate, etc.	Th. tons	1.0	0.5	1.5
	£'000	42	13	55
Copper sulphate	Th. tons	8.7	—	8.7
	£'000	183	—	183
Copper, unwrought, in ingots, cakes or slabs	Th. tons	0.4	—	0.4
	£'000	27	—	27
Disinfectants, insecticides, weed-killers and sheep and cattle dressings—	Th. galls.	252.0	—	252.0
	£'000	21	—	21
{ Quantity stated ..	Th. tons	5.6	0.8	6.4
	£'000	239	23	262
{ Quantity not stated ..	£'000	175	—	175
Fertilisers, not elsewhere specified :—				
Superphosphates	Th. tons	66.4	6.0	72.4
	£'000	189	19	208
Guano, manufactured, and compound manures (including bonemeal and other manufactured fertilisers)—				
	Th. tons	50.2	9.8	60.0
	£'000	341	68	409
{ Quantity not stated ..	£'000	15	—	15
Glue and size	£'000	47	12	59
Oils and greases	£'000	116	33	149
Paints, colours, varnishes, etc. ..	£'000	340	24	364
Perfumed spirits	£'000	4	—	4
Perfumery and toilet preparations (other than perfumed spirits and soap)	£'000	297	—	297
Rubber substitutes	£'000	81	—	81
Soap :—				
Toilet	£'000	137	—	137
Other sorts	£'000	82	7	89
Tarred macadam, asphalt and other road making materials ..	£'000	255	27	282
Other goods	£'000	457	16	473
TOTAL VALUE—OTHER PRODUCTS ..	£'000	3,218	242	3,460
Work done for the trade	£'000	*	*	60||
TOTAL VALUE OF GOODS MADE AND WORK DONE (GROSS OUTPUT) ..	£'000	52,230	3,974	56,204

* See footnote to Table IIA. † See footnote to Table I. ‡ Less than 50 tons.
§ Less than £500. || Amount received for work done.

III.—Employment.

A.—NUMBERS EMPLOYED IN WEEK ENDED 18TH OCTOBER, 1924.

Kind of staff.	Males.		Females.		Males and females.	
	Under 18.	All ages.	Under 18.	All ages.	Under 18.	All ages.
<i>England and Wales and Northern Ireland† :—</i>						
Operatives	2,747	44,000	2,607	9,292	5,354	53,292
Administrative, etc.*	525	8,197	380	3,083	905	11,280
TOTAL	3,272	52,197	3,987	12,375	6,259	64,572
<i>Scotland :—</i>						
Operatives	92	3,537	90	442	182	3,979
Administrative, etc.*	23	502	23	209	46	711
TOTAL	115	4,039	113	651	228	4,690
<i>United Kingdom :—</i>						
Operatives	2,839	47,537	2,697	9,734	5,536	57,271
Administrative, etc.*	548	8,699	403	3,292	951	11,991
TOTAL	3,387	56,236	3,100	13,026	6,487	69,262

* Administrative, technical and clerical staff.

† See footnote to Table I.

B.—OPERATIVES EMPLOYED IN ONE WEEK IN EACH MONTH OF 1924.

England and Wales and Northern Ireland.* (Annual average : Males, 44,196 ; Females, 9,074 ; Total, 53,270.)

Week ended	Males.	Females.	Total.	Week ended	Males.	Females.	Total.
Jan. 12th ..	43,563	8,851	52,414	July 19th ..	44,551	8,833	53,384
Feb. 16th ..	43,670	8,845	52,515	Aug. 16th ..	44,412	8,838	53,250
Mar. 15th ..	44,038	8,995	53,033	Sept. 13th ..	44,415	9,012	53,427
Apl. 12th ..	44,540	9,060	53,600	Oct. 18th ..	44,000	9,292	53,292
May 17th ..	44,662	9,106	53,768	Nov. 15th ..	43,990	9,445	53,435
June 21st ..	44,560	9,113	53,673	Dec. 13th ..	43,955	9,492	53,447

Scotland. (Annual average : Males, 3,544 ; Females, 440 ; Total, 3,984.)

Jan. 12th ..	3,356	441	3,797	July 19th ..	3,638	441	4,079
Feb. 16th ..	3,434	443	3,877	Aug. 16th ..	3,598	440	4,038
Mar. 15th ..	3,483	434	3,917	Sept. 13th ..	3,569	443	4,012
Apl. 12th ..	3,575	433	4,008	Oct. 18th ..	3,537	442	3,979
May 17th ..	3,672	447	4,119	Nov. 15th ..	3,535	441	3,976
June 21st ..	3,638	441	4,079	Dec. 13th ..	3,494	434	3,928

United Kingdom. (Annual average : Males, 47,740 ; Females, 9,514 ; Total, 57,254.)

Jan. 12th ..	46,919	9,292	56,211	July 19th ..	48,189	9,274	57,463
Feb. 16th ..	47,104	9,288	56,392	Aug. 16th ..	48,010	9,278	57,288
Mar. 15th ..	47,521	9,429	56,950	Sept. 13th ..	47,984	9,455	57,439
Apl. 12th ..	48,115	9,493	57,608	Oct. 18th ..	47,537	9,734	57,271
May 17th ..	48,333	9,553	57,886	Nov. 15th ..	47,525	9,886	57,411
June 21st ..	48,198	9,554	57,752	Dec. 13th ..	47,449	9,926	57,375

* See footnote to Table I.

IV.—Mechanical Power.

PARTICULARS OF PRIME MOVERS, ELECTRIC GENERATORS
AND ELECTRIC MOTORS.

Power equipment.	England and Wales and Northern Ireland.*		Scotland.		United Kingdom.	
	Ordinarily in use.	In reserve or idle.	Ordinarily in use.	In reserve or idle.	Ordinarily in use.	In reserve or idle.
	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.
PRIME MOVERS :—						
Reciprocating steam engines	63,511	20,438	4,249	1,575	67,760	22,013
Steam turbines	24,565	15,240	10	10	24,575	15,250
Gas engines	8,173	27,986	297	—	8,470	27,986
Petrol and light oil engines	678	197	3	—	681	197
Heavy oil engines	705	700	—	—	705	700
Water power	317	—	—	—	317	—
TOTAL	97,949	64,561	4,559	1,585	102,508	66,146
TOTAL OF PRIME MOVERS INSTALLED	162,510		6,144		168,654	
	Kw.	Kw.	Kw.	Kw.	Kw.	Kw.
ELECTRIC GENERATORS :—						
Driven by—						
Reciprocating steam engines	10,561	6,161	1,563	513	12,124	6,674
Steam turbines	17,800	11,130	—	—	17,800	11,130
Gas engines	2,389	19,341	130	—	2,519	19,341
Petrol and light oil engines	69	30	—	—	69	30
Heavy oil engines	172	440	—	—	172	440
Water power	54	—	—	—	54	—
TOTAL	31,045	37,102	1,693	513	32,738	37,615
TOTAL OF ELECTRIC GEN- ERATORS INSTALLED	68,147		2,206		70,353	
	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.
ELECTRIC MOTORS :—						
Driven by—						
Electricity generated in own works	33,062	15,794	2,931	212	35,993	16,006
Purchased electricity	51,441	11,460	4,083	1,029	55,524	12,489

* See footnote to Table I.