

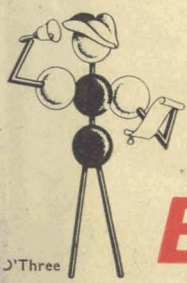
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# THE Chemical Age

VOL. LXXIV

7 JANUARY 1956

No. 1904



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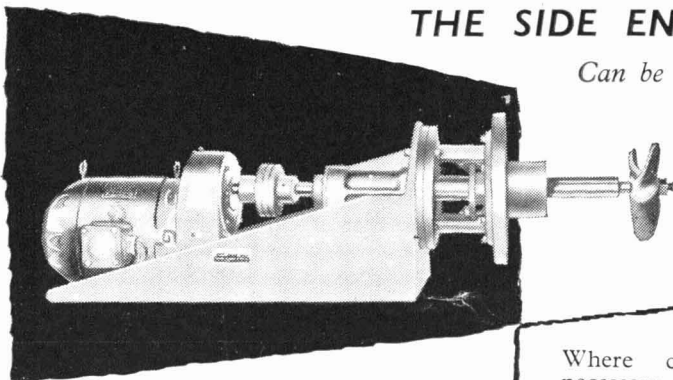
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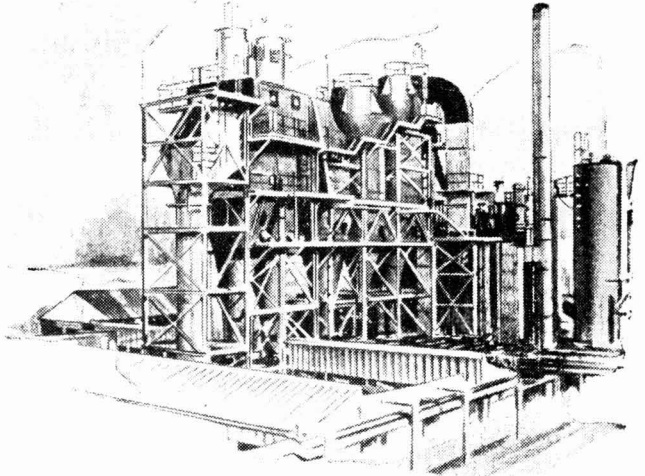
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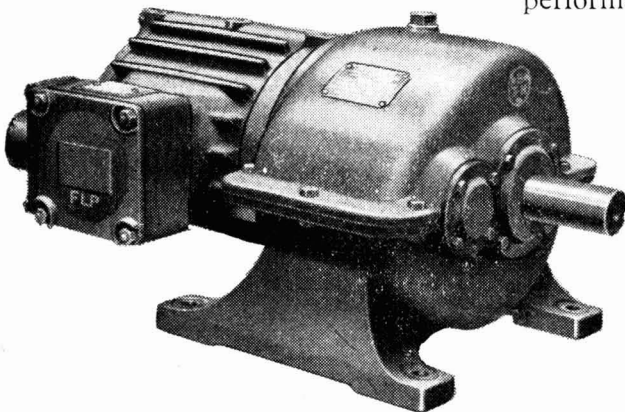
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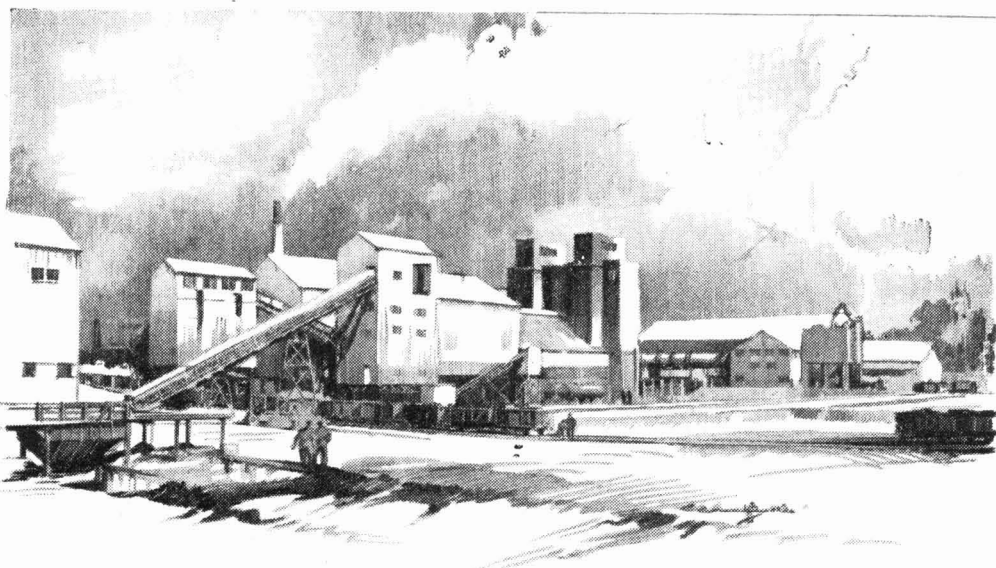
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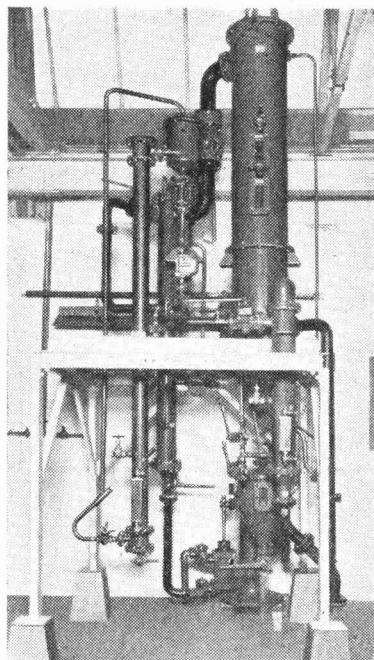
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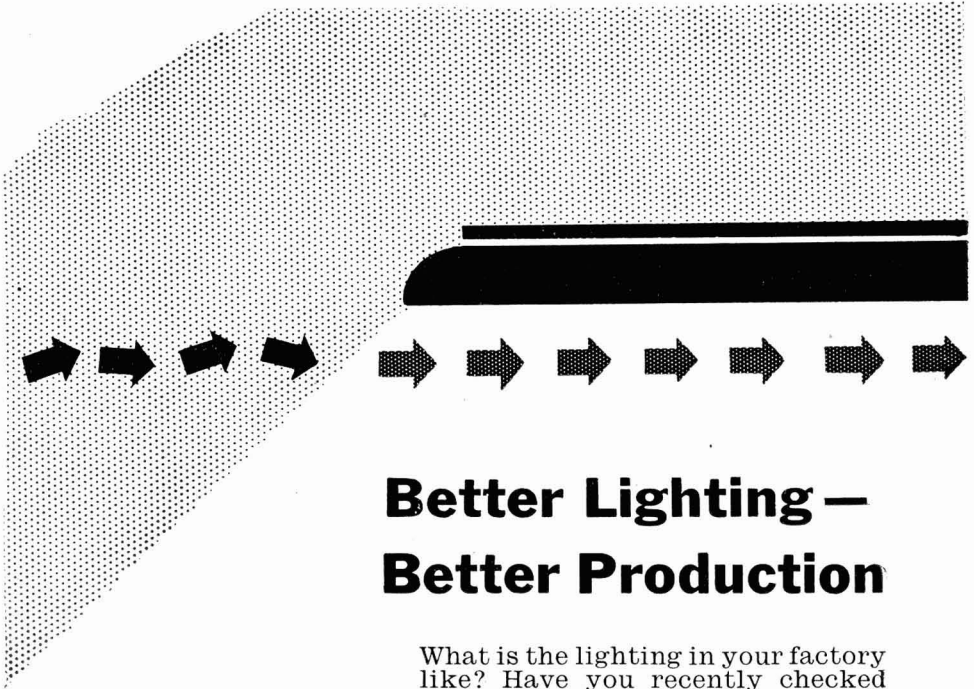
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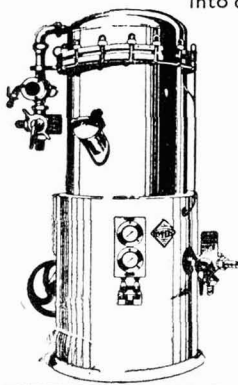
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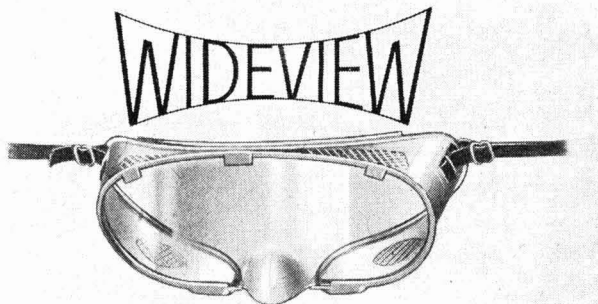
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Volume LXXIV

Number 1904

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# The Chemical Age

*The Weekly Journal of Chemical Engineering and Industrial Chemistry*

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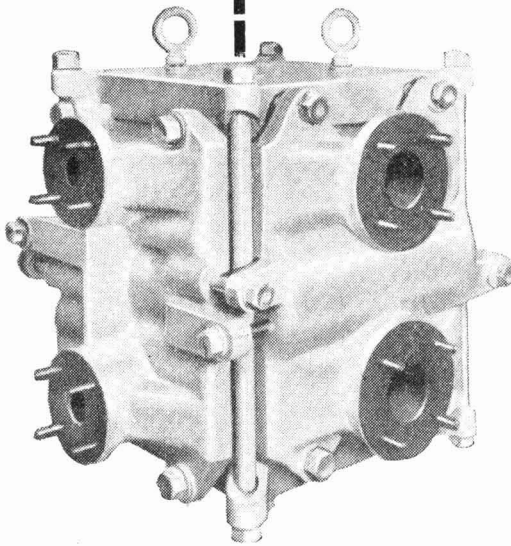
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## OEEC Lessons

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**T**WO informative and interesting reports have recently been published by the Organization for European Economic Co-operation. The first of these appeared on 20 December and was a preliminary report on possibilities for co-operative action in the development of nuclear energy. The other was the second annual report drawn up by the Chemical Products Committee, 'The Chemical Industry in Europe.'<sup>\*</sup> Both contain an important lesson for the reader.

On 10 June 1955 OEEC member countries declared their intention of 'co-operating with a view to the use of nuclear energy for peaceful purposes' and a three-man working party was set up with instructions to 'examine and report to the Council on the possible scope, form and method of such co-operation.' The working party visited 12 member countries including the UK and contacted US and Canadian exporters before publishing its preliminary report. In this the authors express the opinion that Europe's present atomic energy effort falls far short of its industrial potential but add that should Europe make the effort (provided that it secures access to fissile materials) the leeway could be made up. But success, they conclude, depends on co-ordinated effort between member countries. They recom-

mend the setting up of a special committee of the Council to deal with matters relating to nuclear energy. The OEEC, they state, can make national efforts fully effective and prevent them coming into conflict. Co-operation is recommended under six heads: comparison of programmes and projects, promotion of joint ventures, harmonization of legislation, promotion of training, promotion of standardization and a system of international trading. The most interesting proposal in the report is for the establishment of companies independent of the OEEC to carry out joint projects relating to production and applied research.

The report is not very positive regarding these companies; indeed it is indefinite in many other respects. This may well have been deliberate as there is still considerable difference of opinion between governments regarding the best way nuclear energy can be developed for the common good. It achieves one important object, however, and that is to make it clear that joint action is necessary. The vast amount of capital needed and the huge scale on which research must be carried out make it obvious that international teamwork is the only solution. The report leaves many important questions unanswered. The need has been clearly demonstrated and a few tentative suggestions have been made as

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<sup>\*</sup> See p. 17 in this issue.

to the method but the details must be worked out. Nevertheless, the document is thought-provoking and timely.

The second report gives a general picture of the position in the European chemical industry in 1954. It does not attempt to convince or even advise but as the industry throughout Western Europe has been making excellent progress and the tendencies are in the right direction, there was no need for the Chemical Products Committee to exhort or even recommend. After giving the known facts about the industry in the 12 countries concerned, the Committee merely expresses the opinion that 'the outlook for the chemical industry as a whole may be considered favourable, owing to the development of new products and the wide range of its activities.' It is a far more encouraging report than the one on atomic energy and of more lasting usefulness. The first is a stimulus, the second a reference, although it was probably intended to encourage as well. It contains statistics not easily obtainable and will be of great use to anyone interested in the manufacture and sale of chemicals.

From the report it can be seen that 1954 was a good year for the chemical industry. In the member countries production rose on an average by 15 per cent over 1953, whereas total industrial production increased by only 9 per cent. In the US chemical production remained stable in 1954 while total industrial production decreased by 8 per cent. The increase was greatest in some of the countries which have been slow in either developing or recovering from the effects of the last war. In Greece the increase in production compared with 1953 was 39 per cent, in Italy it was 22 per cent, Norway 21 per cent, the Belgo-Luxembourg Economic Union 19 per cent, Germany 16 per cent, France 15 per cent and the UK 11 per cent. In France investment was approximately equivalent to US\$143,000,000, in Italy \$137,000,000, in Germany \$200,000,000 and in the UK \$180,000,000. International trade in chemicals expanded during 1954. Between OEEC member countries and their overseas territories it increased by 19 per cent or 4 per cent more than production. But the trade

between member and non-member countries was far less satisfactory. Here there was a rise of 46 per cent in imports compared with 1953 while exports increased by only 21 per cent. The value of OEEC exports to outside countries was approximately \$1,060,000,000, or roughly the same as the total of US chemical exports.

Although the report is undoubtedly an encouraging one it does contain a gentle warning, half hidden beneath the mound of statistics. This is that it is imperative that the European chemical industry continues or even intensifies its efforts if it hopes to keep its place in the markets of the world. This is partly owing to the fact that expansion is taking place elsewhere and partly to the fact that chemical production in general is increasing quicker than home demand. If output is to continue to expand, member countries must dispose of an increasing part of their production on foreign markets. And here, says the report, competition is bound to increase, notably from the US. It is also clear that European countries must either increase their exports or lower their imports from the dollar countries. In 1954 there was a commercial deficit in trade with the dollar countries, owing to a sharp rise in imports and a decline in exports. The OEEC Committee thinks that this is merely a temporary situation owing to the large-scale investments planned, notably in the petrochemical field.

The report 'The Chemical Industry in Europe' on the surface is overwhelmingly encouraging, but for the British industry at least it should not be used as an excuse for sitting back and taking things easy. The growing strength of the German industry is clearly shown as is the expansion in many countries which have in the past relied largely upon imports from Britain. From the point of view of productive capacity we seem to be sitting pretty in spite of the fact that imports from the US and Canada have been steadily increasing here as in Germany and elsewhere. But is enough attention being paid to the drawing up of long-term sales campaigns? At the moment the accent should be shifting towards selling and it is dollars that this country needs most urgently.

# Notes & Comments

## Anniversaries in 1956

THE principal chemical anniversary of the New Year is that of Perkin's youthful discovery of mauve, an event that is being duly celebrated. Otherwise a quick survey of chemical history has not shown the usual number of important centenaries or jubilees for events or persons. The centenary year for the Bessemer steel process and the half-centenary of the Caro process for cyanides and cyanamides can be listed. Certainly all these events were of great industrial significance. In the field of theory it is 150 years since Proust put forward the law of constant proportions, again a chemical event of far-reaching effect. But there is one most sombre anniversary, made particularly memorable now that it falls in an atomic age—it is fifty years since Pierre Curie slipped on a wet Paris street, and was crushed to death under the wheels of a six-ton wagon. The outstanding pioneer of radioactivity died at the early age of 47, the victim of a traffic accident. Not only was a brilliant career brought to a premature end, but the most famous of the few scientific research partnerships between a man and his wife finished in tragedy. Madame Curie was left to continue alone. It is a personal story of science that is more widely known than most, for it has been told in more than one book and has been the subject of a notable film. It must indeed be 1956's outstanding remembrance.

## Canadian Chemicals

THE latest statistics for Canadian industry—they cover the first six months of 1955—show that Canada's chemical industry is continuing to make exceptionally expansive progress. For all manufactures the sales figure for the first half of 1955 was 6 per cent higher than that for the similar period of 1954, but with chemicals the increase was 9 per cent. This is not an illusory gain, owing much of its numerical expansion to price jumps; for chemicals the price-index of 1955 is only slightly above 1954's

level. More remarkable still is the rise in chemical trading profits. After tax deduction, profits for chemical manufactures were as much as 38 per cent higher than profits in the first half of 1954. To make 38 per cent more on a production that has risen by 9 per cent may perhaps suggest over-pricing, but it is far more realistic to say that with this new surge in output some of the more recent large-scale chemical ventures have begun to make their full returns on investment. In any case, suspicions of excessive profit-making fade when demand is examined—new orders exceed the 1954 level, and the Canadian home-market is heavily exposed to American competition. Also, export trade is now growing at a faster rate than chemical imports; data so far available for 1955 show a 35 per cent gain in export compared with a 12½ per cent increase in imports. This must be giving the Canadian chemical industry some most welcome satisfaction. Incidentally, it is reported that the biggest export trade gain in 1955 was made in chemical sales to the UK.

## Aqueous Facts

THE water supply problem is more serious in the United States than in Britain. We are, by comparison, better endowed with natural supply and storage facilities; when we read about US efforts to use de-salted sea water for industry etc., many of us feel that similar things need not be contemplated here. But our national supply is far from uniform in its adequacy—droughts have very different effects in different regions or areas. It is also disconcerting to reflect that some of the districts that most quickly suffer from water shortage problems are in the wetter or wettest parts of the country! Moreover, most of our water problems are being rapidly aggravated by fast-rising industrial demands. Getting on for a fifth of our total water needs have hitherto been drawn from natural underground storage (ground water), but rate of extraction now exceeds rate of replenishment in most of these



areas. It has been a common industrial practice to sink private wells. Only in a few areas is this practice subject to control by local authority.

### *Urgent Problem*

**S**OONER or later a national water supply policy will have to be developed. As *Nature* (1955, 176, 1133) recently pointed out, there are not only more than 1,100 public supply undertakings in England and Wales, but there are innumerable 'private water developers' such as the hundred or more private well-owners in the City of London. Many branches of chemical

industry are closely concerned. Producing a ton of sulphite paper uses 64,000 gallons, processing a gallon of alcohol requires 100 gallons of water. On the whole, it can be said that new chemical works or new processes have been able to take their water needs for granted, perhaps not always as cheaply as expected, but the problem has rarely passed beyond the costings level. Unless much more is done in the next decade to unify the national water supply system and control indiscriminate extraction, new industrial developments will be more and more site-restricted by water considerations. Here is a problem of much more urgency than most people suppose.

### *Lanolin Factory Blaze*

THERE was an outbreak of fire in the early hours of 24 December at a warehouse belonging to the Westbrook Lanolin Co., Argonaut Works, Laisterdyke, Bradford, which badly damaged the structure of the three-storey building. The outbreak started on the ground floor and is believed to have been caused by an electrical fault. The alarm was given by a night-shift worker shortly after 4 a.m. Bradford and Pudsey fire brigades had the blaze under control within 45 minutes, but the roof was burnt off and the top and second floors were extensively damaged. While the firemen fought the flames, night-shift workers removed hundreds of drums of highly inflammable lanolin from the ground floor.

The firm, which belongs to Woolcombers Ltd., Bradford, is one of the largest manufacturers of lanolin in the world.

The production manager, Mr. G. F. Kitchen, said afterwards that the fire would not affect production. He thought the damage might amount to a few thousand pounds. Only a quarter of the first and second floors were damaged. The second and third floors of the building were used for storing empty drums.

### *Warerite Integration*

ESTABLISHED to manufacture decorative laminated plastics at Ware, Hertfordshire, in 1937, and acquired by Bakelite Ltd. two years later, Warerite Ltd. has been more closely integrated with its parent company.

During the war Warerite operated as a 'shadow' factory producing Bakelite laminated materials, and after the war the Bakelite and Warerite decorative laminated plastics business was concentrated at the factory at Ware.

The integration which became operative from 1 January means that all Warerite materials are now produced and sold by Bakelite, but still under the Warerite trade name. Inquiries regarding Warerite materials should be addressed to Bakelite's sales office, 12-18 Grosvenor Gardens, London SW1. Except for Mr. A. W. Sherwood, manager since 1945, the personnel of Warerite remains unchanged. Mr. Sherwood has been appointed to undertake wider activities in the Bakelite organization as sales promotion executive.

### *Ion Exchange Resin*

IN OUR report of a lecture 'Ion Exchange Resins' given by Dr. T. V. Arden of the Permutit Co. Ltd. at Woolwich Polytechnic on 14 November (see *THE CHEMICAL AGE*, 1955, 73, 1267) it was stated that the ion exchange properties of sulphonated coal were discovered in Germany in 1934.

Industriële Maatschappij Activit of Holland have written to Dr. Arden pointing out that their discovery of the same process preceded the German work by two months.

The Dutch patents were registered as BP 450179 and BP 450540. The German patent is BP 478134.

# Chemical Exports for November

## Australia & India Principal Buyers

THE value of British chemicals exported in November showed a small gain over the preceding month, and was more than £6,000,000 higher than in the corresponding month last year. Australia and India were still the chief importers, each spending more than £1,000,000. Of the 18 countries listed as principal buyers of British chemicals, seven, including Australia and India, decreased the value of their imports. All of the remaining 11 countries increased the value of their chemical imports from Britain.

Demand for most chemicals remained steady during the month, but the value of fertilizer exports, which fell from £535,171 in September to £234,733 in October, rose in November to £308,266. The value of plastics materials exported slumped from £454,490 in October to £149,260. Demand for creosote oil which rose to over 3,000,000 gallons in October declined, 1,099,999 gallons being exported. This total is consistent with the demand for creosote oil in all other months this year, other than October. The biggest increase recorded was in organic acids and derivatives which reached a value of £113,743, almost double the sales in November 1954.

### EXPORTS: PRINCIPAL COMMODITIES

	Nov. 1955	Oct. 1955	Nov. 1954
Acids, inorganic (cwt.)	18,090	18,599	13,053
Copper sulphate (tons)	1,505	2,166	1,645
Sodium hydroxide (cwt.)	316,185	300,189	159,251
Sodium carbonate (cwt.)	450,593	492,478	248,029
Aluminium oxide (tons)	511	1,015	4
Aluminium sulphate (tons)	3,310	4,327	2,128
Ammonia (cwt.)	11,437	8,385	4,915
Bismuth compounds (lb.)	30,634	25,279	22,754
Bleaching powder	25,728	32,206	22,576
Hydrosulphite (cwt.)	7,042	11,468	5,996
Calcium compounds inorganic (cwt.)	26,871	32,037	21,558
Lead compounds inorganic (cwt.)	6,358	6,261	6,276
Magnesium compounds (tons)	2,485	1,931	1,300
Nickel salts (cwt.)	5,052	5,650	5,730
Potassium compounds (cwt.)	4,391	5,638	2,554
Acids, organic & derivatives (value in £s)	113,743	92,053	59,493
Ethyl, methyl, etc. alcohols (value in £s)	97,400	127,753	125,541
Acetone (cwt.)	12,316	9,360	14,932

Citric acid (cwt.)	3,073	2,087	2,037
Sulphonamides, unprepared (lb.)	77,232	78,782	53,630
Dyestuffs intermediates (cwt.)	6,165	5,730	3,106
<b>Total for elements &amp; compounds in £s</b>	<b>4,404,364</b>	<b>4,634,650</b>	<b>3,229,508</b>
Coal tar (tons)	13,749	6,584	10,069
Cresylic acid (gal.)	252,780	223,313	102,924
Creosote oil (gal.)	1,099,999	3,519,125	1,305,846
<b>Total for tar products in £s</b>	<b>305,534</b>	<b>410,796</b>	<b>203,127</b>
Indigo, synthetic dyestuffs (cwt.)	964	3,648	1,590
<b>Total for synthetic dyestuffs (cwt.)</b>	<b>17,532</b>	<b>22,191</b>	<b>14,571</b>
<b>Total for paints, pigments &amp; tannins in £s</b>	<b>2,084,694</b>	<b>2,042,015</b>	<b>1,288,158</b>
<b>Total for medicinal &amp; pharmaceutical products in £s</b>	<b>3,426,029</b>	<b>3,203,070</b>	<b>2,241,675</b>
<b>Total for essential oils, perfumes, etc. in £s</b>	<b>2,542,101</b>	<b>2,297,858</b>	<b>1,459,682</b>
Ammonium nitrate (tons)	42	546	619
Ammonium sulphate (tons)	13,122	9,652	45,770
<b>Total for all fertilizers in £s</b>	<b>308,266</b>	<b>234,733</b>	<b>892,071</b>
<b>Total for plastics materials (cwt.)</b>	<b>149,260</b>	<b>454,490</b>	<b>110,402</b>
Disinfectants etc. (cwt.)	17,735	17,422	13,306
Insecticides, fungicides (cwt.)	31,061	38,696	15,145
Rodenticides & weed-killers (cwt.)	5,738	2,131	5,295
Lead tetra-ethyl (gal.)	451,411	502,370	241,294
<b>VALUE OF EXPORTS IN £S: PRINCIPAL BUYERS OF CHEMICALS</b>			
	Nov. 1955	Oct. 1955	Nov. 1954
Australia	1,367,823	1,747,950	868,338
India	1,239,077	1,501,807	976,822
Canada	940,184	857,831	850,256
South Africa	892,251	971,358	572,065
Netherlands	762,971	654,058	701,796
New Zealand	753,831	707,667	394,155
Eire	641,422	570,782	543,944
Italy	639,633	535,071	445,305
Sweden	582,720	543,990	506,974
United States	565,280	679,011	403,179
Western Germany	543,621	516,905	493,463
Belgium	493,413	405,327	421,506
Pakistan	485,352	414,664	234,535
Nigeria	482,229	533,817	233,904
France	464,544	512,118	517,166
Gold Coast	422,499	361,965	190,251
Denmark	388,454	358,331	341,004
Argentina	165,934	478,540	520,940
<b>Total value of chemical exports</b>	<b>20,596,605</b>	<b>20,589,416</b>	<b>14,417,946</b>

## New Year Honours

### Barony for Sir Frederick Godber

SIR FREDERICK GODBER, chairman, Shell Transport & Trading Co. Ltd., has been created a baron in the New Year Honours List, and SIR HUBERT STANLEY HOULDSWORTH, Q.C., chairman, National Coal Board, has been made a baronet.

Other awards include the following:—

#### Knights Bachelor

ERIC ASHBY, President and Vice-Chancellor, Queen's University, Belfast; HENRY FRANK HARDING JONES, M.B.E., deputy chairman, Gas Council; PROFESSOR SOLLY ZUCKERMAN, C.B., deputy chairman, Advisory Council on Scientific Policy; and JOSEPH BURTT HUTCHINSON, C.M.G., director, Empire Cotton Growing Corporation's Cotton Research Station, Namulonge, Uganda.

#### Order of the Bath

##### K.C.B.

SIR FREDERICK BRUNDRETT, K.B.E., C.B., chairman, Defence Research Policy Committee and scientific adviser to the Minister of Defence.

#### Order of the British Empire

##### D.B.E.

MRS. KATHLEEN LONSDALE, professor of chemistry and head of the department of crystallography, University College, University of London.

##### K.B.E.

SIR HUGH EYRE CAMPBELL BEAVER, who was chairman of the Committee on Air Pollution.

##### C.B.E.

CECIL EDWIN HENRY BAWN, Grant-Brunner Professor of Inorganic and Physical Chemistry, University of Liverpool; SAMUEL HARRISON CLARKE, director, Fire Research Station, DSIR; PROFESSOR JAMES ROBERT MATTHEWS, chairman of the council, Macaulay Institute for Soil Research.

##### O.B.E.

HENRY JAMES DOWDEN, M.C., senior principal scientific officer, DSIR; DOUGLAS GORDON DUFF, lubricating oil adviser, Ministry of Fuel and Power; RONALD FREDERICK JOHNSTON, principal scientific officer, Atomic Weapons Research Establishment, Foulness, UK Atomic Energy Authority; and ALFRED TENNYSON PARSONS, lately senior principal scientific officer, Government Chemists Department.

#### British Empire Medal

HAROLD JOHN DIXON, foreman, Civil Re-

serve Oil Installation (Stourport), Regent Oil Co. Ltd., Stourport-on-Severn; CHARLES HENRY LEADBEATER, research and experimental mechanic (special) fitter, Atomic Weapons Research Establishment, Aldermaston, Reading; and JAMES WILSON, artificer, National Physical Laboratory, DSIR, Twickenham, Middlesex.

## Italian Pharmaceuticals

OPPOSITION to a new Bill concerning the production, import and sale of pharmaceuticals in Italy is reported from both the Italian pharmaceutical industry and from foreign producers. It is feared that the market for British, American, German and Swiss products, in particular, will be damaged.

The Italian pharmaceutical industry is the fourth largest in the world and there are an estimated 30,000 to 60,000 proprietary medicines in Italy.

If the Bill becomes law there will be an absolute ban on all advertizing for medical products except in medical publications, and a limit will be put on authorized proprietary medicines.

Under the new law only five analgesic proprietary medicines would be authorized and at most five more could be imported. It is thought that foreign proprietaries would be almost squeezed out of the market.

The draft of the new law should come before the Italian Parliament in the near future and it is believed that it will become a major political issue.

## Minerals in Transvaal

The Phosphate Development Corporation Ltd. in the Northern Transvaal, in addition to producing rock phosphate, will produce other minerals as by-products. There are hints that uranium and thorium occur naturally in the centre core of the seven square mile deposit and the Department of Mines and the Geological Survey have been studying and analysing the deposits, which certainly contain magnetite, copper and baddeleyite.

## Extension Plans

Walker Extract & Chemical Co. Ltd. have had plans submitted for building extensions to their premises in Moncrieffe Street, Bolton, Lancs.

# European Chemical Industry

## High Level of Activity in 1954 States OEEC Report

FIGURES published in 'The Chemical Industry in Europe', a study prepared by OEEC, 2 rue André-Pascal, Paris 16 (price 12s), and covering 1954 and part of 1955, show that the chemical industry in member countries represents about three per cent of total national production. An average taken over 12 countries shows that 1.2 per cent of the total labour force is employed in the chemical industry, thus making this industry one of the most productive in terms of man-power.

During the period covered by this report a high level of activity was recorded in nearly all sectors of European industry. The temporary levelling off which was felt in the United States did not seriously affect production in Europe. For OEEC countries as a whole chemical production showed an increase of 15 per cent compared with 1953. The total for all industrial production for the same period was nine per cent.

Most member countries reported that this upward trend continued during the first half of 1955. In the United States the output of the chemical industry has started to rise and a sharp increase is expected.

Use of production capacity in the key sectors has generally been satisfactory. Some cases of surplus capacity have, however, been reported in sectors working for other industries or for direct consumption. Cases in point are dyestuffs, vegetable and synthetic tannins, soaps and superphosphates.

### No Raw Materials Problems

The supply of raw materials raised no problems in 1954. Many materials were available on the spot and imports of other raw materials such as phosphate rock, bone etc. did not seem to have involved any difficulty. Owing to a slackening of demand on the home market the United States' exports to Europe were in general sufficient to meet demand.

The total labour force employed in the chemical industry in OEEC countries in 1954 was roughly 1,400,000. This figure appears to be slightly larger than for 1953. Western Germany is the largest employer

(342,671) with the United Kingdom second (335,000) France third (213,000) and Italy fourth (189,000). These four countries account for about three quarters of the OEEC countries' total chemical production.

For the eight countries for which figures are available (Belgo-Luxembourg Economic Union, France, Italy, Netherlands, Norway, Sweden, United Kingdom and Western Germany) investments in the chemical industry during 1954 amounted to about \$775,000,000 as against a value added of about \$5,000,000,000. It seems reasonable to assume, says the report, that the rate of investment in OEEC countries for 1954 was about 15 per cent of the value added. The corresponding figure for the United States amounted to about 14 per cent.

### Investments Distribution

Investments largely went to the basic sectors of the industry (in particular to petroleum chemicals) and to fertilizers, plastics materials and synthetic detergents.

Investment in the chemical industry is mainly financed from the industry's own resources, a large part of profits, particularly of large concerns, being ploughed back for this purpose. Several companies often pool their resources and experience in order to set up new plant.

An indication of the amount to which automation is applied can be gained by studying the index for chemical production with the index of manpower employed. In seven countries out of eight for which figures are given the production index has increased by a much greater amount than the manpower index. For example, taking the 1950 figures as 100 in each case, the figures for the UK are: manpower index 104, production index 117.

It is emphasized that in interpreting figures of this sort it should be remembered that the chemical industry differs from many other industries where a straightforward comparison can be made between manpower and output. It is not possible to draw any real or valid conclusions from such comparisons in the chemical sector.

In discussing research the report says that

the expenditure in this field is difficult to obtain. Large companies often devote five per cent or more of their turnover on applied research. This topic has been treated in a previous publication ('The Organization of Applied Research in Europe and the United States', OEEC, Paris, 1954).

For a more detailed analysis of the chemical industry the report divides materials into 11 sections: basic chemicals, petroleum chemicals, dyestuffs, tanning materials, paints, pigments, varnishes and related materials, medicinal and pharmaceutical products, soaps and detergents, fertilizers, plastics materials, miscellaneous chemical products and photographic and cinematographic supplies.

### Basic Chemicals

Basic chemicals include six key inorganic chemicals (soda ash, caustic soda, chlorine, calcium carbide, sulphuric acid and ammonia), certain organic chemicals (methanol, acetic acid, acetone and phenol, phthalates and plasticizers), benzole and naphthalene derived from coal, petroleum and natural gas.

Sulphuric acid production, which is often considered to reflect the general level of activity in the chemical industry, was in general at a high level in 1954. Apart from the smaller producers (Austria, Greece and Portugal) whose output has risen considerably over the past five years, the largest increase will be found in Germany where production has expanded by two thirds since 1949-50.

The trend towards the reduction in the use of sulphur as such compared with other sulphurous materials for the manufacture of sulphuric acid continued in 1954, when only 347,700 metric tons were used as against 476,300 metric tons in 1949-50.

Consumption of pyrites and other sulphurous materials amounted to 3,136,000 metric tons or an increase of 50 per cent over the tonnage used five years ago.

The demand for methanol, particularly from the plastics industry, is rising rapidly and the output of five of the nine OEEC countries producing the chemical has nearly doubled since 1950. Information for the United Kingdom is no longer available since there is only one producer. However, output was considerable in the past and is likely to remain so. United States output in 1954 amounted to 510,000 metric tons,

compared with 193,750 metric tons for the five OEEC countries considered.

Output is rising more rapidly in those countries where production is already considerable.

With the development of plastics materials the demand for phthalic acid compounds has risen considerably over the last few years, increasing in the United Kingdom for example by nearly two thirds in 1954 compared with 1953. Output has also been rising in Germany, Norway and Sweden. In general the capacity for phthalates and plasticizers is sufficient to meet requirements.

The section on basic chemicals concludes by saying that throughout western Europe the chemical industry is expanding but imports are, however, rising. The levelling off in demand in the United States may to some extent have stimulated exports of basic chemicals, but the rise in European imports from dollar sources appears rather to be due to the fact that sufficient supplies of basic chemicals have not always been available to meet the demands of manufacturers of semi-finished and finished products. The heavy investments to be made in this sector may be expected to remedy this situation in the not too distant future.

Prices, in particular of chemicals sold in bulk, have shown a downward trend over the last two years says the section on petroleum chemicals. Reasons for this are believed to be on the one hand increased competition and on the other hand a lowering of production costs due to improvements in efficiency and the increased scale of production.

### Main Expansion Areas

The main expansions in the last two years have taken place in France and Italy rather than in the United Kingdom which had developed petroleum chemical production on a substantial scale in the immediate post-war period.

Plans for the establishment of a petroleum industry in the Belgo-Luxembourg Economic Union (BLEU) have not changed since last year's report. The plant, at Antwerp, is expected to come on stream by the beginning of 1957, producing ethylene oxide and derivatives, acetone and phenol by the cumene route, and raw materials for synthetic detergents.

At present the only member countries producing petroleum chemicals are France, Germany, Italy, the Netherlands and the

United Kingdom. No plans for the production of petroleum chemicals in other countries have been reported.

The value of production of dyestuffs increased by 20 per cent in OEEC members' countries between 1953 and 1954, compared with an increase of 13 per cent in tonnage. The average value per kilogramme of dyestuffs rose from \$2.83 to \$3. This can be attributed in part to the increased production of high grade materials.

The report forecasts that the activity of the textile industry will ensure a slightly increasing demand for dyestuffs on home markets. Demand for other uses (e.g. paper-making) is expected to be maintained.

On external markets the development of the textile industry in overseas countries and the rising standard of living also suggest a slightly increasing demand. Payment difficulties are the biggest obstacles, particularly in trade with South America.

The forecasts made are based principally on the expected trend in high grade dyestuffs. It may become more and more difficult to dispose of traditional products as a result of surplus capacity and the resultant competition.

After years of extensive fluctuation the tanning chemicals' situation seems to be more stable according to figures available for 1954. The level of activity remains low owing to the difficult situation of the leather industry. It was found, says the report, that member countries in 1954 relied more than formerly on products from other member countries and their overseas territories. It is the hope of OEEC that this trend will be continued and possibly intensified.

#### Price Changes

There has been a tendency for prices of paints, pigments, varnishes etc. to fall, but despite this exports rose in value by a fifth in 1954 compared with 1953. These materials accounted for four per cent of imports and five per cent of exports of member countries in 1954.

Several countries have reported a widening in the range of medical and pharmaceutical products manufactured on the large scale. Production of cortisone and ACTH increased considerably in France in 1954 and vitamin B<sub>12</sub> was produced commercially for the first time. The United Kingdom also announced increased production of cortisone and hydro-cortisone, as well as certain antibiotics.

Products in this group were responsible for 11 per cent of total chemical imports and 13 per cent of total chemical exports for member countries in 1954.

The section on soaps and detergents emphasizes the competition between these two rival materials. Production of household soap, which up to 1950 was the largest single material, has shown a distinct tendency to fall as a result of competition from synthetic products. This tendency is said to be even more pronounced in the case of soft soaps. Soap powder production is increasing, chiefly in France and Germany, but figures have to be interpreted carefully as in the case of Germany no distinction is made between powders based on synthetic detergents and those based on soap.

#### Increased Detergents Demand

However, the steadily increasing demand for washing and cleaning products has meant that the increases in detergent production have not caused a corresponding decrease in soap products; activity in the latter industry seems too stable or even increasing in certain sectors.

In the United Kingdom there is still a tendency for soaps to be replaced by synthetic detergents for some purposes, although less rapidly than in previous years. Production of dodecyl benzene, which is used in the manufacture of synthetic detergents, should increase in the next 18 months when a new plant is put into operation.

Foreign trade in soaps and detergents is generally small, with the exception of the UK, and is practically confined to OEEC countries and their overseas territories. No great change is expected in production or market conditions in the next two or three years.

OEEC member countries account for 45 per cent and 40 per cent respectively of the production of nitrogenous and phosphatic fertilizers (excluding Eastern Europe) and 44 per cent of the production of potash fertilizers (excluding the USSR whose production has so far not entered world trade).

In the plastics industry one of the most notable advances has been made by Austria, whose production has increased fourfold in the period 1950-54. In particular a start was made in the manufacture of pvc and transparent cellulose film.

Germany showed the most substantial increase in the period 1950-54 but big increases

were also made by Italy, France and the UK. These four countries account for 90 per cent of total European sales; Germany 38 per cent, the UK 33 per cent, France 10 per cent and Italy nine per cent.

Of materials the most rapid expansion took place in group 39-02 which includes polythene, pvc, polystyrene, acrylic and most other thermoplastic materials, followed by group 39-01, phenolic and amino plastics, alkyds and most other thermosetting resins.

It is anticipated that the biggest expansion in the next few years will be in group 39-02. New polythene plants, planned or in construction, will make a large and increasing contribution. The market for polythene is said to be largely untapped in Europe as a whole. Production of pvc and polystyrene are also increasing.

As a result of increasing production and higher productivity the prices for plastics materials in 1954 showed a downward trend.

An annex to this report is devoted to a study of the sulphurous materials situation in 1954. Production of elemental sulphur in OEEC member countries is tending to decline. The high cost of Italian sulphur, and the resulting difficulties encountered in export markets is the main reason for this decrease. Sulphur production in France has now stopped altogether.

## Canada's Rapid Growth

### Task of the Chemical Industry

THE Canadian chemical industry faces a dual problem of keeping ahead of Canada's fast growing demands and developing an increased export market to maintain a reasonable rate of production until home consumption catches up with installed capacity, said Mr. Victor G. Bartram, of Montreal, president of Shawinigan Chemicals Ltd., addressing members of the Manufacturing Chemists' Association Inc., at their fifth semi-annual meeting and winter conference in New York City.

Mr. Bartram explained that the chemical industry, like any other, depended for its growth on consumer outlets and as Canada grew and developed so would industry. 'And Canada is growing rapidly', Mr. Bartram said, 'bolstered by a high rate of birth, immigration and one of the lowest death rates *per capita* on record.'

He predicted a total population of 24,000,000 by 1975, with a labour force of 9,000,000 compared with 4,500,000 in 1941.

'On this basis', he said, 'our gross national product which will be approximately \$26,000,000,000 this year, should more than double in that time and may amount to \$57,000,000,000 to \$58,000,000,000 by 1975.'

Canada's population, Mr. Bartram said, which to-day lived in 4,000,000 households, would require 6,000,000 to 7,000,000 households in 1975. This represented at least a 50 per cent increase, but 50 per cent was not the whole story. Take the consumption of electricity in the home, for example, he said. At present, the average domestic consumption for each resident of Canada was 3,000 kilowatt hours per year, which was much higher than the comparative US figure. There were plenty of household electrical appliances—refrigerators, electric stoves, washing machines—and other electrical equipment in use in Canada to-day because power was plentiful and cheap but it was predicted that each individual would require five times as much electricity in the home by 1975.

Turning to food production, Mr. Bartram said Canada to-day had about 3.85 acres of field crops *per capita*. This figure, he said, would probably drop to 2.75 acres by 1975, but people would be eating more and better because of technological advances in agriculture and greater use of fertilizers.

Canada's highways at present were crowded with more than 3,500,000 motor vehicles, but by 1975 it was predicted there would be at least 10,000,000 vehicles, said Mr. Bartram.

'These figures give some idea of the overall growth which will affect all industry, and the Canadian chemical industry must keep in step not only with these increased demands but must plan to keep ahead of them, as well as develop an increased export market to help maintain a reasonable rate of production at all times, or at least until home consumption catches up with installed capacity.

'In some recent developments in Canada', he explained, 'capacity installed has been greatly in excess of expected domestic requirements, so in some lines Canada has a great surplus of productive capacity with very limited export possibilities in these particular products.'

# Spectrophotometric Titrations

## Speakers at Midland Section of SAC

A MEETING of the Midlands Section of the Society for Analytical Chemistry was held on Wednesday, 9 November, in the University, Edmund Street, Birmingham. A discussion on 'Spectrophotometric Titrations' was opened by Dr. R. A. Chalmers (University of Durham) and Dr. S. J. Clark (British Nylon Spinners).

In introducing his points, Dr. Chalmers said that in the detection of an end point by spectrophotometric methods it was necessary that one of the components of the reaction system should have a large extinction coefficient at some wavelength where the other components had only small ones. The change in the absorbance of this component was then determined during the course of the titration and plotted against the volume of titrant added; the break-point in the curve was taken as indicating the end point, although it might not always coincide with the stoichiometric end point.

In the latter case it would be necessary to apply an empirical correction and the titration would have to be made in carefully controlled conditions. The simplest method of standardizing solutions and determining corrections was to titrate varying amounts of standard solution and to calculate the results by the method of least squares.

Spectrophotometric methods could be classified according to the component of which the absorbance was measured:—

- (i) The titrant.
- (ii) The substance titrated.
- (iii) A conventional indicator which showed a change in a physical property of the system by changing colour.
- (iv) A substance formed or liberated during the reaction.

In all four cases it was possible to derive from theory the shape of the titration curve, and to determine the practicability of a given titration, given certain data. As an example of the first type, consider the titration of magnesium with disodium ethylenediaminetetra-acetate (EDTA) at  $pH$  10 (1). From the absorption spectra it was seen that EDTA absorbs light of short wavelengths quite strongly whereas the magnesium chelate does not. If magnesium was titrated with

EDTA at  $pH$  10 and the absorbance at 222  $m\mu$  was read at intervals, a plot of absorbance against volume of EDTA added showed two straight lines intersecting at the end point. The theory was obvious. Until an excess of EDTA was present the absorbance remained constant (ignoring dilution effects). As soon as the end point was passed and free EDTA was present the absorbance increased linearly with the concentration of excess EDTA in the solution.

### Second Class of Reactions

The second class of reactions was exemplified by the titration of ferric iron with EDTA at  $pH$  1.7 to 2.3 with salicylic acid present (2). The iron salicylate absorbed strongly at a wavelength of 525  $m\mu$ , but the iron-EDTA complex and EDTA itself did not. As the reaction proceeded and the salicylate complex was converted into the EDTA complex the absorbance steadily decreased until it reached a constant value at the end point when conversion was complete and further addition of reagent had no effect on it.

The third case covered the use of acid-base and redox indicators. The theory had been developed by Ringbom and his co-workers (3). The great advantage of using a spectrophotometric end point for acid-base titrations was that the end point could be read from the curve at an arbitrary but reproducible  $pH$ . This was particularly useful for the titration of very dilute solutions. If the first derivative of the absorbance with respect to volume of titrant added was plotted against volume of titrant, the point of inflection of the normal curve, corresponding to the  $pK$  of the indicator, appeared as a maximum. Similar considerations applied to redox indicators.

The fourth class was the most difficult to treat theoretically, although in some cases the theory was similar to that of the first two types of titration. The type might be considered under two sub-headings; reactions in which the reaction product was formed at a uniform rate during the titration, and reactions in which it was not.

An instance of the first type was the EDTA titration of copper at  $pH$  2.4 to 2.8 (2). The copper chelate had a greater absorbance at



745  $m\mu$  than had either the metal ion or the EDTA. The absorbance increased linearly with the amount of EDTA added until the end point was reached, and then decreased slightly as the solution was diluted with excess titrant.

The second kind was typified by the titration of calcium with EDTA using murexide as indicator. The theory of the titration had been worked out by Fortuin, Karsten, and Kies (4). Ringbom had also contributed an account of the theory of similar titrations (5, 6). From the absorption spectra it was seen that murexide absorbed light of wavelength 610  $m\mu$  quite strongly, but the calcium-murexide complex did not. When the titration was begun the solution being titrated contained free calcium ions (if the calcium present was in excess of the amount of murexide added), calcium-murexide complex, and a small amount of free murexide from dissociation of the complex. As the titration proceeded, the EDTA first formed a complex with the free calcium ions, and then began to extract calcium from the calcium-murexide complex, thereby liberating free murexide. The rate at which the murexide was released would depend on the stability constants of the two complexes and the relative concentrations of the components of the reaction system.

If we denoted the ratio of the stability constants of the EDTA complex and the murexide complex by  $K$ , the concentration of free murexide by  $I$ , the total concentration of murexide by  $i$ , the concentration of free EDTA by  $T$  and the total concentration of EDTA added by  $t$ , then it could be shown that:—

$$I = iTK/t + TK$$

If the appropriate values were inserted for  $i$ ,  $K$  and  $t$ , and  $T$  was calculated to a first approximation by assuming that no murexide complex was present, the curve for the absorbance of the indicator liberated (proportional to the concentration) plotted against volume of titrant added could be calculated. It had the same form as the curve determined experimentally.

As might be expected, the theory was complex and needed to take into account the relative stability constants, the effect of  $pH$  on them, and the concentrations of the reactants. If reactants with suitable stability constants were chosen, neither the point of inflection of the curve nor the break-point obtained by extrapolation would coincide with the end

point. If the concentrations of the reactants were varied the shape of the curve would be found to vary. From theoretical considerations it was possible to state the conditions under which a sharp break, coincident with the stoichiometric end point, would occur in the titration curve.

### Tedious to Perform

Usually, spectrophotometric titrations were tedious to perform since the titrant was added in small increments so that the end point was not passed before its approach had been detected. The titrations could be considerably speeded up, and their precision improved, by automatic recording of the curve. By use of a syringe micro-burette driven through a gear train by a synchronous electric motor, rapid stirring of the solution being titrated, and feeding of the output from the spectrophotometer cells into a differentiating and amplifying circuit, and high-speed recording to the derivative curve, it had been found possible (7) to titrate micro-quantities of calcium with a precision of  $\pm 5$  parts per 1,000, and to titrate 0.001 N hydrochloric acid with 0.1 N sodium hydroxide with a precision of  $\pm 3$  parts per 1,000. If the solution could be stirred so efficiently as to prevent the appearance of transient colour changes near the end point it would be possible to introduce a second differentiating circuit and an automatic stop for the burette drive, so giving a completely automatic titrimeter.

Following Dr. Chalmers' theoretical approach to the subject, Dr. Clark presented some practical aspects of spectrophotometric titrations which had arisen in a routine industrial laboratory.

In a titration in which titrant, reactant or reaction product absorbs light, said Dr. Clark, a plot of absorbance against volume of titrant added would consist of two straight lines intersecting at the end point; provided, of course, that the system obeyed Beer's law. The slopes of the lines would depend upon the nature of the absorbing species present at any stage during the titration and the curve would be more or less rounded in the vicinity of the end point, depending on the chemistry of the system under consideration. The titration curves were generally similar in shape to those obtained from amperometric titrations.

The technique was of general use when the reaction under consideration was not complete at the equivalence point, but would go to completion in the presence of a reasonable

excess of titrant. Examples of such reactions were: precipitations involving moderately soluble precipitates, neutralization of very weak acids and bases, oxidation-reduction reactions involving couples of similar magnitude and reactions which were slow to come to equilibrium at the equivalence point. The examples quoted below exhibited some of these defects, brought about, principally, because the titrations were performed in very dilute solution.

The method was simple and made use of commercially available apparatus with but little modification. Absorptiometric methods were in such widespread use that many laboratories now possessed, at least, a simple photoelectric instrument; the majority of such instruments could be adapted for titrimetry.

The method shared with amperometric titrimetry the advantage that the property being measured was a linear function of concentration, in contrast to potentiometry, for example, where a logarithmic function was measured. Moreover, it was applicable generally to neutralization reactions, whereas amperometry was not. The apparatus was simple to use and it was, in general, easier to maintain than electrometric apparatus.

Application of the method to non-absorbing systems was often possible through the use of indicators.

Dr. Clark showed a slide comparing the photometric and potentiometric titration of a  $10^{-4}$  M solution of an organic base. It was obvious that the photometric method allowed the more precise location of the end point.

### Great Sensitivity

The sensitivity of the method was such that not only could small amounts of material be titrated, but very dilute solutions could also be used. This had the advantage that ordinary volumetric glassware could be employed and thus the titration was simply carried out.

Other advantages of the method were the ability to detect colour changes in solutions absorbing at the same wavelength as the indicator, and an improvement in precision resulting from the use of turbidimetric titration rather than direct turbidimetric or nephelometric measurement.

It would be seen from the above that the method was capable of doing some things that could not be done in any other way and that it was capable of improving the precision of a method. It could not be too strongly

emphasized that no technique of detecting the end point of a titration could do more than this. The accuracy was in general a function of the chemistry of the system and was unaffected by the method of end point detection.

### Modification Possible

Any photoelectric instrument which was so constructed that a titration vessel could be placed in the light beam could be modified for photoelectric titrimetry. A modification of the Unicam SP 600 was described here by Dr. Clark. An extra cell carriage was required, the top plate of which was drilled to receive a burette tip and stirrer shaft. The holes were surmounted by short lengths of copper tubing painted matt black to reduce stray light. The tip of the burette and the exposed part of the stirrer shaft were similarly painted. It was important that stray light be reduced to a minimum since, particularly at high absorbances, it caused a negative deviation from Beer's law. The effect would show itself as a gradual rounding of the upward branch of the titration curve. If this was attributed to incompleteness of reaction at the equivalence point, then a serious error in the location of the end point might occur. The extent of the error would depend on the value of the absorbance at the end point and some types of titration would be affected more than others.

The instrument was checked for linearity by a blank titration using a solution of a coloured substance which was known to obey Beer's law. After a volume correction had been applied, the plot of absorbance against concentration would be linear up to the point at which the stray light error became detectable. Conditions must then be arranged so that this value of the absorbance was never exceeded during a titration.

Magnetic stirring was preferred in general, although precautions had to be taken to guard against heating effects which might cause errors in absorbance readings. However, because of the difficulty of fitting a magnetic stirrer into the SP 600, stirring was carried out by means of a glass rod to the end of which a glass ring was attached. Stirring was halted while an absorbance reading was taken.

Titrations could be carried out normally in a 50 ml. beaker which fitted into a Perspex holder attached to the cell carriage. The beaker was held firmly in position by a thumb-screw. It was essential that the beaker did not move during a titration as optical irregularities

in the glass would cause a change in absorbance. Larger volumes could be titrated by modifying the shape of the titration vessel. A rectangular vessel, of glass or Perspex, which filled the whole of the available space, was convenient. However, it had rarely been found necessary to take a sample volume of more than 20-30 ml.

### Test Tube Adapter

For titration of small volumes of solution, the test tube adapter supplied by Unicam Ltd. was used. The titrant was added from an Agla micrometer syringe, fitted with a robust capillary, and stirring was accomplished by means of a glass rod.

The modifications were extremely simple and left the instrument available for normal spectrophotometric purposes.

The routine determination of the equivalent weights of organic acids and bases formed an important part of the microanalytical service provided by his laboratory, said Dr. Clark. Often, only very small samples were available and photometric titration in non-aqueous solution provided a reliable means of analysis. The lower limit, for a fairly strong acid or base, corresponded to a concentration of about 2 micro-equivalents in 20 ml. of solution (about  $10^{-4}$  M). This represented a sample size of the order of 0.2-0.5 mg. This could be reduced by at least a factor of 10 by using a smaller volume for the titration. Larger samples of weaker acids were required since more concentrated solutions were necessary. In practice, a 3-5 mg. sample was used, the titrant being  $10^{-3} - 5 \times 10^{-3}$  M. A determination could be completed in about 15 minutes, including calculation of volume corrections and plotting of the titration curve. It was only necessary to record absorbance at four to five points on the linear sections of the curve on either side of the end point. The precision was good; standard deviation was of the order of  $\pm 0.2$  per cent.

Ammonia could be determined by reaction with hypobromite in alkaline solution (8). Excess reagent was added, and the excess was determined either iodometrically or by addition of excess sodium arsenite solution and back titration with hypobromite. Tartrazine acted as a reversible indicator in the latter titration (9). The iodometric method appeared to be the more sensitive, but it could not be applied in the Kjeldahl method described below because of interferences. Investigation of the iodometric finish was being carried out

elsewhere (10). The work described here had been confined to the arsenite titration, this being a development of a method due to Bhatti (11).

The end point of the arsenite-hypobromite titration was detectable visually with reasonable precision using 0.01 N solutions, but at greater dilutions the colour change was poor. However, if the titration was followed photometrically, precision was good using  $2 \times 10^{-4}$  N solutions. Practically, this meant that as little as 0.2 ppm of ammonia nitrogen could be titrated using ordinary volumetric glassware.

In a typical curve the first inflection point might be expected to correspond to the point where all the arsenite had been titrated and where reaction with the indicator started. However, both reactions proceeded concurrently, some indicator being consumed when each increment of titrant was added, as shown by the decreasing absorbance of the solution during this part of the titration. Thus the first inflection had no quantitative significance. The second inflection corresponded to complete reaction with the indicator. It was only necessary to plot the section of the curve containing this second point of inflection in order to determine the end point.

The indicator blank was large, representing about 0.70 ml. of  $4 \times 10^{-4}$ N hypobromite per 0.1 ml. of indicator solution, but it was constant and only needed to be determined once for a given batch of indicator solution. A fairly high concentration of indicator was required in order that the part of the curve up to the second inflection be linear.

### Considerable Simplification Possible

The titration could be simplified considerably and the undesirable indicator blank eliminated by titrating excess oxidant directly with indicator solution. The reaction was stoichiometric over a wide range of concentration.

The method had been applied to the determination of trace amounts of ammonia in reasonably pure aqueous effluent solutions. It was more rapid and more precise than the usual colorimetric methods.

The method had also been applied successfully to the ultramicro Kjeldahl determination of nitrogen. The advantage of the hypobromite reaction in this connection was that distillation of the digest was unnecessary, provided a suitable catalyst was employed. The complete determination was effected in one vessel, thus minimizing errors due to

manipulation. The method was applicable to organic compounds requiring reduction before digestion, *e.g.* nitro- and nitroso-compounds. The use of chromous sulphate as reductant had proved to be extremely effective (11). However, chromic ion formed in the reduction interfered subsequently by reaction with hypobromite. It was necessary, therefore, to oxidize this to dichromate during the digestion. This was achieved by the addition of potassium persulphate and silver sulphate to the digestion mixture. The yellow colour of the resulting solution did not interfere in the titration, nor did the slight precipitate or silver halide formed from the silver catalyst.

Many of the common precipitation reactions had been studied at one time or another. Three methods of measurement and of interpretation of results had been used.

Firstly, turbidimetric titration, in which the absorbance of the solution was measured as the titration proceeded. It was essential for the success of this method that absorbance should be a linear function of the amount of precipitate present and, also, that equal increments of titrant should produce a constant amount of precipitate. These conditions could often be fulfilled by suitable arrangement of the reaction conditions.

In the second method, nephelometric titration, the light scattered by the precipitate was measured; transmittance was a linear function of the amount of precipitate formed. The same limitations applied as in the first method. Generally, the method was more sensitive than turbidimetric titration.

### Heterometric Titration

Thirdly there was heterometric titration, which had been fully described by Bobtelsky (12). No attempt was made to produce a linear plot. The method was mainly of use for the study of reactions which produced precipitates and was of little value for quantitative titrimetry. Much information could be obtained about the course of precipitation and about the formation of intermediates and complexes during a precipitation reaction.

The method had found its main application in the study of high polymers. Here, a polymer solution was titrated with a non-solvent and precipitation was followed photometrically. Much valuable information could be obtained about the composition of mixed polymers and about molecular weight distribution.

A few notes were presented here concerning

the performance of the SP 600 in turbidimetric and nephelometric titrations.

During the study of two reactions—the precipitation of potassium by tetraphenyl boron and the precipitation of sulphate by 4-amino-4'-chloro-diphenyl-(CAD)—it was observed that the absorbance of the solution decreased as the titration proceeded. This anomaly could be explained by a consideration of the optics of the system.

A divergent light beam emerged from the first slit in the system and, after having passed through the titration cell, fell on the second slit. Since the two slits were joined mechanically and were of the same width for any given setting, only part of the light passed through the second one to the photocell.

### Direct Beam Absorbed

When precipitate was present in the solution, the direct beam was absorbed and scattered by the precipitate and thus the measured absorbance of the solution increased. At the same time, the divergent beam was similarly affected. Some of this light was scattered through a small angle and passed through the second slit. Thus more light fell on the photocell causing an apparent decrease in absorbance. Sometimes this effect was so great that there appeared to be an overall decrease in the absorbance of the solution. As the titration proceeded, the turbidity of the solution increased to such an extent that the scattered light was absorbed before the slit was reached and the absorbance then increased.

If the collimation of the light beam was improved by placing a third slit between the first one and the titration cell, this effect was diminished. Of course, it was not possible to eliminate the effect entirely by this means since a parallel beam of light was never produced.

Since scattering was dependent on the wavelength of the incident light, increasing the wavelength of the illumination should decrease the amount of scattering and thus the magnitude of the effect. This did, in fact, occur.

The effect had not been noticed using a simple photometer in which the exit slit was large compared with the entrance slit, presumably because all the light transmitted was received by the photocell.

If the SP 600 was used for precipitation titrations, then it was necessary to follow the titration nephelometrically.

The apparatus was the same as outlined

previously except that the solution was illuminated from below. The monochromator of the spectrophotometer was not used.

The titration of sulphate with CAD had been examined, but the system was too sensitive to small changes in pH to be of value.

Good results had been obtained in the titration of small amounts (0.1-1.0 mg.) of potassium with tetraphenyl boron; the method had found routine use in the titration of potassium salts of organic compounds.

### Discussion Period

At this point the meeting was opened for discussion and for questions to be put to the two speakers. Much interest was shown in Dr. Chalmers' automatic spectrophotometric titrimeter. When questioned about the possible commercial appearance of this instrument, Dr. Chalmers said that it could be much condensed from its present somewhat bulky form, e.g. by the substitution of transistors for power packs, and so on. A difficulty in handling the apparatus at present was the complicated switch procedure, the six switches which were employed needing to be operated in a definite order. Some further figures were provided by Dr. Chalmers to bear out the accuracy of the automatic titrations as outlined already. It had been shown that calibration of the syringe micro-burette was essential.

To an enquiry about the application of his method of ammonia determination to reasonably pure aqueous effluent, Dr. Clark said that the effluent for which the method was developed was unusually pure and no preliminary distillation of ammonia from it was necessary. Nitrogenous materials containing free amino groups etc. which were normally present in effluents, would naturally interfere by virtue of the hypobromite attack on them.

Dr. Clark was asked if there were any noticeable temperature effects when carrying out spectrophotometric titrations at the low concentrations of solutions he had mentioned. Overhead stirring had apparently caused no such effect so far, although interference would be likely in the case of magnetic stirring. Dr. Chalmers said that in his automatic method, even though the rate of stirring was exceptionally high, the titrations were completed so quickly that there was no appreciable temperature rise. The laboratory temperature changed so little normally that no interference was forthcoming on this account. As to sharper end points and greater precision by working with very dilute solutions, Dr.

Chalmers thought that the end points were definitely sharper, but the precision was not necessarily altered. The precision of spectrophotometric titrations as compared to amperometric was brought up, and Dr. Clark was of the opinion that it depended largely on the system in question although there was not much to choose between the two.

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## Shawinigan Sales Rise

SHAWINIGAN Chemicals Ltd. improved its volume of sales during the year and expansion is being continued. This was announced by Mr. J. A. Fuller, president of Shawinigan Water & Power Co., the parent company. He also announced that a new sulphuric acid plant will be built at Shawinigan Falls, Quebec, by Shawinigan Chemicals.

Business also improved this year for Shawinigan Chemicals subsidiary and associated companies, Mr. Fuller said. Both BA Shawinigan Ltd. and St. Maurice Chemicals Ltd. were working to capacity. Canadian Resins & Chemicals Ltd., another associated company, was also operating at full capacity, and to meet increasing demand, the plant at Shawinigan Falls was being expanded.

A large expansion programme was also being undertaken by another associated company in the US, the Shawinigan Resins Corp., owned jointly by Monsanto Chemical Co. and Shawinigan Products Corp., a wholly-owned subsidiary of Shawinigan Chemicals. Shawinigan Resins was adding to its plants at Springfield, Mass., and was building a new resin manufacturing plant at Trenton, Michigan. This plant would make possible the increased production of the vinyl resin used in the important interlayer sheeting for auto safety glass.

# Keep the Gas Safe

by HENRY ALLEN

(The Yale and Towne Manufacturing Company)

**I**N the sphere of industrial accidents gas ranks high as a potential hazard, and the urgent need for clearly defined safe working practice in connection with gas in all its forms and uses is of paramount importance both to the factory occupier who has overall responsibility for accident prevention and to the engineer who must install and operate the equipment.

The statutory regulations are well enough known and the several official publications such as the memorandum 'Safety in Design and Operation of Gas Heated Ovens and Furnaces' (Factory Department Form 1856 HM Stationery Office, 6d) are familiar texts, but there remains the need to define detailed points of policy and, above all, to train and educate personnel in safe working habits.

It is lamentable, for instance, how many accidents occur every year during the lighting up of gas-fired furnaces and ovens, because cocks and taps are partly or fully open when they should be closed. A case officially reported recently occurred with a large boiler equipped to burn blast furnace gas as its normal fuel, with standby equipment for coke oven gas. The boiler had been under repair. A fireman checked equipment in preparation for the lighting up, closed the cocks, and on the following day opened the main valve on the gas supply and a bleeder valve near the burners to purge the supply pipe of air. He then closed the bleeder valve, lit three pilot lights and inserted them into the furnace.

## Burner Cocks Opened

The boiler exploded and post-accident investigation revealed that a maintenance team had visited the boiler and after checking the cocks had opened and left open the burner cocks with the result that gas was flowing into the furnace throughout the gas supply pipe purging period.

The blast furnace gas supply was equipped with safety devices, including low pressure cut off which prevents the gas being turned on if the burner cocks are left open, but there were no safety devices at all on the standby equipment—and the standby equip-

ment for coke oven gas was being used on this occasion. The accident emphasized the principle that standby equipment must be as competently protected as normal equipment. It also stressed the inexcusable carelessness of maintenance men not completely trained in safe working practice.

'What I know is what I picked up myself,' a maintenance employee told the officials at a recent inquiry into the death of a man killed at a gasworks. It was a commentary on the primary need for organized training where gas is used. The deceased operator fell through an uncovered manhole into a coke hopper at a gasworks. In a rescue attempt, another employee fell and both lost their lives while 14 others suffered from the effects of fumes.

## Breathing Apparatus Not Checked

Evidence was given at the inquiry that the cylinders of the breathing apparatus that the would-be rescuer wore was last checked about three months before the accident, when it was found that the pressure in that used by the dead man showed the cylinder to be half full. The employee responsible for the cylinders then said that he had no training; he obviously should have been instructed in Section 27 of the Factories Act 1937, amended by Section 11 of the Factories Act 1948, which requires that breathing apparatus must be examined by a competent person at least every month.

Such accidents illustrate hazards that can and should be anticipated and guarded against. But gas in its complexity has a way of causing the unusual accident that occurs when, it seems, normal safety techniques have been scrupulously followed. When such an accident happens, thorough post-accident investigation is essential both to analyse the circumstances of the case under review and for the defining of future policy. A recently reported case exemplifies this unexpected quality of some accidents.

An explosion occurred in a gas-heated box oven of orthodox construction. It had a loose roof, calculated to function as an

explosion relief, and was fitted with a thermocouple type automatic pilot. The pilot flames consisted of one which heated a thermocouple to keep the automatic pilot valve open, and one eight inches long to light the main burner. The two pilot flames were joined by a short slot in the head of the burner.

The oven exploded when the gas to the burner was turned on. Analysis later revealed that part of the pilot head was choked so that the main pilot flame was suppressed whereas the small pilot flame was still alight and playing on the thermocouple; therefore the automatic valve was still held open. What had happened was that the automatic pilot had no chance to operate competently owing to the obstruction of the pilot flame by tar or scale.

#### Hazards from Tar

Tar is hostile to any gas device and can and does produce danger and create hazards. It can, furthermore, affect production controls as, for instance, causing a relay valve to stick in the closed position when it should be open.

The loose roof had, as anticipated, functioned as an explosion relief, but the oven was, characteristically, somewhat fragile and it was suggested after the accident that better policy for the future would be to make the back as well as the roof into an explosion panel, further to enable the ordinary box oven to withstand the sudden application of even small internal pressures.

Explosion reliefs, if correctly sited and of suitable construction, can greatly reduce the damage and possibility of injury resulting if an explosion should occur. Factors affecting explosion risks should be known by all personnel, as for instance, that air-gas mixtures within the limits of 19:1 to 2:1 are explosive and that maximum violence is obtained with a mixture of approximately 4.5:1.

Many of the hazards that arise with flame extinction can be effectively guarded against if a gas appliance is properly installed. It is generally accepted, for instance, that all natural draught flued appliances should incorporate a draught diverter in the flue and have an approved terminal at the external end of the flue, the draught diverter preventing down draught affecting flame stability. Furthermore it is now almost standard practice that flue dampers, if fitted

should be interlocked with the gas main valve or permanently locked in position or have one third of their area cut away.

As for flame failure devices, there is adequate official help available in the installation and use of each of the three principal types of flame failure devices at present operating; bimetallic and thermal expansion, thermo-electric, and electronic. It has to be borne in mind however that bimetallic and thermal expansion types are unsuitable for many purposes because of the slowness of reaction of the bimetallic element, the failure due to fatigue of the element and the limited working life of the element, and, because the maximum temperature at which the element can be operated is below 500°C, this type of device is useless for high temperature appliances such as furnaces.

Similarly, the temperature that most thermocouples will withstand makes them unsuitable for furnace protection. Electronic types are now admitted as the most satisfactory at present obtainable. They have quick reaction coupled with the property of failing safe under most conditions. Where multi-burner protection is required, the safest method is undoubtedly to fit a separate device to each burner.

Many appliances used in industry which are gas-fired will in themselves demand safety techniques quite apart from the fuel, but the whole picture of the operation has to be studied for the formulation of a code of practice that will also cover the hazards of gas. Where gas is used in an industrial process or industrial setting, there too, will be the human element, that all powerful factor in accident causation. To deal with that problem two approaches are essential—the training of the worker in full appreciation of the hazards and of precautionary techniques, and the definition of an operating policy that will reduce those hazards to a minimum.

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#### Speeding Sodium Bicarbonate Imports

India has decided to issue additional licences for the import of sodium bicarbonate to established importers on the basis of 10 per cent of half of their best year's imports. To ensure quicker supplies against these additional licences, the period of their validity will be restricted to three months from the date of issue.

# Factory Accidents, 1954

## Chief Inspector's Report

THE Annual Report of the Chief Inspector of Factories for the year 1954, published early last month by HMSO (price 8s.), states that during the year under review there has been for the second time since the war years an appreciable increase in the total number of accidents. In factories only, the number of accidents increased from 158,597 to 161,458, an increase of 1.8 per cent. Accidents occurring at other places within the purview of the Factories Acts increased from 23,040 to 23,709, an increase of 2.9 per cent. The total number of accidents reported during the year was 185,167, compared with 181,637 in 1953. The number of fatal accidents in all premises under the Acts decreased to 708.

In factories only, the accident rate per thousand workers was 22.4 for 1954. The rate for all workers in 1953 was 22.7 and in 1952 was 22.5. The report states that the small variation in rate during the last three years is due to a number of factors, the significance and effects of which are difficult to assess and analyse. Since 1952, industrial production has been steadily rising. This has not merely involved an increase in the number of persons employed, but has involved more overtime working, less short-time working, an increase in the tonnage of materials handled, and, perhaps most important of all, the absorption into the ranks of the employed population of many persons who are taking employment in factories for the first time and are unfamiliar with industrial hazards.

### Never too Old to Learn

The report goes on to quote the example of an accident that occurred to a man aged 57, by profession an entertainer, who had never worked in a factory before. He lost the tip of his third finger, right hand, on the belt and pulley driving a machine. The drive was near a wall and fencing consisted of a gate at the end of the machine. He had opened the gate and tried to put the belt on while the machine was in motion. 'There is a tendency to think,' says the report, 'that adult men are not in need of instruction, although firms realize that when

young persons start work in factories, they must be protected by some training and supervision, on account of lack of experience.'

According to the report, 457 accidents due to inflammable liquids were reported in 1954, and of these 10 were fatal accidents. The corresponding figure for 1953 was 425, including 20 fatalities.

### Welding Explosions

'As in 1953,' the report continues, 'the most common type of accident associated with inflammable liquids was the explosion of drums, tanks and similar enclosed vessels when heat was applied by welding or cutting torches etc. Most people nowadays realize that precautions must be taken before such work is done, but few appreciate the kind of precautions necessary and how thoroughly the precautions must be carried out if explosions are to be prevented. A placard (Form 386) is available from HMSO, which contains advice concerning the preparation of drums, tanks etc., before welding, soldering or flame-cutting. A copy of the placard could with advantage be posted in every workplace in which the risk of this kind of explosion may arise.'

Some of the explosions reported during 1954 occurred because welding or flame-cutting was carried out near to but not actually on 'empty' drums or tanks which had contained inflammable liquids or other inflammable or explosive material, and which had not been made safe. 'In one such case,' says the report, 'a man was using an oxy-acetylene torch to cut down some iron railings in a factory yard; close to the railings was a dumping ground for obsolete vessels, scrap etc.; one of these vessels was a steel tank approximately four feet long and three feet in diameter which had been on the dump for 10 years and which had contained a nitro compound. Sparks resulting from the use of the oxy-acetylene torch on the railings entered an opening at the top of the vessel and there was an immediate explosion. One end of the vessel was blown 300 yards. The man was injured by the blast and also by his burning clothing. "Empty" paint drums,



oil drums, etc., left lying about can be just as dangerous.'

During 1954, there was a slight but not significant decrease in the total number of gassing cases reported as compared with the number reported in 1953. There was no significant change in the number of fatalities and the ratio of fatal to total gassing cases remains at the high figure of nine per cent.

### Gassing Accidents

The total number of gassing accidents would be substantially reduced if the accidents occurring during maintenance work were eliminated, as many could be, the report declares. 'In particular, of the accidents which are caused each year by carbon monoxide, nearly half are mainly due to lack of care during maintenance work. Some of the things which are done during maintenance work can be ascribed to misjudgment of the risks involved, but some are less excusable. The precautions to be taken before entry into plant, for instance, should be well known to everyone in charge of plant in which there may be any kind of toxic gas or deficiency of oxygen.'

The report goes on to say that when external work is to be done on plant, it is too often assumed that, because the job is in the open, there can be no risk. 'This assumption is erroneous for, when gas is leaking, local concentrations can be quite high, as some of the following accidents show. Compressed-air breathing lines are now quite commonly found in steelworks and chemical works, and still greater use can be made of this simple but effective precaution.'

Cases of gassing by carbon monoxide reported during the year totalled 113 (including 14 fatalities) compared with 121 cases (including 19 fatalities) during the previous year.

Cases of gassing by sulphuretted hydrogen included one in which a washer attendant, aged 45, at a tar distillation plant, was fatally gassed and a foreman who went to his rescue was also affected. The top distillate was being subjected to a series of washes to remove impurities; the washer attendant was found lying in the open about 10 ft. away from an open-top waste tank, at about 8 p.m. on a still, heavy evening. The foreman who went to his assistance was overcome, but managed to stagger away

from the fume-laden area before collapsing, and recovered after treatment. Artificial respiration was given to the other man, but he died soon after admission to hospital. Post-mortem examination next day showed the cause of death to be acute heart failure due to the inhalation of a vapour or gas having a toxic or anaesthetic effect. A caustic wash for the removal of sulphide had been run off into the waste tank and followed by a concentrated sulphuric acid wash, which was by mistake run into the same waste tank. The strong acid neutralized the caustic and liberated the sulphides as sulphuretted hydrogen. On the morning after the accident the air over the open tank was found to contain 0.01 per cent sulphuretted hydrogen.

Another gassing accident quoted in the report concerned a process operator, aged 40, in a chemical works who, with another man, was discharging a rail tanker containing chlorine. After attaching a discharge coil the valve was opened and there was an escape of chlorine gas. Both men, who were trained personnel, inhaled some chlorine as they moved away, but one of them returned to stop the leak, while the other went to fetch two respirators. When he returned, his mate was vomiting and coughing. The latter was treated immediately at the works surgery by the doctor and nurse, and was away from work for a week. 'In spite of strict instructions,' says the report, 'that respirators were to be worn at the "alert" during the attachment of the discharge coil and actually worn when the valve was opened, neither of the men had carried out these instructions. The works was newly built in a rural area and the firm had the problem of educating local workers in the nature of the hazards likely to be met, although the key personnel and supervisors had had long experience in chemical manufacture. After this occurrence further training in safe methods of working was given.'

### Trichlorethylene Poisoning

A further case of gassing concerned a scaler, aged 49, and his mate, employed by contractors, who were scraping out sludge from the bottom of a drained trichlorethylene storage tank, each taking a half-hour spell in turn and wearing breathing apparatus with a fresh air supply. Compressed air was being blown into the tank

during the operation. The scaler was seen to be in difficulty and was pulled out through one of the two manholes, 18 in. in diameter. He was then unconscious, but was resuscitated by the Fire Brigade and removed to hospital, where he was treated with oxygen. It was thought that the face-piece of his breathing apparatus was not properly adjusted and that he may have breathed fumes given off by the sludge, which was being agitated by the entry of compressed air. The firm was advised to keep a second breathing apparatus readily available for work of this kind; ventilation of the bottom of the tank by extraction of air was recommended as being safer practice than blowing in compressed air.

During 1954, 143 blood examinations were made of luminizers, and 14 of persons employed in cleaning luminizing departments. Clinical examinations showed that their general health was on the whole good and such disorders of health as were present were not attributable to hazards of the work. Blood abnormalities were not serious and followed closely the variations observed in former years, but there was a slight incidence of absolute as well as relative lymphocytosis.

Skin lesions, possibly caused by *beta* radiation, were observed in five luminizers. Four of these were using an automatic method of application, and exposure was related to the cleaning of the sumps of the machines. At a second examination, six months later, after protective measures had been strengthened, the skin lesions had healed.

#### Radioactivity Exposure

Four firms carrying out luminizing failed to use the National Physical Laboratory's facilities for film estimations of radiation exposure; the reason given was that so little continuous luminizing was being done that it was difficult within the period of activity of the film to achieve the recommended two weeks' exposure. Films submitted by 11 firms showed exposures of 0.05-0.20R per week; nine firms' records showed levels which were closely approaching the maximum permissible dosage rate of 0.3R per week, while at three firms there was evidence of combined *beta* and *gamma* radiations above this level.

The deaths occurred in 1954 of two men last employed in radium research 19 years ago, states the report. One was employed

as a laboratory assistant, the other in charge of a chemico-physical laboratory, preparing radium salts and radon for therapeutic purposes.

The laboratory assistant, after two years, left in 1935 owing to the condition of his hands, one of which was operated on in 1947 for removal of a wart and an ulcer. Further operations on the hands were performed from 1951 to 1953, and death occurred in 1954 from an extensive carcinoma in the right axilla.

#### Three Amputations

The second man was in contact with radium and radon from 1910 until 1935, except for an interval from 1914-1918. His hands were first affected after six years' employment and three amputations were performed during the next 20 years. His blood picture during this time showed leucopenia and anaemia, which became severe in 1954. Bone marrow biopsy at this time indicated a leukaemia. It was estimated during life that he had a fixed radium body burn of between 0.12 and 0.49 microcurie.

The report states that during the year there has been a renewed interest in the possibility of formulating a safety colour code. 'Although this matter was explored some years ago and considered impracticable, the idea persists, as is shown by the fact that factories here and there have been adopting simple codes of their own making. These codes are usually initiated by managements who feel that colour can be used as an adjunct to training, supervision and physical safeguards.

'The realization is growing,' continues the report, 'that any safety colour code must be the essence of simplicity and convey an immediate message, also that the colours chosen must not clash in any way with traditional associations. From this it would appear that a simple code of three colours, red (for danger and fire-fighting appliances), orange (for caution) and green (for safety equipment), together with black and white for contrast markings, could be formulated with a reasonable hope of success. Work is now proceeding on this basis and it is hoped that a simple, effective and easily understood code will be formulated. Nevertheless, it must be understood that any colour code for safety, useful as it may be, cannot be a substitute for physical measures for the safeguarding of any hazard.'

## Key Industry Duty List

THE Board of Trade has made the Safeguarding of Industries (List of Dutiable Goods) (Amendment No. 9) Order, 1955, adding the following to the list of chemicals liable to Key Industry Duty:—Androst-5-en-3 $\beta$ -ol-17-one, androst-5-en-3 $\beta$ -ol-17-one acetate, barium  $\beta$ -2-ethyl-n-butoxypropionate, barium glucose-1-phosphate, barium glucose-6-phosphate, barium laurate, n-butyraldoxime, cadmium  $\beta$ -2-ethyl-n-butoxypropionate, cadmium laurate, calcium glucose-1-phosphate, calcium glucose-6-phosphate, calcium p-hydroxybenzoate, p-chlorophenyl isocyanate, choline hydrogen tartrate, 3-cyanopyridine, 4-cyanopyridine, 3:3-di-(p-acetoxyphenyl)oxindole, di-n-butyltin dichloride, 2:4-dichlorophenyl isocyanate, 2-dimethylaminoethanol,  $\alpha\alpha$ -dimethylbenzyl hydroperoxide, diosgenin, n-dodecyl gallate, 5-ethyl- $\alpha$ -picoline, 17-ethynyl-androst-ene-3 $\beta$ :17 $\beta$ -diol.

Glucose-1-phosphoric acid, glucose-6-phosphoric acid, n-hexadecyl gallate, magnesium glucose-1-phosphate, magnesium glucose-6-phosphate, methyl isopropenyl ketone, 1-methylpyrrolidine, methyl vinyl ketone, n-octadecyl gallate, dipotassium glucose-1-phosphate, dipotassium glucose-6-phosphate, pregna-5:16-dien-3 $\beta$ -ol-20-one, pregna-5:16-dien-3 $\beta$ -ol-20-one acetate, pregna-5:16-dien-3 $\beta$ -ol-20-one acetate oxime, pregn-5-en-3 $\beta$ -ol-20-one pregn-5-en-3 $\beta$ -ol-20-one acetate, disodium glucose-1-phosphate, disodium glucose-6-phosphate, tetracycline hydrochloride, n-tetradecyl gallate, thialbarbitone, tri-n-butyltin acetate, triethyltin acetate, trimethylaminetricarboxylic acid salts, dipotassium trimethylamine- $\alpha\alpha'$ -tricarboxylate, tripotassium trimethylamine- $\alpha\alpha'$ -tricarboxylate, disodium trimethylamine- $\alpha\alpha'$ -tricarboxylate, trisodium trimethylamine- $\alpha\alpha'$ -tricarboxylate, tri-piperazine dicitrate.

The Order, which came into operation on 21 December 1955 is published as Statutory Instruments 1955 No. 1897. Copies may be obtained from HM Stationery Office, price 2d. by post 3½d.

### New Address

On 1 January Dowty Nucleonics Ltd. moved from Vittoria House, Cheltenham, to new research laboratories and offices at Brockhampton Park, near Andoversford, Gloucester. Tel.: Andoversford 391/2.

## Fertilizer Plant in SA

PLANS to build a fertilizer factory at Sasolburg in South Africa next to the Government oil-from-coal plant have been made by Fisons. Estimated cost is £3,500,000 and the factory will be the largest fertilizer plant up-country, where South African consumption is highest.

Phosphate from Foskor and ammonium sulphate from Sasol will be used and it is hoped to produce 100,000-200,000 tons of superphosphate and 150,000-300,000 tons of mixed fertilizers per year. The factory may also produce sulphuric acid and return nitrogen or ammonia to Sasol for the oil-from-coal process. Preparations are expected to take two years.

The Fisons group already has plants near Cape Town, Durban, Lusaka and Dagga-fontein.

The large fertilizer plants have previously been at the coast because rock phosphate was imported. With the starting up of Foskor in Northern Transvaal the raw material had to be transported to the coast, processed there and sent back to the interior.

Earlier this year the chairman of Sasol invited private enterprise to start factories in the interior to process Sasol and Foskor products.

## Obituary

MR. V. BINNS, B.Sc., M.Sc., F.R.I.C., area chemist in charge of the British Railways Research Chemical Laboratory at Crewe, died at his home in Tunbridge Wells, Kent, aged 57, on 15 December. The funeral was at Llandudno, North Wales, on 20 December.

SIR JAMES DUNN, Bt., chairman and president of the Algoma Steel Corp. of Ontario, died at St. Andrews, New Brunswick, on 1 January, aged 81.

MR. GEORGE E. THOMSON, who died recently at Stoke Poges, aged 90, who for many years a leading figure in the Scottish chemical industry. He was chairman of James Millar, Son & Co. Ltd., of Glasgow, a firm he was associated with for more than 70 years. Mr. Thomson was appointed a director of the firm after the First World War, and became the chairman in 1941.



**ERRORS OF OBSERVATION AND THEIR TREATMENT.** By J. Topping. The Institute of Physics, Monographs for Students, London, 1955. Pp. 119. 5s.

An attempt is made in this book to keep the mathematical treatment as simple as possible and to this end proofs of some of the more difficult theorems are omitted. In this way the book is made more suitable for the elementary student, e.g. a student taking the National Certificate course in Applied Physics and also to students of physics and chemistry in schools and universities.

Most people find statistics a difficult subject on first acquaintance and a study of this book should prove a useful introduction to more advanced works.—J.P.S.J.

**SOLUBILIZATION AND RELATED PHENOMENA.** (Physical Chemistry: A series of monographs, Volume IV). By M. E. L. McBain & Eric Hutchinson. Academic Press Inc., New York & London. Pp. 259. Price \$7.

Prior to his death in 1953, James McBain had been planning to write a book on solubilization, a branch of colloid science in which, as in many others, he had made notable and pioneering contributions.

Much of the material for the book had been collected and organized by his wife and co-worker, Evelyn McBain who, in conjunction with Dr. Hutchinson, now presents this monograph and dedicates it to the memory of a man who without any shadow of doubt will take a prominent place in the history of the development of our knowledge in the colloid field.

Solubilization, a term introduced by McBain himself, is the name given to the phenomenon whereby substances which are otherwise insoluble in a given medium are brought into solution as the result of the presence of colloidal material. It is a phenomenon which resembles outwardly the well-known protective action of col-

loids in stabilizing suspensions and emulsions and which resembles also, outwardly at least, the equally well-known effect of a mutual or co-solvent. The distinguishing feature of solubilization is that the dissolved substance is taken up, molecule by molecule, and incorporated into the organized colloidal particles of the stable colloid itself. This is in direct contrast to protective action where only the surface of the suspended particle or droplet is covered or coated with the colloid, thus presenting to the solution a surface identical with that of the colloid itself.

The problem of the mechanics of solubilization is obviously directly linked with the question of the detailed structure of the micelles in the original colloidal solution. Here the authors enter on controversial ground for, in spite of detailed study by many schools of workers in the last 30 years, the nature of aqueous solutions of colloidal electrolytes is still, in some respects, a matter of dispute. Also, solubilization is not confined to aqueous colloidal solutions and the nature of micellar solutions in hydrocarbon solvents and the architecture of the colloidal particles in such solutions is even more obscure.

One of the most powerful weapons used in the elucidation of the problem has been X-ray diffraction, and much of our detailed knowledge of micelle structure has been gained in studies of this kind. Some recent work, however, has suggested that earlier interpretations in terms of Bragg spacings may not have been entirely justified, and it is now clear that some of the simplified interpretation of X-ray patterns may need serious revision. With little more than natural bias the authors steer a careful course through this and other current controversies, and present a satisfying and integrated account of the present views on these subjects.

The practical importance of solubilization is too obvious to need comment—the number of patents dealing with this subject is merely a guide to the wide applicability of the phenomenon in industry and commerce. One other aspect of the subject is worthy of mention. There is now little doubt that solubilization through the well established solubilizing powers of the bile salts plays a part in the transport of material in biological systems.

This is an important book in the sense that no comparable survey of the subject is available. It can be recommended with confidence to the academic scientist who wishes to bring himself up to date with developments in this field, and especially to the industrial chemist concerned with colloid problems.—R. C. PINK.

OFFICIAL METHODS OF ANALYSIS OF THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS. Edited by W. Horwitz. 8th edn. Association of Official Agricultural Chemists, Inc., Washington, DC. 1955. Pp. xvi + 1008. \$12.50 (foreign).

This eighth edition of the well-known 'Official Methods of Analysis' is one of the most interesting and comprehensive to appear so far. Much of the dead-wood which existed in previous editions has been judiciously pruned and a more definite stand has been taken on the number of permissible variations in standard methods. In addition, an important step forward has been taken in recommending new methods of analysis, particularly instrumental methods and newer techniques such as chromatography etc.

For example, the gravimetric methods recommended in the previous edition for the determination of vanillin and coumarin have been replaced by methods in which separation is achieved by chromatography and determination by spectrography. A similar combination of these techniques has replaced the classical dyeing and spot-testing method used for the isolation and identification of coal-tar colours in foodstuffs.

A new chapter has been added on emission spectrography and the possibility of expanding the chapter to cover flame photometry and adsorption spectroscopy has been suggested in the preface. Flame photometric methods for sodium and potassium appear for the first time and another innovation is the procedure described for the field estima-

tion of radioactive contamination (eg in civil defence work).

Apart from new additions in the sphere of techniques and instrumentation, however, several new chemical methods are described. These range from a new wet digestion procedure for potash in fertilizers,  $\alpha$ -amylose in malt, digitoxin in drugs, to methods for the determination of hormones etc. Standardized methods for the ultimate analysis of carbon, hydrogen, halogens other than fluorine and for sulphur have been added to the chapter on microchemistry.

This edition, like its predecessors, teems with information. Descriptions of procedures are given precisely and unequivocally with as much economy of words as possible. In an effort to conserve space many abbreviations are used and the interesting experiment of substituting common nouns such as 'buchner', 'gooch' and 'erlenmeyer' for Buchner funnel, Gooch crucible and Erlenmeyer-flask, has been made. This usage is common in the spoken word of course, but it remains to be seen how analysts will react to it in print. The procedure has interesting historical implications, but widespread extension of this principle might result in expressions such as: 'weigh 0.5 g. sample into a smith and . . . .'

The book is provided with a good index which is not entirely comprehensive, however. There are numerous reference tables. The methods recommended are well proven and trustworthy. Beyond doubt the eighth edition is a worthy successor to earlier issues.—T. S. WEST.

### Atomic Energy Agreement

Discussions between the United Kingdom Atomic Energy Authority and the Indian Department of Atomic Energy have led to an agreement for co-operation and mutual assistance in the development of the peaceful uses of atomic energy. Under this agreement the UKAEA will provide the Indian Department of Atomic Energy with enriched uranium fuel elements for a swimming pool reactor now under construction at Bombay. The agreement also includes arrangements for the Authority to assist in the design and construction of a high flux research reactor which may be built at a later date.

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## Midlands Office

Fielden Electronics Ltd., industrial instrumentation specialists of Wythenshawe, Manchester, have opened a Midlands office at 18 Wolverhampton Street, Dudley, Worcs.

## Vegetable Tannins Symposium

The Society of Leather Trades' Chemists will hold a symposium on vegetable tannins in the Chemistry School, Cambridge, on 12 and 13 April. Among those who have accepted invitations to present papers are Dr. W. Mayer, Dr. O. T. Schmidt and Professor K. Freudenberg, all of Heidelberg University, and Dr. W. E. Hillis of the Australian Commonwealth Scientific Industrial Research Organization.

## Pollution Proceedings

The Mersey River Board, at a meeting in Manchester on 16 December, began proceedings against the Straw Pulp Manufacturing Co. Ltd., of Radcliffe, alleging that the company discharges 629,000 gallons of alkaline effluent into the River Irwell daily.

## Glass Technology Scholarships

The Worshipful Company of Glass Sellers of London are offering up to four scholarships in glass technology at the University of Sheffield. The examination will begin at the University on 9 April, and will consist of papers in chemistry, physics and pure mathematics. Entry forms, syllabuses and particulars may be obtained from the Registrar, University of Sheffield, Sheffield 10.

## Chemical Prices Changed

B. Hepworth & Co. Ltd., chemical manufacturers of Kidderminster, Worcester, have announced price changes affecting three of their products. They are: sodium sulphate, delivered in bags, £9 5s to £10 5s per ton; sodium sulphate (desiccated) delivered in bags, £18 per ton; and sodium sulphate (saltcake), unground spot, £7 10s to £8 10s per ton.

## Scottish Section Meeting

The annual general meeting of the Scottish section of the Society for Analytical Chemistry will be held at the Rhul Restaurant, 123 Sauchiehall Street, Glasgow, on 20 January at 5 p.m. The meeting will be followed by a film evening, at which guests will be welcome.

## Glycyrrhetic Acid

Genatosan Ltd., of Loughborough, announces that it hopes shortly to be able to supply hospitals with a dermatological cream containing sodium glycyrrhetinate, equivalent to two per cent w/w of glycyrrhetic acid, for use in extended clinical trials.

## Simon Carves Ltd.

Simon Carves Ltd., Cheadle Heath, Cheshire, will open a new drawing office in Rochdale this month. The company specializes in constructional engineering, chemical plant, colliery equipment etc., and has in hand orders worth millions of pounds.

## Soil Fertility Conference

A conference on 'The Maintenance of Soil Fertility' will be held at the Rougemont Hotel, Exeter, on 10 January by the National Agricultural Advisory Service, in conjunction with the western section of the Fertilizer Manufacturers' Association.

## Token Imports

The Board of Trade has announced that the token import scheme will continue in 1956 for imports from Canada and the US on the same basis as in 1955. A notice to importers will be issued shortly by the import licensing branch of the Board of Trade. The object of the token import scheme is to allow into the UK a limited quantity of manufactured goods in which there is a traditional trade, and which had to be restricted because of a shortage of dollars.

## Brotherton's Expand Laboratories

On Wednesday, 11 January, Brotherton & Co. Ltd. are holding an Open Day for the inspection of the new wing which has been built on to their Central Research Laboratories. The company's research activities were centralized in Leeds in 1947 and expansion since then has more than doubled the original building. The new wing, which was completed last month, allows space for five new laboratories, a lecture room, metal- and wood-working shops, a kitchen and a staff dining room. The total staff employed in the building is 30. The work carried on under the direction of Dr. W. Cule Davies covers research on the firm's existing range of products and their applications and the development of new products.

# . OVERSEAS .

## Indian Paint & Varnish

The Indian Government has decided that the export of paints, varnishes and enamels should continue to be licensed freely during 1956.

## Nuclear Research Contribution

A Dutch Government memorandum to the Lower Chamber of the States-General discloses that the Government intends to increase Holland's contribution to the European Organization for Nuclear Research by 250,000 guilders, to 1,250,000 guilders.

## Derelict Mine Restored

A copper mine which has been derelict and flooded for 28 years in Northern Rhodesia is shortly to go into production. It is the Mtuga mine, 100 miles north of Lusaka. The company bringing it back into service is Magundi Copper Mines & Minerals Ltd.

## Oil Refinery Inaugurated

The King of Greece laid the foundation stone of the oil refinery at Aspropyrgos, near Lake Koumoundouros, recently.

## New Department

The formation of an electric products department of Linde Air Products Co. (formerly Dominion Oxygen Co.), a division of Union Carbide Canada Ltd., has been announced. Mr. Gordon Murphy, B.A., P.Eng., has been appointed general manager, with Mr. John W. Ross, B.A., P.Eng., as operations manager, and Mr. S. J. Carmichael as sales manager. The announcement said that the electric products department, staffed by engineers and specialists, is assuming full responsibility for the manufacture, development, sale and servicing of Linde's electric equipment and processes.

## Indian Uranium & Thorium

Dr. J. C. Ghosh, of the Indian Planning Commission, stated recently in Calcutta that if India's uranium and thorium reserves were utilized for atomic reactors, the country would have enough energy resources to maintain a standard of living equal to that of the US for 200 years. India had reserves of uranium ore which might give 15,000 tons of uranium metal on extraction. It also had reserves of 180,000 tons of thorium in readily extractable form. Reserves of Indian high-grade iron ore exceeded 10,000,000,000 tons.

## New Research Centre

Mr. Axel Wenner-Gren, the Swedish financier, is to finance an international research centre which is to be built in Stockholm. Estimated cost of the centre when completed will be about £700,000.

## US Water Purifier

US Army engineers have developed a mobile water-purifying unit capable of making radioactive water safe in 30 minutes. The unit, a combination of filter and chemical treatment of water, is said to have solved the problem of water contamination caused by fallout from atomic explosion.

## Indian Salt Exports

The Indian Government has decided that validity of all licences for export of salt, which remain wholly or partly unutilized at the end of December 1955, may be extended until the end of March 1956.

## US Synthetic Rubber Plant

Goodrich-Gulf Chemicals, of Cleveland, Ohio, is to buy the US Government's synthetic rubber factory at Institute, West Virginia, for \$11,000,000. The plant is the largest of the synthetic rubber factories built by the Government during the war. The decision to sell it is subject to review by the Attorney-General who must decide if the sale is not contrary to the American Anti-Monopoly laws. His findings will be sent to Congress by 13 January.

## Australian Research

Broken Hill Proprietary has almost completed the setting up of a central research organization for the Australian iron and steel industry at Newcastle (NSW). It will initiate research under six major sections—ores, coal, coke and other fuels, combustion, chemistry, physics and alloys. Professor H. Warner, professor of metallurgy, Melbourne University, is to become director of the establishment in the New Year.

## Indian Creosote & Glycerine

The Indian Government has decided that creosote oil (light) should continue to be licensed freely on shipping bills up to the end of 1956 to all permissible destinations other than the Portuguese possessions in India. A limited quota of refined glycerine for export by non-manufacturers during January-June 1956 has been released.

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## PERSONAL

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MR. C. M. SLOCOMBE has been elected to the board of Samuel Fox & Co. Ltd. with effect from 1 January.

MR. H. P. O'BRIEN, who joined British Nylon Spinners as company secretary in 1947, has been appointed a director of the company.

MR. A. R. M. GEDDES, a director of the Dunlop Rubber Co., has been elected chairman of the council of the International Road Federation.

MR. F. B. HOWARD-WHITE, M.C. M.A., has been appointed to the delegate board of the Mond Nickel Co. Ltd. with effect from 21 December. Educated at St. Paul's School and at Cambridge, Mr. Howard-White joined Mond Nickel in 1920. In 1928 he was called to the Bar, and in 1938 was appointed joint secretary of Mond Nickel. In 1951 he was made a director of Birlec Ltd., a position he gave up when that company ceased to be part of the Mond Nickel organization. In May last year he was appointed a director of Henry Wiggin & Co. Ltd. Mr. Howard-White is a member of the Colonial Office Advisory Committee on Colonial geology and mineral resources.

Samuel Fox & Co. Ltd. announce that MR. A. C. BRIERLEY, at present in United Steel Co.'s export department, was appointed to succeed MR. J. H. GOODLAD as light steel sales manager with effect from 1 January 1956.

MR. T. D. OUGH, works manager of the Plymouth factory, has been appointed general works manager of Acheson Colloids Ltd., a new position created by expansion plans now being undertaken by the company. Mr. Ough, who will operate from Plymouth, will have overall responsibility for production at all Acheson factories in Europe. He is succeeded as Plymouth works manager by MR. H. G. DAVIS, formerly deputy works manager.

On 1 January, MR. J. W. DONALDSON retired from his position as export director of ICI's Nobel division. Mr. Donaldson joined the Nobel Explosive Co. Ltd. in 1909.

SIR IVOR COX was appointed deputy chairman of AEI Overseas Ltd. with effect from

1 January. He has been succeeded as group managing director by MR. F. J. E. TEARLE, who has also been made a director of AEI Ltd.

MR. JOHN R. CHARLTON has been appointed to the newly created position of manager of the product development section of Canadian Resins & Chemicals Ltd. A graduate of the University of Toronto, Mr. Charlton has had 14 years' experience in plastics engineering and development work. He is a member of several professional societies, including the Chemicals Institute of Canada, Chemists' Club of New York, American Chemical Society and the Society of Plastics Engineers.

The Colonial Office announces the re-appointment of the RT. HON. THE LORD REITH, G.C.V.O., G.B.E., C.B., T.D., to be chairman of the Colonial Development Corp. for a further period of three years from 1 April 1956 to 31 March 1959. The re-appointment is also announced of MR. HUBERT NUTCOMBE HUME, C.B.E., M.C., to be deputy chairman of the corporation for a further period of three years.

MR. EDWIN R. PERRY, D.F.C., A.I.M., has been appointed as a development officer in the platinum metals division of the development and research department of Mond Nickel Co. Ltd. at Acton. He will take up his duties on 24 January 1956. Mr. Perry's previous experience has been in the research laboratories of the General Electric Co., Baker Platinum Ltd., and High Duty Alloys.

The wedding took place at Dacre Parish Church on 21 December of MR. L. BROOK HOLLIDAY, a director of L. B. Holliday & Co. Ltd., aniline dye manufacturers of Deighton, Huddersfield, and MISS PAMELA ANNE HIRSCH, of Low Hall, Dacre, near Harrogate.

MR. J. G. WINDOW, sales director of QVF Ltd., of Stone, Staffs, suppliers of glass industrial plant and pipeline, returned from his seven-day visit to Finland with £5,000 worth of orders. Mr. Window, who went to Finland early in December to lecture to members of the Chemical Society on



'Chemical Engineering in Glass' took with him a scale model of a sulphuric-acid absorber for demonstration. Among the orders he returned with was one for a full-sized absorber.

MR. G. F. ADAMS, B.Sc., A.Inst.P., the scientific adviser, and MR. H. B. TOFT, B.Sc., of the physics department of A. Gallenkamp & Co. Ltd., have been appointed to the board. Mr. Adams, formerly on the research staff of GEC at Wembley, joined Gallenkamp in 1939. He will continue to be in charge of the technical and development departments. Mr. Toft resigned his appointment as Principal of Bath Technical College to become a sales executive with Gallenkamp in 1954.

The Council of the Institute of Metals has awarded the Medal in Platinum for 1956 to PROFESSOR GEORGES LEON CHAUDRON, Doct. ès Sc., Professor of the Sorbonne, in recognition of his contributions to knowledge, particularly in the field of light metals. DR. DONALD MCLEAN, D.Sc., B.Sc., principal scientific officer of the metallurgy division of the National Physical Laboratory, has been awarded the Rosenhain Medal for 1956, for contributions in physical metallurgy, and MR. E. J. THACKWELL, of the Northern Aluminium Co., the W. H. A. Robertson Medal for 1955 and Premium of 50 guineas for a paper on 'The Choice & Construction of Monolithic Linings for Twin-Bath Induction Furnaces for Melting Aluminium Alloys.'

MR. R. HART STILL has been appointed to the board of Bakelite Ltd. Other appointments made as the result of the reorganization of the company's sales and production departments are: MR. A. J. HEARN, chief accountant; MR. A. LLOYD, production controller; MR. R. C. MOUNTFORD, works manager (Ware); MR. C. D. PHILIPPE, thermoplastics division sales manager; MR. C. A. ROBB, general works manager; MR. A. W. SHERWOOD, sales promotion executive; MR. P. SMITH, general sales manager (home sales); MR. G. J. TAYLOR, commercial relations executive.

MR. CHARLES J. BRYANT, A.C.I.S., F.I.A.C., secretary of the Bryan Donkin Co. Ltd., and British Furnaces Ltd., for the past five years, has retired at the age of 72. Mr. Bryant was the oldest employee of the company; starting with the firm at Bermondsey, London, in 1898, later moving

to Chesterfield to take charge of the accounting section. In 1945 he was appointed assistant secretary of the Bryan Donkin Co. Ltd., and British Furnaces Ltd., and in 1950 was appointed secretary. As an appreciation of his services Mr. Bryant was presented with a cheque by the directors and members of the staff gave him a grandfather clock. He is succeeded by MR. E. ARNOLD, A.C.I.S.

DR. ALAN ROBERTSON, B.Sc., Ph.D., A.R.I.C., manager of the Drikold section in ICI's ammonia works, has been appointed deputy labour manager of ICI Billingham division, in succession to MR. G. T. BRITTON, who is going to the company's commercial works as deputy works manager. DR. H. E. NORTH, B.Sc., Ph.D., A.R.I.C., work study manager, Billingham division, has been appointed to succeed MR. J. B. ROBERTSON as distribution manager. DR. A. C. DOCHERTY, B.Sc., Ph.D., A.R.I.C., analytical control section manager in research department, has been appointed to succeed Dr. Robertson as Drikold section manager. MR. J. B. ROBERTSON has been appointed sales control manager for building and industrial products in succession to MR. J. L. ROGERSON who is going to central purchasing department in London.

DR. ROBERT S. ARIES, president of the chemical consulting organization of R. S. Aries & Associates, New York, has been elected a fellow of the New York Academy of Sciences in recognition of his achievements in science. Dr. Aries is a part-time member of the graduate faculty of the Polytechnic Institute of Brooklyn and is the patentee of 18 US and foreign patents in the field of plastics, pharmaceuticals and pulping.

The General Electric Co. Ltd. announces that MR. D. A. STRACHAN, A.I.Min.E., F.I.E.S., M.A.M.E.M.E., has been appointed to the head office of the company and will be responsible for flameproof and mining equipment sales. MR. S. C. WELLS, D.L.C., has been appointed chief of oil industry equipment sales.

On account of the increasing pressure of his duties in the Powell Duffryn group and elsewhere, SIR HENRY WILSON SMITH, K.C.B., K.B.E., has resigned from the board of Mobil Oil Co. Ltd., with effect from 31 December 1955.

# Law & Company News

## Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

### Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary but such total may have been reduced.)

SEFTONIAN LABORATORIES LTD., Liverpool.—5 December, mortgage to Midland Bank Ltd. securing all moneys due or to become due to the bank; charged on 9, 9a, & 9b Rose Lane, Liverpool, with fixtures. \*Nil. 3 August, 1955.

TEMPO LABORATORIES LTD., Tunbridge Wells.—5 December, £3,750 debenture to G. V. Kenyon, London, and others; general charge. \*£3,000. 18 July, 1955.

### Satisfactions

HERBERT & KIRKWOOD LTD., Staines, Middlesex, electro platers.—Satisfaction, 9 December of debentures registered 21 September, 1948, to the extent of £50 and of charge registered 19 February, 1951, to the extent of £50.

PLUS PRODUCTS LTD., Gateshead, plastics manufacturers.—Satisfaction, 8 December of mortgage registered 12 September, 1951.

### Changes of Name

PICTORIAL MACHINERY (CHEMICALS) LTD., Pictograph Works, St. Wilfrids Road, New Barnet, Herts, to Pictograph Ltd., on 22 November, 1955.

WYLIE'S CLEANSERS LTD., Berger House, Berkeley Square, London W1, to Berger Group Supplies Ltd., on 30 November, 1955.

VIVUS PRODUCTS LTD., horticultural chemists etc, 27 Manor Road, Brackley, Northants, to J. Gordon Ryland Ltd., on 1 December, 1955.

## New Registrations

### Stratton Chemicals Ltd.

Private Company (559,002.) Capital £100 in £1 shares. To carry on the business of manufacturers of and dealers, wholesale and retail, in organic and inorganic chemicals etc. Subscribers: Geoffrey K. Ireland and Herbert S. Garfield, solicitors, of 20 Copt-hall Avenue, London EC2.

### Greenmantle Industries Ltd.

Private company (559,030.) Capital £100 in £1 shares. To carry on the business of manufacturing chemists, distillers, electricians, electrical mechanical engineers and suppliers, contractors and manufacturers of and dealers in chemicals, metals and other substances, electricity and electrical apparatus etc. Directors: Mrs. Betty J. Hiley and Mrs. Rosa A. Thomas. Reg. office: Greenmantle, 13 Warham Road, South Croydon, Surrey.

### Bermans (Manufacturing Chemists) Ltd.

Private company (556,966.) Registered 7 November. Capital £1,000. Directors: Leo. H. Shaine and Alan M. Berman. Reg. office: 59 Sloane Street, London SW1.

### Kitsons (Agricultural Chemists) Ltd.

Private company (557,335.) Capital £3,000 in £1 shares. Directors: Raymond H. Shaw and Mrs. Joan M. Shaw. Reg. office: 1 Broad Street, Worcester.

### Western Ink Company Ltd.

Private company (557,351.) Capital £100 in £1 shares. To carry on the business of manufacturers of and dealers in printers' ink and ink of all other kinds, etc. Director: Wilfred Harvey, a director of Sampson, Low, Marston & Co. Ltd., etc., and Stanley V. Wiltshire, a director of Cumberland Paper Co. Ltd. Reg. office: Paulton, Somerset.

### Spax Chemicals Ltd.

Private company (558,188.) Capital £100 in £1 shares. To carry on the business of manufacturing, research, dispensing and analytical chemists and druggists. Directors: Anthony J. Mackness and Arthur F. Edwards. Reg. office: 61 Fortress Road, Kentish Town, London NW5.

### Metaltest Ltd.

Private company (558,223.) Capital £100 in £1 shares. To carry on the business of manufacturers of special chemical sub-

stances, and to sell, distribute and export them for the purpose of detecting cracks, fissures and flaws in castings etc. Subscribers Jean Herbert and T. A. Herbert.

#### **Peccelex Ltd.**

Private company (558,227.) Capital £2,000 in £1 shares. To carry on the business of manufacturers of and dealers in plastic materials and chemicals of all kinds etc. Directors: Alan D. Whitehead, director of Polymer Consultants Ltd., and Harold Robinson. Reg. office: 3-4 Fox Court, London EC1.

#### **Vapar Chemical Co. Ltd.**

Private company (558,848.) Capital £100 in £1 shares. To carry on the business of manufacturers of and dealers in chemicals, gases, drugs etc. Directors: Samuel Wachsmann, Benjamin Ballon and Eric Donaldson. Reg. office: 415 Oxford Street, London W1.

#### **Gaul's Carpet Cleaner Ltd.**

Private company (558,823.) Capital £1,000 in £1 shares. To manufacture, bottle, pack and deal in carpet cleaning materials; chemical manufacturers etc. Directors: Charles H. Milne and W. R. T. Roddam. Reg. office: Adelaide House, London Bridge EC4.

#### **Gourlay Davis & Partners Ltd.**

Private company (558,242.) Capital £100 in 10s. shares. To carry on the business of importers and exporters of and dealers in merchandise, including fertilizers, chemicals, pharmaceuticals, phyto-pharmaceuticals, sulphur, pyrites etc. Directors: Geoffrey B. Gourlay, Sydney G. H. Davis, Geoffrey N. Noel-Tod and Philip Hadfield. Reg. office: 13 St. James Square, London SW1.

#### **South Eastern Tar Holdings Ltd.**

Private company (558,715.) Capital £100,000 in 45,000 'A' and 55,000 'B' shares of £1 each. To acquire all the issued shares of South Eastern Tar Distillers Ltd., and to enter into an agreement with South Eastern Gas Board and Burt Boulton & Haywood Ltd., and to carry on the business of an investment holding company etc. Power is taken to carry on business as tar distillers etc. Subscribers: Sybil P. Hart and J. L. Hargood. Four of the first directors shall be nominated by Burt Boulton & Haywood Ltd. (representing 'A' shares) and five by South Eastern Gas Board (representing 'B' shares). Solicitors: Linklaters & Paines, 6 Austin Friars, London EC2.

## **Company News**

### **Albright & Wilson Ltd.**

The directors of Albright & Wilson Ltd. announce that acceptance of the offer to ordinary stockholders of 6,084,852 ordinary shares of 5s each at 15s 6d per share totalled over 99 per cent. Applications for additional shares amounted to over 35 times the number available.

### **Powell Duffryn Ltd.**

The directors of Powell Duffryn Ltd. have declared an interim dividend of six per cent actual, less tax, on the 9,660,471 ordinary shares of 10s for the year ending 31 March 1956, payable on 25 February 1956.

## **Market Reports**

LONDON.—Most sections of the industrial chemicals market have begun the year on a firm note, with a fair weight of new business. Price revisions have been few and the market shows no definite trend, but buyers are having no hesitation in placing forward contracts. The strength of the metal has again raised the basic prices of white lead and red lead. The rates as from 30 December are white lead £152 5s per ton, red lead £148 per ton and litharge £150 per ton. The position of the coal-tar products market is unchanged and supplies of most items are well sold forward.

MANCHESTER.—Activity in heavy chemical products on the Manchester market during the past week has been fairly active on the whole, and deliveries to most of the leading industrial outlets have been satisfactorily resumed after the seasonal interruption, the potash and soda compounds being prominent in this respect. Steady to firm price conditions are reported in virtually all sections. In the fertilizer section the demand for basic slag is active and a fair business is passing in sulphate of ammonia, while among the by-products, carbolic and cresylic acids, creosote oil, and most of the light distillates are being called for in good quantities.

GLASGOW.—The New Year holidays have, as expected, had their effect on the Scottish heavy chemical market and business generally was much quieter than usual. A fair volume of inquiries is still being received for export.

## Sasol's AGM

PRESIDING at the annual meeting of Sasol, Dr. F. J. du Toit, the chairman, said that the Corporation's income should be £3,400,000 by June, and, allowing for this amount, the total capital needs would rise to £40,000,000, including £25,000,000 in share capital and £15,000,000 in loans from the Industrial Development Corporation. Capital expenditure in the year to 30 June was £5,774,087. With exception of less important parts of subordinate units and one or two changes in the principal units made

necessary by experience, the work of construction had been completed.

The cost of coal from the Sigma mine owned and managed by Sasol is 5s a ton. In the last quarter only 100,000 tons were used but when the factory needs it the mine can supply 2,000,000 tons a year. Lack of skilled technicians caused various constituent parts to be tested inadequately or badly made and in some cases there were mistakes in detailed designs. Sasol already sells ammonium sulphate, liquid oxygen, creosote and other tar products.

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## Next Week's Events

### MONDAY 9 JANUARY

#### Association of Applied Biologists

London: Chemistry Theatre, Imperial College, Imperial Institute Road, South Kensington SW7, 10.30 a.m. & 2.15 p.m. A joint symposium of two sessions: 'The Resistance of Insects to Insecticides'.

#### SCI (London Section)

London: Chemical Society's Rooms, Burlington House, Piccadilly W1, 6.30 p.m. 'Management & Food Science' by Rupert Carr.

### TUESDAY 10 JANUARY

#### Society for Visiting Scientists

London: 5 Old Burlington Street W1, 7.30 p.m. 'Hopes & Aims of the International Geophysical Year' by Dr. Lloyd V. Berkner, O.B.E., and Sir Graham Sutton, C.B.E., D.Sc., F.R.S.

#### RIC (London Section)

Gravesend: Technical College, Mayfield Hall Annexe, Pelham Road, 7 p.m. 'Radioactive Techniques in Industry & Research' by J. L. Putnam, M.A., F.Inst.P.

#### Institution of Chemical Engineers

London: Geological Society, Burlington House, Piccadilly W1, 5.30 p.m. Joint meeting with SCI: 'Explosions & Poisons—A Comparison of American & British Precautions' by J. H. F. Smith, M.Sc., F.R.I.C.

#### Textile Institute

Bradford: Midland Hotel, 7.15 p.m. 'Chemical Faults' by F. F. Elsworth, B.Sc., Ph.D., A.R.I.C., F.S.D.C.

#### Institute of Metal Finishing

London: 8 Hill Street W1, 6.30 p.m. 'Performance Testing of Paint Films' by R. J. Brown, F.I.M., A.I.A.E., & A. J. Birch.

### WEDNESDAY 11 JANUARY

#### Society of Instrument Technology

Middlesbrough: Cleveland Scientific & Technical Institution, Corporation Road, 7.30 p.m. 'Sizing of Control Valves' by A. W. Morrison, B.Sc. (ICI); 'Testing & Inspection of Control Valves' by S. Fisher (ICI); 'Servo-motors for Control Valve Operation' by H. Forrester, Grad.I.Mech.E. (ICI).

#### SCI (Microbiology Group)

London: Institution of Civil Engineers, Great George Street, Westminster SW1, 10.45 a.m. & 2.15 p.m. Eight papers on 'Anaerobes'.

#### Society for Analytical Chemistry

Birmingham: The University, Edgbaston, 7 p.m. Ordinary meeting.

#### Incorporated Plant Engineers

Leicester: College of Art & Technology, 6.30 p.m. 'Rust Prevention' by representatives from Jenolite Ltd.

### THURSDAY 12 JANUARY

#### Society of Instrument Technology

London: Manson House, 26 Portland Place W1, 6.30 p.m. 'Liquid Flow Control' by B. W. Walls, B.Sc., A.M.I.Chem.E.

#### The Fertiliser Society

London: Geological Society, Burlington House, Piccadilly W1, 2.30 p.m. 'The Effect of Sampling on Fertiliser Analysis' by E. W. Schwehr, B.Sc.

#### SCI (Edinburgh)

Edinburgh: North British Hotel, 7.30 p.m. 'Worm Infestation—the Chemist's Approach to an Important National Problem' by A. Mackie, B.Sc., Ph.D., F.R.I.C., F.R.S.E.

### FRIDAY 13 JANUARY

#### Society of Cosmetic Chemists

London: Cafe Royal, Regent Street W1, dinner & dance.

## Relaxing Export Controls

CADMIUM lithopone is one of the chemicals released from control by a Board of Trade Order effective from 29 December, although cadmium lithopone containing selenium remains subject to control under 'Selenium & Its Compounds & Preparations'. The Order, the Export of Goods (Control) (Amendment No. 2) Order, 1955 (SI No. 1920), relaxes certain export licensing controls and is available from HMSO, price 3d (by post 4½d).

Among the principal relaxations permitted under the Order are:—licences will not be required for exporting bone oil, specified chemicals and certain fertilizers abroad, other than to China, Macao, North Viet Nam and Tibet. Neither will licences be required for the export of artificial graphite, refractory goods and certain chemicals to the British Commonwealth, the Irish Republic and the US.



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# CLASSIFIED ADVERTISEMENTS

## SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

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### DEPARTMENT OF CHEMISTRY AND FOOD TECHNOLOGY

The Governing Body invites applications for suitably qualified candidates for appointment as Grade B Assistant or Grade A Assistant, in the Department of Chemistry and Food Technology.

Candidates appointed should be able to teach general chemistry at G.C.E. Advanced Standard and some branch of chemistry to a higher standard (B.Sc., A'R.I.C.) They will also be expected to teach courses in applied chemistry or technology.

Further particulars and forms of application may be obtained from the undersigned.

**FREDK. J. PACKER.**

Clerk to the Governing Body.

**SCIENTIFIC OFFICER** (min. age 21) required by **MIN. OF SUPPLY** at Waltham Abbey, Essex, for research on heat transfer phenomena at high temperatures. **Quals.**: 1st or 2nd class honours degree or equiv. in physics or chemical engineering. **Salary** within range £513 10s.—£925 (Superannuable). Equal pay scheme. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A458/5A/VH. Closing date 21st January, 1956.

## SENIOR DEVELOPMENT AND DESIGN ENGINEERS

**SENIOR** appointments are offered to qualified Engineers with experience on chemical plant. Applicants should be capable of directing and controlling the activities of a Development or Design Team and should hold a minimum qualification of 2nd-class Honours Degree.

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Applications, giving full details of qualifications and experience, to **BOX NO. C.A. 3452 THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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Application form and particulars from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, 30, OLD BURLINGTON STREET, LONDON, W.1**, quoting No. S4541/56. Applications to be returned by 31st January, 1956.

## NORTHERN GAS BOARD DARLINGTON DIVISION

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Applications, stating age, experience, qualifications and the names of two persons to whom reference can be made, should be addressed to the undersigned not later than January 21st, 1956.

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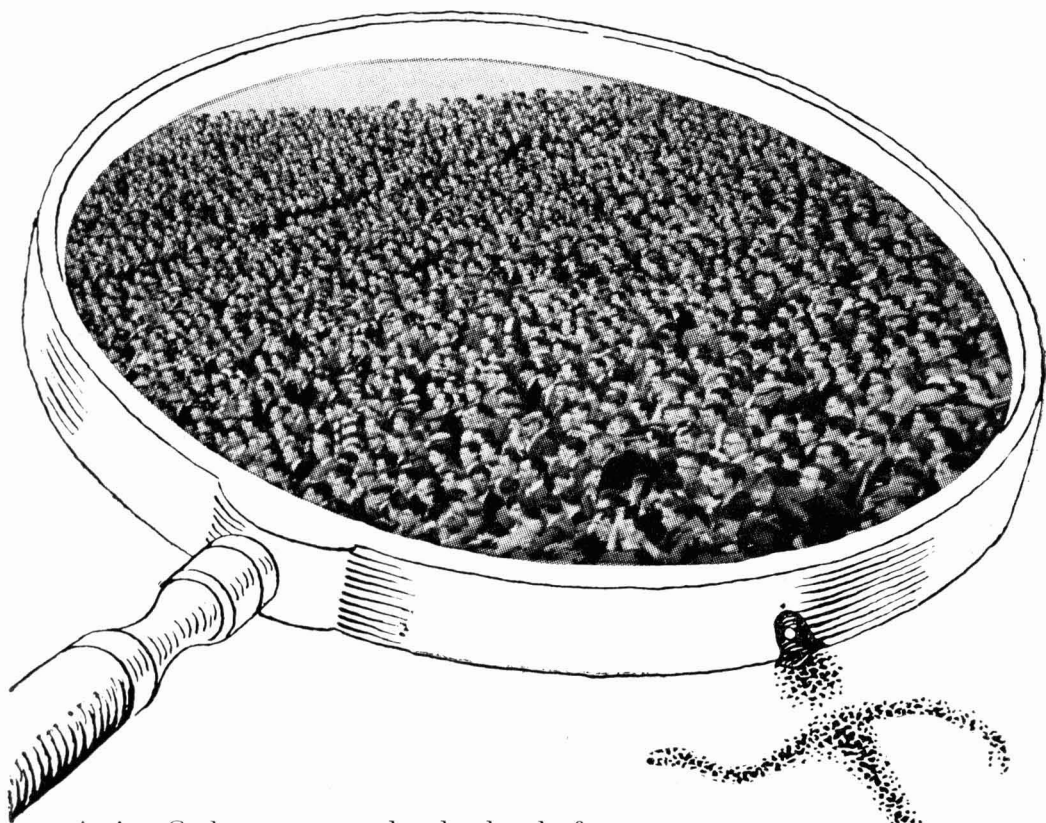
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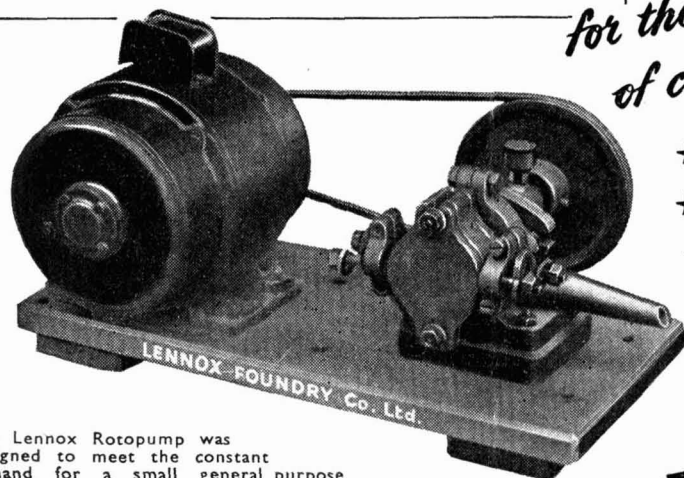
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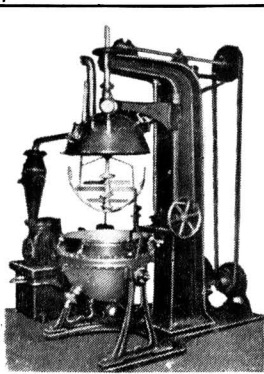
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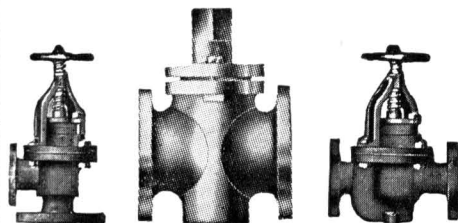
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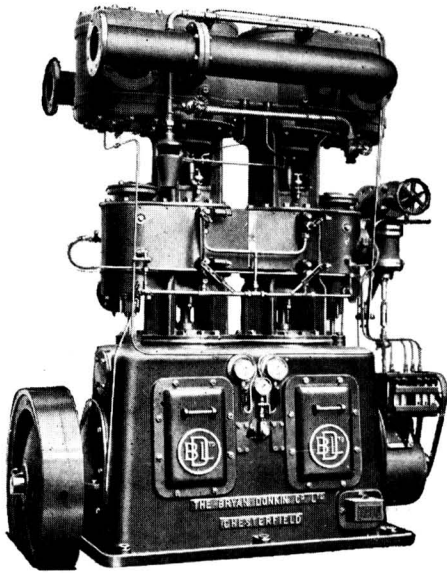
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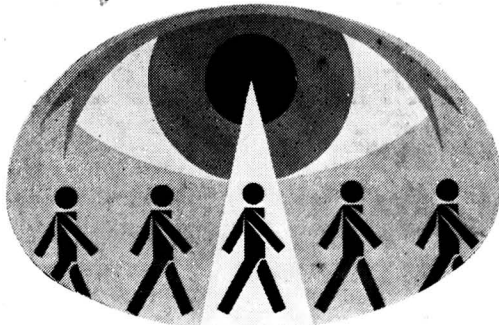
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