The
Chemical Age

VOL LXVIII 17 JANUARY 1953 No 174

Safety First

INDEX TO ADVERTISERS IN THIS ISSUE

	Page
Baker Perkins, Ltd.	ix
Braby, Fredk., & Co., Ltd.	iii
British Acheson Electrodes, Ltd.	vi
British Electrical Development Assn.	155
Brotherhood, Peter, Ltd.	i
Browns Foundry Co., Ltd.	Cover ii
Callow Rock Lime Co., Ltd. (The)	Cover iii
Classified Advertisements	xii, xiii & xiv
Cruickshank, R., Ltd.	Front Cover
Elcontrol, Ltd.	
Farnell Carbons, Ltd.	xiv
Fielding, T. H., & Sons, Ltd.	xiv
Guest Industrials, Ltd.	Cover ii
Imperial Smelting Corporation (Sales), Ltd.	Cover iv
Jobling, James A., & Co., Ltd.	vii
Kestner Evaporator & Eng. Co., Ltd.	ii & xv
Kilner, John, & Sons (1927), Ltd.	xv
Laporte Chemicals, Ltd.	xvi
Lennox Foundry Co., Ltd.	xvi
Mirvale Chemical Co., Ltd.	Cover iii
Nitralloy, Ltd.	xiv
National Enamels, Ltd.	xv
Nordac, Ltd.	x
Pott, Cassels & Williamson	viii
Potter, F. W., & Soar, Ltd.	ii
Powell Duffryn Carbon Products, Ltd.	v
Proctor Bros. (Wireworks), Ltd.	ii
Prodorite, Ltd.	Cover iii
Pulsometer Eng. Co., Ltd.	x
Quickfit & Quartz, Ltd.	iv
Reads, Ltd.	153
Spencer, Chapman & Messel, Ltd.	Cover ii
Staveley Iron & Chemical Co., Ltd. (The)	viii
Steel, J. M., & Co., Ltd.	xi
Wallach Bros., Ltd.	ii
Wallis, Charles, & Sons (Sacks), Ltd.	xv
Whitaker, B. & Sons, Ltd.	Cover ii

The
Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
Telegrams: ALLANGAS FLEET LONDON · Telephone: CENTRAL 3212 (26 lines)

Volume LXVIII 17 January 1953 Number 1749

Soil Conditioners

LITTLE more than twelve months ago news of Krilium, a chemical soil conditoner, was released by the Monsanto Chemical Company. A single year is scarcely long enough for waiting and seeing even in this century, but a great deal seems to have happened to chemical soil conditioners, certainly enough to justify taking an interim snapshot of the current American scene.

As is well known, it was not Monsanto's original intention to distribute Krilium commercially during 1952. Distribution was to be confined to experimental field work, pilot-plot usage, etc., and 1953 would have been the earliest year for free sales. But a number of other chemical manufacturers seemed less prepared to follow this sensible course, and almost within weeks some half a dozen conditioners were being advertised and aimed mainly at small gardeners. In reasonable self-defence the original pioneers revised their policy and Krilium joined its own imitators in the advertising columns and in the gardening sundries shops.

One conclusion has only too sharply emerged—this is a chemical speciality field in which there can be no monopoly. A wide range of synthetic polyelectrolytes enjoys this property of aggregating soil particles. Time and testing alone can tell which are the best, but meanwhile the claim of performance can be made qualitatively, if not quantitatively, for a number of chemicals. To quote from a recently U.S. article: 'Tests on most of these products are just getting well under way at some of the agricultural experiment stations. . . . It is becoming evident that these products are not all equally effective in conditioning soils.' (*National Fertilizer Review*, 1952, **27**, 4, 11.) The plain truth seems to be that modern high-pressure commerce has swamped scientific intentions and at the end of a 'free-for-all' year few people are any better informed about the real value of chemical soil conditioners than they were when Krilium was first announced.

The earliest information about Krilium suggested that it was a polyacrylate, but when the Monsanto Company was forced to enter the market it did so with its 'Merloam' formulation of Krilium, a vinyl-acetate maleic anhydride product. It was American Cyanamid who marketed a polyacrylate, and it is said that most of the soil conditioners now on the

market are based upon polyacrylate raw materials. Cellulose derivatives and silicates have also been developed as soil conditioners. An inorganic venture already announced but not yet on the market has been described as 'a ferric ammonium complex'. There is some justice, perhaps, in the reported fact that Krilium, though higher in price than most of its competitors, was probably the largest seller. The student of soil science would have liked to hear more about actual results secured by 1952 gardeners, for whether a price of $2 a pound is high or reasonable depends upon the degree of structural improvement that is brought to a garden soil.

Nevertheless, there is some news of an objective kind. The basic research work begun some two or three years before the first Monsanto announcement is steadily continuing. The durability of the 'synthetic' binding of soil particles, as compared with that obtained from humus constituents, has now been confirmed for some of the first test-plots are three years old and their state of aggregation is superior to that of plots treated with organic matter. Tests with radiocarbon 'tagged' conditioners have also proved that the polyelectrolytes are not decomposed easily by soil micro-organisms. It appears to be better for conditioners to be powders than liquids for they need to be well worked into top-soils, and it is being found that liquid applications affect surface-layers only and do not penetrate into the root zone. Low-grade clay soils are not only giving better crops after treatment but often the crops mature earlier; thus, with tomatoes, the 1952 yield of ripe tomatoes was increased from two to 14 tons as a result of soil conditioner treatment in May, 1951. But the quantities required per acre are high, 500 to 1,000 pounds of the active chemical per acre being the lowest rates used in tests. At $2 per pound this represents a sizeable investment even for high-value crops.

We understand that soil conditioner research has been started during the year at several British agricultural research stations. It is to be hoped that current development will be restricted to these and other similar investigations and that there will not be a spate of small-pack products pressure-aimed at the British back-gardener. Until clear and firm recommendations for soil conditioner use under our own climatic conditions can be given officially, commercial distribution on the 1952 American pattern can bring nothing but advance discredit to these potentially important agricultural or horticultural chemicals.

On Other Pages

Upward Trend in Chemicals Likely to Continue . . 125
New Continuous Measurement System 127
Analytical Chemical Courses . . 128
Radiochemistry in Paint Research . . 129
Brazilian Chemical Imports . . 132
High Frequency Titrimetry . . 133
National Packaging Exhibition . . 138
Tests for Phosphatic Fertilisers . . 139
Revolutionary Sludging . . 141
The Organic Chemist in Industry . . 143
The Oil Industries Club . . 144
Chemist's Bookshelf . . 145
Home News Items . . 147
Overseas News Items . . 148
Personal . . 149
Publications and Announcements . . 151
Next Week's Events . . 152
Law and Company News . . 156

The annual subscription to THE CHEMICAL AGE is 42s. Single copies, 1s.; post paid, 1s. 3d. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784/5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited.

Notes & Comments

Benzene Hexachloride

DURING the past few years solid progress has been made by benzene hexachloride (or BHC) and it has in many specific cases of pest control proved more effective than DDT. The discovery that the gamma-isomer of this long-known organic chemical possessed powerfully insecticidal properties was entirely British and perhaps for that reason its steady advance has on the whole been modestly publicised. Initially BHC was seriously handicapped by the taint nuisance: though it could control many pests, its residues often gave the final crops a musty flavour. To avoid this, applications had to be made long before harvesting times and this limited the pest-killing opportunities of an otherwise effective substance. As most chemists and growers now know, that problem has been overcome. The taint was derived from the other isomers present in the technical material and not from the insecticidal gamma-isomer. BHC can now be manufactured with a high degree of gamma-isomer purity and this refined form does not produce the deleterious side-effect. The range of pest control problems for which BHC can now be used has been enormously widened. British work has shown that the cumbersome winter and spring spraying programme of fruit-growers can be neatly simplified by relying instead upon a short series of BHC sprays in the spring, a technical advance that is at the same time a welcome economic relief.

Specific Efficiency

RECENTLY two examples of the specific efficiency of BHC have been reported. In New Zealand it has been found—from tests over five consecutive seasons—that BHC is outstandingly effective as a control for woolly aphis in apple orchards. DDT, nicotine, and parathion failed where BHC succeeded. In the first tests the taint trouble manifested itself, but by restricting BHC treatment to the dormant season good control without taint spoilage of the fruit was secured. The latest tests have shown that the refined gamma-product can be used at any time without taint hazard so that now this form of BHC need only be used when woolly aphis trouble has actually been observed, an advantage not enjoyed by the cruder form that had to be applied only in the dormant season. A second case has just been reported by British workers (*Plant Pathology*, 1952, **1**, 4, 121). For many years the best preventative for cabbage root fly has been calomel dust. Now it has been shown that BHC, as a liquid spray applied to the soil at the base of brassica plants, is notably effective and at a far lower cost than calomel dust. The BHC treatment costs about 4s. per acre (for materials) as against nearly £4 per acre for calomel dust.

More Economical

MORE emphasis might well be laid upon BHC's economic contribution to pest control. As mentioned above, BHC often proves itself to be effective where an established remedy is already known; but usually the BHC treatment is much simpler and much cheaper. If BHC is to enjoy the commercial rewards of its steady technical progress, however, all manufacturers and formulators should make it abundantly clear whether their products are based upon the mixed isomers or upon the purer gamma-isomer form. There cannot be uncertainty about this vital matter for wherever the cruder form of BHC is used for a growing crop the taint danger may discredit BHC for years to come.

Chlorophyll De-Bunked

PROFESSOR A. H. CORWIN of the Johns Hopkins University made a forthright attack upon the odour-suppressing claims of chlorophyll preparations at a recent meeting of the American Chemical Society. Chlorophyll-containing materials could not get into the bloodstream in sufficient

amounts to have any significant de-odourising power, and if they could get into the bloodstream in sufficient quantities he felt they would make the consumers dangerously sensitive to light. As for the basic evidence showing that chlorophyll could reduce the smell of odourous wounds, none of the tests had shown that chlorophyll was in fact superior to common salt solutions for this purpose. The air-space de-odourising gadgets now being widely sold owed their properties in Professor Corwin's opinion, to the aromatic masking perfumes added to these preparations and to the formaldehyde that most of them contained. Formaldehyde has a paralysing effect on the sense of smell so that other odours cannot easily be detected. Though chlorophyll was probably the most important pigment in the world because of its role in photosynthesis, its value for other purposes had not been established. However, 'it furnishes chemists, physiologists, and other scientists with a lot of good, clean fun.' The professor obviously belongs to the same school of thought as the chemical poet who last year produced the now-famous lines about the goat that feeds on yonder hill. We refrain from quoting them; instead, we steal a new one from the correspondence columns of *Chemical Week* (20 December, 1952):

'I wish each fish
Plumb to the gill
Would stuff itself
With chlorophyll.'

If the chlorophyll controversy rages for five years, somebody will be able to cash in with an anthology of chlorophyll verse.

Polythene Film in the U.K.

Joint Anglo-American Company Proposed

LAST week it was announced that Imperial Chemical Industries Ltd. and the Visking Corporation of Chicago, U.S.A., are proposing to form a joint company in Great Britain to manufacture polythene film. The Visking Corporation was formed in 1925 to manufacture seamless transparent tubes from regenerated cellulose, a product which has since found world-wide use for sausage casings. The fundamental research work of the Visking company into extrusion processes has in recent years enabled it to develop a range of products based on the modern thermoplastics.

At the request of the U.S. Government during World War II the Visking Corporation developed a process for manufacturing unsupported packaging film from polythene. Subsequently, they have developed a large market for this product which is sold under the trade name of 'Visqueen' and today Visking are the world's largest producers of polythene film.

Polythene, which was discovered in I.C.I. laboratories in 1933, is sold by I.C.I. under the trade name 'Alkathene.' I.C.I. also pioneered its manufacture in film form in Great Britain. The proposed joint company will combine the resources of I.C.I. with those of the Visking Corporation, who have unique experience and knowledge of the production of the high-quality polythene film required to meet the ever-increasing demands for defence purposes and industry generally.

Polythene film is transparent, tough, inert, moisture and water-proof, and is used for a diversity of protective packaging applications. Bags, wrappings, and drum and case liners are used in packing foodstuffs, pharmaceuticals, chemicals, electrical and metal components of all sizes, textiles, silverware, machinery, etc.

Its chemical inertness and moisture-resistance prevent corrosion and enable it to be used in contact with moisture-sensitive and reactive chemicals. Its use for frozen foods and high-altitude meteorological balloons indicate its unique resistance to cracking at low temperatures. Its electrical properties enable it to be used for lapping cables. The protective merit of polythene film has found favour in defence programmes and export packaging where long storage and 'tropicalisation' are required.

Technical & Scientific Register

The total number of persons enrolled on the Technical and Scientific Register at 10 November, 1952, was 5,644. This included 3,908 registrants already in work but who desired a change of employment, and 1,736 who were unemployed. Vacancies notified during the four-week period 14 October to 10 November were 531. Posts filled numbered 171.

Upward Trend Likely to Continue

Mr. T. C. Fawcett Cautiously Optimistic

PRESENTING his annual report for 1952, Mr. T. C. Fawcett, chairman of the Chemical and Allied Trades Section of the Manchester Chamber of Commerce, said that previous reports covering post-war years had all emphasised the abnormal demands made upon chemical producers by user industries, and the salient feature of these years had been the difficult supply position. The Report for 1952 must, however, strike a different note for during the year the chemical industry, as with many other trades, had witnessed a considerable fall in the demand for its products.

The effects of the trade recession, said Mr. Fawcett, were becoming evident in the latter months of 1951 and grew in intensity as the year 1952 progressed, being felt most severely by those sections supplying the textile industries. There were signs of an improvement in the situation although new business was far below the level reached in previous years. The upward movement was, however, steady and with all due caution, it was believed that this trend might continue.

The change in consumption had naturally affected the situation regarding availability of supplies. Almost all important items were freely available and even sulphur had ceased to present the problems so much to the fore in recent times. It must be emphasised, however, that this respite only resulted from the lowering of demand and might well be only short-lived. There was no slackening of the efforts to increase production of sulphuric acid from indigenous raw materials with a view to preventing a recurrence of the crisis brought about in 1950. Development in other directions within the industry had continued and particular mention might be made of activities in the field of synthetic fibres and petroleum chemicals.

Difficulties Facing Exporter

Increased competition from overseas producers, a fall in consumer demand, and import restrictions arising from insecure economies had all combined during the year to make difficult the task of the chemical exporter. Nevertheless, it was possible to record that exports of chemicals, drugs, dyes and colours during the first ten months of the year at £117,420,355 were only less than half a million pounds below the record figure reached in the same period of 1951. Imports during the same period were considerably reduced being £37 million as against £55 million for the previous year.

Ever-increasing Competition

Despite the excellent overseas trading results it was obvious that the days of easy sales were over and that ever-increasing competition would be encountered. The Committee was confident, however, that by the expansion within the industry at present envisaged and by utilising to the full the products of ever-continuing research, the chemical industry would continue to play a vital role in contributing to the nation's economic well-being.

The recession in the consumer goods trade did not seriously reduce the sale of dyestuffs until early in 1952 but the demand then fell to the lowest level experienced for many years. In addition, producers of textiles for export were handicapped by new import regulations abroad and this was particularly so in the case of rayon and cotton goods for Australia.

Since the beginning of September, there had been a steady increase from the previous low level and the general feeling was that this improvement would continue but not attain the abnormal level which prevailed prior to the recession.

Evidence had continued to accumulate of keen competition from Germany in various foreign markets, and this was particularly so in the case of the South American countries.

During 1952 the overseas demand for pharmaceutical products fell considerably, partly because of the excessive purchases made following the outbreak of the Korean war and partly from economic reasons which led to the imposition of import restrictions by many countries. Another contributory factor was the nationalistic desire for self-sufficiency which gave rise to new or

expanded local production, often uneconomic but protected by import barriers or by high tariffs. Towards the end of the year there had been signs of a general, if slow, improvement in trade.

The lubricating oil industry during 1952 had continued its steady progress although the demand for lubricants continued to decrease slightly.

This had been mainly due to the fact that owing to the depression in trade considerably less machinery had been running and consequently less lubricants and oil products of all types had been needed.

The position, however, was now showing some signs of improvement and it was hoped that next year the demand for products from the oil industry would show a substantial increase.

The shortage of steel sheet for drums had continued during the year but it was now showing signs of improvement. This was a matter of very great importance to the oil industry and although the position was improving it was still most important that all users should endeavour to return their packages in good condition as soon as they were empty.

The supply position so far as oil was concerned was quite satisfactory and as production was increasing it was fully equal to meet any increased demands.

Considerable research work had been carried out and new developments had taken place in producing special types of oil, particularly to meet the needs of up-to-date machinery. These developments which were taking place every day in the use of such things as additives and the building up of special oils should materially help the consumer to deal with any problem which he might have.

During the year, Mr. K. G. Holden had resigned from the committee and in accepting his resignation, members expressed sincere appreciation of his services in the past. To fill the vacancy thus caused Mr. C. E. Young had been co-opted into membership.

ACTH from Ox Pituitaries

AMPLE supplies of ACTH to meet all British requirements and also allow some for export overseas are now available according to a statement issued by the Crookes Laboratories Ltd., of Park Royal, London. This has been made possible by the use on a large scale for the first time of the pituitary glands of oxen. All other ACTH supplies in the world come from the pituitaries of pigs.

The new British preparations from ox-glands of home-reared cattle are the result of 3½ years extensive research work and laboratory experimentation. Assistance in obtaining sufficient supplies of the glands was given by the Ministry of Food and the National Research Development Corporation.

Efforts are now being made by the all-British team of chemists, bio-chemists, pharmacists and physiologists at the Crookes Laboratories Ltd. to isolate further physiologically active substances in the ox pituitaries and to carry out further experiments to enable these substances to be made available to the public and the medical profession through normal commercial channels.

ACTH obtained from ox pituitaries is in every way as effective as the hormones produced from those of pigs, and experts have not been able to find any difference in quality or effect on rheumatic sufferers said Mr. J. R. Bowden of the Crookes Laboratories Ltd.

To Study Patents Act

THE third 1952-53 session scientific meeting of the Society of Cosmetic Chemists of Great Britain will be held in the Conference Room of the British Colour Council, 13 Portman Square, London, W.1, on Friday, 6 February, 1953, at 7 p.m., when a paper on 'Patents' will be read by J. G. Fife, M.Sc., Ph.D., F.R.I.C., F.C.I.P.A.

Dr. Fife will discuss patents with particular reference to the cosmetic industry. Numerous important changes were introduced by the Patents Act 1949, and an indication as to how the new law is working in practice will be given. Problems arising from inventions made in the industry will be dealt with, particularly with respect to compositions and cosmetic operations used in hair-waving.

The meeting is an open one. It is hoped that all members will make an effort to attend and to invite any persons interested.

New Continuous Measurement System

Process Control by Combined Instruments

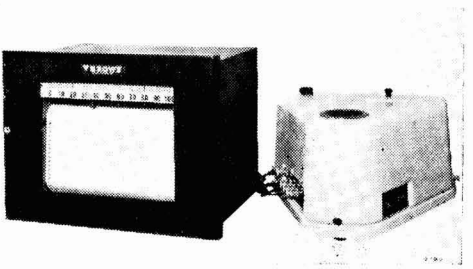
A NEW combination, which should prove of wide interest to all process industries, is the use of a Brown ElectroniK potentiometer with a Baird & Tatlock type 'B' absorptiometer for continuous measurement of small changes in colour density or turbidity of liquids flowing in chemical processes. The outstanding feature of the system is that it gives continuous null-balance measurement. It can provide pnuematic or electric control of the process involved and can therefore be installed as part of the control plant.

Two Identical Photocells

The Baird & Tatlock absorptiometer comprises two identical vacuum emission type photocells which are illuminated by a beam of light from a projector lamp through an optical system, one element of which is the mirror of a moving-coil galvanometer. Interposed between the galvanometer mirror and the photocells are two 'continuous-flow' absorption cells located on a sliding cell carrier. The cells are made of optical glass and have been specially designed for continuous flow. The liquid under examination flows through one cell, and a liquid used as a reference standard through the other.

Any change in the amount of light falling on one photocell, due to variation in absorption in the liquid under test, causes an out-of-balance e.m.f. from the photocell circuit to be applied to the specially adapted amplifier and input system of the Brown ElectroniK potentiometer. The potentiometer circuit of this instrument is used to energise the coil of the reflecting galvanometer. When an out-of-balance signal is detected by the amplifier, the instrument balancing motor drives the slidewire of the potentiometer in such a direction as to deflect the galvanometer to increase or decrease the area of illumination on the affected photocell until the amount of light falling on this photocell becomes equal to that on the standard photocell. Thus the photocells are kept equally illuminated, thereby automatically compensating for changes in lamp intensity due to normal mains voltage fluctuation.

H.T. voltage for the photocells is derived from the amplifier in the Brown ElectroniK potentiometer and is stabilised by neon tubes. The high input impedance required to match that of the photocells is obtained by the use of a simple cathode follower pre-amplifier. To counter long-term changes which may occur in the photocell characteristics or in the pre-amplifier stage an automatic 're-zeroing' device is incorporated. With the light on the photocells extinguished and 'dark current' only flowing, on closing a switch the instrument automatically adjusts a voltage dividing network so that under these conditions the voltage fed into the amplifier is zero. It is not anticipated that this operation will need to be carried out more often than once every 24 hours; it can if necessary be made fully automatic. A sensitivity adjustment makes available the full deflection of the instrument for a wide range of percentage absorption.



Continuous flow photoelectric absorptiometer and self-balancing electronic potentiometer

The potentiometer may be in either circular or strip chart form, and incorporates the wide range of features for signalling, control action and so on. The Baird & Tatlock absorptiometer can be supplied with colour filters and absorption cells to suit specific liquids.

Australian Uranium Search

An aerial survey of various parts of South Australia to assist in the search for further uranium deposits is to be undertaken during the next few months. Mr. Playford, the Premier, announced on 1 January that an aircraft for this purpose had been made available to the South Australian Government by the British Ministry of Supply.

Analytical Course

London 'Summer School' in September

A SUMMER school in analytical chemistry organised by the London Section of the Royal Institute of Chemistry with the participation of the Society of Public Analysts and Other Analytical Chemists is to be held at the Royal College of Science, Royal School of Mines, South Kensington, S.W.7, from 6-12 September.

Three courses, open to Fellows and Associates of the RIC and to members of the Society of Public Analysts, will be run concurrently, beginning at 9.30 a.m. daily.

Course 1.—Organic Analysis

Eight lectures will cover the detection and determination of the major elements including fluorine and oxygen, the metals and groups in organic compounds; the analysis of plastic materials; ion exchange techniques; and instrumental methods of analysis to include spectroscopic and electrochemical instrument techniques.

Practical work will consist of analysis using microchemical techniques for the elements and groups; the analysis of plastic materials; estimation by ion exchange of organic bases, removal of anions from salt solutions followed by titration of the base, and quantitative separations by ion exchange resins; recent instrumental methods of organic analysis including spectroscopic techniques, polarography, potentiometric, high frequency, amperometric, and coulometric titration.

Lecturers: R. Belcher, Miss M. Corner, Dr. A. L. Glenn, Dr. J. Haslam, G. Ingram, Dr. A. J. Nutten and Dr. L. Saunders.

Course 2.—Metallurgical Analysis

This course will be concerned with the analysis of metals and alloys and the determination of metallic impurities. Nine lectures will cover principles, applications and recent advances in polarography, absorptiometry and spectrography as applied in metallurgical analysis. Practical work will consist of experiments illustrating the application of these techniques.

Lecturers: *Polarography*—A. S. Nickelson, G. W. C. Milner and G. F. Reynolds. *Absorptiometry*—Dr. F. J. Bryant and D. W. Wilson. *Spectrography*—F. W. J. Garton, H. T. Shirley, M. Milbourn, and Dr. A. C. Menzies.

Course 3.—Biochemical Analysis

The course will consist of nine lectures and associated practical work, which will include chromatography (paper and column), electrophoresis, absorption spectroscopy (visible, ultra-violet and infra-red), polarography, flame photometry and determination of radioisotopes.

Lecturers: Professor E. J. King, Professor R. H. S. Thompson, Dr. C. Dent, Dr. R. A. Kekwick, Dr. W. Klyne, Dr. E. Lester Smith, Dr. A. J. P. Martin, N. Veall and Dr. I. D. P. Wootton.

In addition there will be one evening meeting which will be so arranged that participants in the three main courses will be able to attend. This meeting will take the form of a debate or discussion 'Concerning the need for statistical methods in analytical chemistry.' The opening speakers will be Dennis R. Read and E. J. Vaughan, and the meeting will be preceded by an informal supper.

The Summer School will open with a lecture by the Government Chemist, Dr. G. M. Bennett, C.B., F.R.S., F.R.I.C., and the president of the Institute will give a concluding address.

Places available, including practical work, are limited to 50, but additional numbers can be taken of those wishing to take the lectures only.

Details of fees, accommodation and so on may be obtained from G. Murfitt, Metals & Methods, Ltd., Bacon Works, Langley, near Slough, Bucks. Applications should be made as early as possible and places will be allocated in order of receipt of registration.

President Re-elected

At the annual general meeting of the British Leather Manufacturers' Research Association held on 17 December, Mr. Humphrey Morland was re-elected president. It was reported that the total income of the association for the past year exceeded that of 1950/51 by £7,000.

New members of the council were:—Dr. W. R. Gaythwaite, G. M. Harvey, W. H. Kershaw and Andrew Muirhead.

At the meeting of the new council which followed, H. A. Densham, O.B.E., was re-elected chairman, C. J. Pittard vice-chairman and Dr. J. P. Danby was co-opted on to the council.

Radiochemistry in Paint Research

New Technique Discussed by GCCA

RADIOACTIVE tracers offer the means of carrying out experiments in paint research which it is often difficult, if not impossible, to achieve by other methods. A number of these special applications were discussed by Dr. D. F. Rushman, of the Paint Research Station, Teddington, in a paper delivered on 16 December to the London Section of the Oil and Colour Chemists' Association. Dr. F. W. Stogle, chairman of the section, presided.

By these radioactive techniques, said Dr. Rushman, it was hoped that it would be possible to gain a clearer insight into the complex reactions concerned in paint making and to obtain more accurate and sensitive means of detecting and analysing traces of such things as driers, on the correct functioning of which the whole success or failure of a paint might depend.

He discussed briefly the basic fundamental principle underlying the use of isotopic tracers, namely, that isotopes, once thoroughly mixed, are not normally separated by ordinary chemical and physical processes.

There were a number of radioactive isotopes in nature, but with the exception of the naturally-occurring lead isotopes, applications of interest in paint research almost invariably involved examples drawn from the wide range of artificial radioactive elements produced by neutron bombardment in the chain reacting uranium pile.

Rapid Advancement

Coming to instrumentation and technique, the rapid advance in radiochemistry during the early 1940's coincided with similar rapid advances in electronic engineering, and the latter had strongly influenced the techniques used in modern radiochemical work, though the photographic plate still played a considerable part.

Most radiochemical laboratories used the Geiger-Muller counter (GM tube) as the basis of their detecting and measuring equipment. The two types of GM tube in most frequent use were the 'end-window' and the 'liquid' types (which the speaker illustrated), although many other special types were available and often had particular advantages for some work.

The pulses from the GM tube, after amplification, could be counted by a scaler (a high speed electronic counting device) or alternatively passed to a rate-meter which recorded the mean rate of arrival of pulses.

Dr. Rushman showed photographs of various operations in the laboratory, illustrating the use of trays to minimise the danger of breakages, the use of forceps and similar handling tongs for the more active solutions, and the use of the β-γ monitor for detecting stray contamination.

Sensitivity of Detection

In connection with the application of radioactive tracers in paint research, Dr. Rushman dealt first with those depending on sensitivity of detection. One of the most unique features of radioactive materials, was the extraordinary sensitivity of the detecting devices available, for example, 10^{-15} grams of phosphorus 32 would represent a satisfactory quantity of radioactivity for assay purposes.

Several applications arose from this sensitivity. One was the examination of the interface between a paint film and the substrate. If a paint, suitably labelled with a radioactive isotope, was stripped from its substrate, some information as to the nature of the interface could be gained from the presence or absence of activity on the stripped panel. The formation of metallic soaps at the interface could be examined in this way. Conversely, the panel could be made radioactive and the presence of activity sought in the stripped film.

Radiochemical methods could also play a significant part in some analytical problems, involving the analysis of ordinary unlabelled materials. The simplest example of this type of application was the direct determination of naturally occurring radioactive materials. The amount of thorium in rutile mineral was one such case; the potassium content of potassium zinc chromes was another.

It was often possible to identify and assay trace impurities in a material by the activity induced in it when subjected to irradiation, usually in a pile. This method did not seem to have been used in paint research so far, but was a powerful method capable of extreme sensitivity in favourable cases.

Method of Drying Oils

A method of greater potential importance to the chemistry of drying oils was that of 'analysis by isotopic dilution.' It often happened that, whereas a component of a complex mixture could be isolated with a reasonable degree of purity, it was impossible to achieve this separation with anything like a quantitative recovery. The separation of fatty acids or of triglycerides by crystallisation was a typical example.

If in such a case, a known weight of a radioactively labelled sample of the component to be isolated was first added to the mixture, the efficiency of recovery of the wanted component could be found by comparison of the recovered activity to that originally added to the mixture. Once the efficiency of recovery was known, the quantity initially present could readily be found. As an example, Dr. Rushman gave some results of the analysis of methyl stearate in admixture with tristearin.

A somewhat different type of problem solved by the use of radioactive tracers, he continued, was one associated with the chemical nature of pigment surfaces.

Although not strictly involving radiochemistry, there was a wide variety of interesting applications for radioactive materials in which the material was used as a marker, identified by its activity. A simple example was the use of a radioactive marker in a falling ball viscometer for use with opaque liquids. The position of the radioactive ball could be located by a suitable directional counter.

This principle could be extended further to the case where the rate of fall of pigment particles was followed by the use of radioactively labelled pigments. In this way it became possible to study sedimentation in viscous systems without disturbing the free sedimentation by the sampling procedure.

A good example of the use of radioactive isotopes as a tracer in a chemical reaction arose in connecton with the laboratory dehydration of castor oil, using phosphoric acid as a catalyst. Analytical determination of the total phosphate after saponification of such an oil failed to account for the amount of phosphoric acid. This showed immediately that the phosphorus remained in the oil and had not been lost as a volatile compound. Saponification showed that an appreciable quantity of the phosphorus was in some way linked with the fatty acids and could be extracted from the acidified solution by ether.

Of the activity in the aqueous layer, very little was precipitated by molybdate reagent. The addition of inactive sodium phosphate, followed by its precipitation as phosphomolybdate, removed no further activity from the solution, demonstrating that the residual activity was not present in the form of orthophosphate. This use of inactive 'carriers' to allow the separation and identification of unknown sources of activity is common in radiochemical work, especially when ultra-micro quantities were to be handled.

There were many such examples in the literature of the way in which radioactive isotopes might help in elucidating complex reaction mechanisms by tracing the fate of individual molecules or even parts of molecules. The identification of the end groups in long chain polymers was a case of interest in paint research.

Carbon 14 Labelling

Dr. Rushman also discussed the use, at the Paint Research Station, of carbon 14 labelling in the study of interchange reactions between the esters of fatty acids at high temperatures. He added that the method was proving particularly satisfactory in work designed to examine the kinetics and mechanisms of ester interchange in oil and varnish systems.

Finally, he referred to the possibility of directly initiating certain chemical reactions, including polymerisation, by irradiation from a suitable radioactive source. The amounts of activity required, of course, would be enormously greater than for the type of application mentioned earlier. It might involve departure from established industrial technique, but there was every likelihood that such large amounts of activity would be available at quite low cost.

Opening the discussion which followed Mr. L. O. Kekwick (president of OCCA), inviting Dr. Rushman to elaborate on the

investigation of the pigment surface, asked if all the barium ions in the surface were in fact replaced.

Dr. Rushman replied that it was not a case of replacing them completely, but achieving an equilibrium where the proportion of radioactive barium ions on the surface of the barium sulphate was the same as the proportion in solution. From the total number in the solution, the total number on the surface could be found. In the case of barium sulphate the number of sulphate ions on the surface might be very different from the number of barium ions. The interchange was complicated by adsorption, which proceeded at the same time, and must be allowed for. By 'adsorption' was meant the net transfer of ions as opposed to interchange which 'gave one and took one.'

The question of whether the work on ester interchange had been extended to the vexed problem did ester resins actually interchange with the oils on heat treatment, was raised by Mr. R. F. G. Holness.

Stating that he had not yet examined an ester resin, Dr. Rushman said that it would seem that ester interchange was a quite general phenomenon, although in the absence of catalysts it was quite slow, and he would expect that the ester resins would interchange in the same way.

Cost of Equipment

Answering a question by Mr. J. Grey concerning the cost of equipment, he said many people had done a lot of radioactive work for a total outlay on special equipment of not more than (say) £500. This assumed that a suitable room and general laboratory facilities were already available.

Dr. S. H. Bell made the point that the most important equipment of all was represented by the men engaged in the work; they needed a particular outlook, apart from knowledge, and the Paint Research Station was fortunate in the type of men engaged there.

Proposing a vote of thanks to Dr. Rushman, the president took the opportunity to express appreciation of the fact that the Paint Research Station had taken up radiochemistry, and he paid tribute to the perspicacity of its director in seeing that it was done; unless such investigations were carried out by an establishment of that sort, those who were more concerned with laboratory work which earned cash would not be able to appreciate its advantages and to know what could be achieved. As the work progressed it would be possible to see more and more how it was applied to the technical problems in the industry; and he asked that the Paint Research Station should provide a paper from time to time, so that the technologists in the industry could be kept informed. This work deserved encouragement because he felt that the future of Britain was absolutely dependent on her technical advances, and the more such work was presented to bodies such as OCCA the more those advances would take place.

Dr. L. A. Jordan (director of the Paint Research Station, and a past-president of OCCA) said he had been invited by the president to support the vote of thanks to Dr. Rushman. The meeting had paid the speaker a well deserved tribute, and Dr. Jordan added his own tribute to the happy way in which Dr. Rushman worked with his colleagues.

The work described was in the nature of a show piece, but at the same time it was very important. Potentially its limits were at present still unknown, but at least the meeting had seen a considerable diversity of points of contact and points of interest which were by no means fully explored.

Relationship between the Paint Research Station and OCCA, he said, had been a happy one for a long time. The workers at the research station had been in the habit of giving lectures once or twice a year, and he had no doubt that they would contrive, so long as there was something in the cupboard, to bring it out. He thanked the meeting for its tribute to Dr. Rushman, and said he felt that perhaps it might be shared by the research station as a whole.

Investments Lower

The oils, colours and chemical industries in Scotland took a substantially smaller share of the invested capital in New Companies in 1952 amounting to £61,500 compared with £201,700 in 1951. The total of new investment promotion amounted to only £4,040,904 as against £8,655,327 in 1951. The halving of the 1951 figure is undoubtedly an indication of the much more cautious approach which developed in the latter year, and represents the uncertainty and difficulty which involved virtually every industry in that period.

Brazilian Chemical Imports

New Policy Endangers British Exports

COMPARING the first eight months of 1951 and 1952, Brazil's imports of chemical and pharmaceutical products decreased last year by £1,837,120, to £29,320,000. Cellulose, essences, resins and other raw materials of vegetable origin, not included in the above figure, decreased by £155,040, to £18,249,000; synthetic dyestuffs, by £71,360, to £6,778,660; plastic materials and synthetic resins, by £22,440, to £1,645,600.

Basis of Foreign Trade

Under the policy, recently announced by the Brazilian Government, Brazil's foreign trade is becoming more and more based on reciprocal agreements. During the past month the new director of the Export-Import Department of the Bank of Brazil began publishing lists of the merchandise specified in such agreements, for which import licences will be issued, indicating at the same time from which country they may be imported. Brazil now has 14 of these commercial treaties in force, or about to be renewed.

Chemical products included are as follows, the values being quoted in all cases in American dollars for accountancy purposes:—

Portugal: sulphur, resins and unspecified products, $11,000. Italy: chemicals and pharmaceutical preparations, $4,480,000, including caustic soda, barilla, fertilisers, cellulose and sulphur. Germany: sundry chemical and pharmaceutical products, valued at $11,820,000; dyestuffs account for $2,500,000; plastic materials, $1,100,000; unspecified inorganic products, $1,500,000; pharmaceutical preparations, $2,000,000. Poland: sundry products $790,000, including barilla, zinc oxide and potassium salts. Japan: sundry products $760,000, the chief item being insecticides valued at $450,000. Also sundry products from Czechoslovakia valued at $830,000, Yugoslavia $370,000 and Spain $1,020,000.

The Franco-Brazilian agreement, which expired at the end of 1952, has been renewed, but the new and enlarged lists for 1953 have not yet been published. The expiring agreement provided for imports of chemical and pharmaceutical products valued at $15,135,000. The chief items were barilla and caustic soda, $2,000,000; dyestuffs, $2,600,000; fertilisers and insecticides, $5,000,000; unspecified chemical products, $1,000,000.

No renewal was made of the Anglo-Brazilian Trade Agreement which expired on 30 June, 1951, as the British authorities were of opinion that free commercial exchanges would yield better results. This view may well have been justified at the time, but Brazil's new policy greatly favours those countries with reciprocal agreements. The value of imports from Great Britain increased by £7,385,000 during the first eight months of 1952, when compared with the corresponding period of the previous year. This increase was due, however, to the diversion of trade from U.S.A. to Europe, owing to the dollar shortage, and Britain's share of Brazil's total foreign purchases actually dropped from 9.21 per cent in 1951 to 8.46 per cent in 1952.

Licenses to import British goods have, moreover, decreased steadily from 335, to 14.7 per cent of the total number issued, in June last, to 21, or 1.2 per cent, in October. Many of the chemical products, referred to in the above lists, have hitherto been supplied in appreciable quantities by Great Britain. Other traditional imports from U.K., such as industrial machinery and equipment, electrical materials, tools, cutlery and motor vehicles, are now included in agreements signed with her competitors.

Fire at Sulphur Plant

FUMES overcame seven firemen during a fire in the carbon disulphide sulphur extraction plant at the works of J. Brown & Co., Ltd., manufacturing chemists, Savile Town, Dewsbury, on the night of Monday, 29 December, 1952.

Four fire brigades from Dewsbury, Heckmondwike, Mirfield and Wakefield used over 250 gallons of foam. Due to the promptness and efficiency with which the fire was tackled no interference of production was expected.

When blazing sulphur fell on Station Officer W. Gill, of the Dewsbury Brigade, his clothing caught fire and he became a mass of flames. Burning sulphur also fell on some firemen who rushed to his aid, but the flames were extinguished before serious harm was done.

High Frequency Titrimetry

by PHILIP W. WEST
(Coates Chemical Laboratories, Lousiana State University, Baton Rouge)

HIGH frequency oscillators and their applications in analytical chemistry have become a very important subject for research during the past few years and the present discussion is presented in the hope of orienting the reader regarding the ultimate importance of this field. It is also hoped that the trends of development of oscillometry can be evaluated and that some appreciation of the problems existing and the possible lines of solution can be established.

Because of the nature of this presentation it does not seem practical to review in detail the instrumental aspects of high frequency measurements. The theories pertaining to high frequency oscillators and their application to chemical studies do not seem an attractive subject for discussion at this time and, in fact, it seems that the development of theory in this field has yet a long way to go before satisfactory answers to a multitude of questions can be derived. Under the circumstances, therefore, this discussion will be limited to general appraisals of the field of oscillometry with emphasis on a review of current applications of high frequency methods in analytical chemical work.

Applications Not New

The use of high frequency oscillators in chemistry is not at all new. For almost forty years dielectric constants have been determined through application of high frequency methods. Measurements of dielectric constants have been applied not only in theoretical studies, but have also been used to follow the progress of some chemical reactions as well as to determine the composition of certain binary mixtures. A very well known application of such instruments has been in the determination of the moisture content of solids. The present interest in high frequency methods as applied to analytical chemistry stems, however, from studies made since 1945 in which it has been pointed out that high frequency oscillators can be utilized without the necessity of electrodes coming in direct contact with the system to be studied. Blake, working in Australia, pointed out the significance of high frequency oscillators in analytical chemistry[14-19]; and Jensen and Parrack, working independently in the United States, described high frequency oscillators designed particularly for analytical applications[35,36]. The work in these two laboratories created a great deal of interest and stimulated further developments in the design and use of electrodeless instruments for use in electrochemical measurements of chemical systems.

High Frequency Instruments

Since the initial studies of Blake, Jensen and Parrack, a great deal of work has been done in the development of instruments for use in high frequency methods of analysis. In each case the high frequency oscillator is used as a means of measuring the net composition of some system being studied. The material under examination is placed in a cell which is a component of the tank circuit of the oscillator and any change in the composition of the material studied consequently produces changes in the voltages, the grid- or plate- currents, and in the frequency of oscillation.

The instruments employed fall into two general categories. The one class includes instruments which measure the response derived from chemical systems in terms of current or voltage changes. The other class involves those instruments which employ frequency-measuring instruments. In the latter case the instrument generally consists of two oscillator circuits which are beat together and the difference in frequency of the two oscillators is then measured. By inserting a chemical system into the tank circuit cell of the working oscillator, a difference in frequency is produced as compared to the reference oscillator and this difference is plotted versus the change in composition so as to produce a working curve for the system being studied.

The familiar heterodyne principle is very readily adapted to measurement of frequency changes induced by diverse chemical systems. Such oscillators are inherently stable and are very sensitive to slight

changes in the composition of any chemical system inserted into the tank circuit. Unfortunately, the sensitivity of high frequency measurements using the frequency response approach varies considerably with variation in concentration. Instruments of this type are specially well suited for non-electrolyte systems, but are of limited value in studies of electrolyte solutions because the oscillator tends to load with concentrations of electrolytes in the order of one hundredth molar and greater.

Less Susceptible

Instruments of the current- or voltage-measuring type are generally less susceptible to loading difficulties with electrolyte systems. A number of suitable circuits have been described, and instruments utilizing either current or voltage indication are particularly well adapted to titrimetric work.

The development of the field of high frequency methods follows two general lines. The most promising approach, in the opinion of the author, is that of direct concentration measurement. Such applications have been utilised in a general sort of way for many years in dielectric constant work and the theories that apply to dielectric constant measurement can be applied roughly to interpretation of high frequency methods of utilizing non-electrode systems. A definite advantage to the direct measurement type of application is that it fills a need not already met by other methods. While it is true that optical methods and some electrical methods may apply to direct concentration measurements and even to recording or monitoring systems, the fact still remains that oscillators measuring the frequency induced by chemical systems lend themselves ideally to the analysis of simple mixtures where there is only one variable under observation. It is admitted that most of the work to date in the field of high frequency methods has been devoted to titrimetric applications. This is understandable because high frequency oscillators do lend themselves quite readily to the detection of end points. It would seem, however, that existing titrimetric methods fill most of the needs in such work and it is hard to see at this time where oscillometry will be an adequate substitute for potentiometric, amperometric, or coulometric methods of analysis where such methods can be made to apply. The preceding statement must be qualified, however, by pointing out that extremely dilute solutions of electrolytes can often be handled more conveniently, in all probability, using high frequency techniques rather than conventional methods. Also, there are some titrations that can be followed by high frequency methods that do not lend themselves to measurement where electrode systems may be involved. Finally, and probably most important, titrations of organic compounds, particularly in non-aqueous solution, may lend themselves very readily to study with high frequency oscillators.

Among the titrimetric applications, the following works are of general significance. Jensen and co-workers have utilised high frequency titrations of calcium and magnesium ions in aqueous solution[3,5]. Their studies have indicated that high frequency titrimeters can be readily utilised in the detection of such end points as those obtained with standard soap solutions and calcium ion. Although their studies indicated that calcium could be determined with reasonable accuracy, they were not able to report as favourable results in the case of magnesium determinations. The use of ethylenediaminetetraacetic acid might be a more fortunate choice for calcium and magnesium titrations with instrumental indication of end points.

Determination of Chloride

High frequency titrimetry has been used in the mercurimetric determination of chloride by Blaedel and Malmstadt[8]. The chlorides are titrated with one hundredth molar mercuric nitrate in acidic solution, through use of a high frequency titrimeter, with a precision of approximately 0.03 ml. This would indicate that the end point obtained by means of the high frequency method appears superior to that obtained by the corresponding potentiometric or conductimetric methods. The most serious limitation to the high frequency titration in this case is the restriction imposed by the frequency response of the particular titrimeter used. The author employed a 30 mc. titrimeter, for which the working concentration should fall between 0.003 and 0.02 molar for sodium chloride or 0.0007 to 0.004 molar in terms of hydrochloric acid, and it was therefore necessary to

adjust the ionic strength of the solution to bring the response within the favourable range for the instrument.

Studies by these same authors have been made on other systems using a 350 mc. titrimeter[9]. The 350 mc. titrimeter was found applicable for the determination of end points based on acid-base, precipitation, complexation, and redox reactions. In all of the cases studied the end-points obtained with the instrument agreed closely with calculated equivalance points based on titrimetric procedures. Included in their studies were the titrations of silver nitrate using standard sodium chloride, the titration of mercuric nitrate with potassium thiocyanate, and the titration of oxalic acid by means of thorium nitrate. A simple titration for the determination of thorium by means of oxalate was also noted[10].

Anderson and Revinson have described a titrimetric method for the determination of berryllium, using a grid-dip type oscillator for determination of the end-point and sodium hydroxide as the titrant[2]. This work seems to be of particular significance because beryllium is one of the few remaining elements that has not been successfully determined by standard titrimetric procedures. A high frequency oscillator of the tuned plate-tuned grid type has been employed by Milner for the titrimetric determination of sulphate[30]. The determination was performed using standard barium chloride solution as the titrant and a high frequency oscillator operating at approximately 18.5 mc. per second was employed for the detection of the end point. The results obtained by the high frequency method compare very satisfactorily with those obtained by alkalimetric or gravimetric procedures. It is also noteworthy that the instrument employed in these studies operated successfully with electrolyte solutions approaching one molar concentration.

Locating the End-Point

The problem of locating the end-point in high frequency titrations is often of special interest because the titration curves appear in various forms depending on frequency, and other instrumental factors, and on solution concentration and identity. Where there are differences between theoretical and experimental end-points, correction can be obtained during standardisation of the titrants employed. The method of differential titration suggested by Blaedel and Malmstadt[12] is also of advantage in the correction of end points.

The second major approach in the analytical use of high frequency methods is in the study of concentration changes in simple mixtures. Oscillometry can be applied very advantageously to the studies of mixtures by direct concentration measurements which can often be made on simple systems with a minimum of time and with accuracies well suited to control operations. Frequency measuring instruments are especially adaptable to concentration measurement because of their sensitivity and stabilty. Such measurements are especially attractive in the field of organic analysis and the analysis of selected organic binaries is a most attractive field for future development.

Number of Applications

A number of applications along such lines have been suggested. West, Senise, and Burkhalter[18] have recently described the determination of water in various alcohols by means of high frequency oscillators and their work indicates that such determinations of water can be carried out very efficiently. The analysis of the system water-benzene-methyl ethyl ketone has also been proposed by West, Robichaux, and Burkhalter[17]. They employed a high frequency oscillator of the heterodyne type for their studies and were able to analyse the ternary system by first measuring the frequency of the mixture after which the sample was dehydrated by means of calcium chloride and the residual frequency again determined. The characteristic frequency found on the dehydrated sample was then referred to working curves for the simple mixture of benzene and methyl ethyl ketone. The concentration of water was established by noting the change in frequency obtained upon dehydration.

In addition to the techniques mentioned in the preceding discussions, there are general applications that pertain to theoretical studies and special problems. An interesting application of high frequency methods has been discussed by Nance and his co-workers[40] in which a heterodyne oscillator, using a condenser element, has been applied to the detection of chromatographic zones. Oscillometry holds a considerable amount of promise for use in kinetic studies. The recent work of

Axtmann[4] can be taken as an indication of what can be done along these lines although his work was actually performed with a dielectric constant meter. In most such analytical applications, in which dielectric constants are measured, it is possible to substitute a non-electrode element for the ordinary dielectric cell and so eliminate direct contact of the sensitive element with the solution being examined. Jensen, Watson, and Beckham[37] utilised high frequency titrimetry to study the saponification rate of ethyl acetate.

A number of studies have been made on complexation reactions. Critchfield has studied the formation of the cyanides of cobalt and nickel using high frequency methods [20] and Hara has done a significant amount of work on the study of various complexes formed in aqueous solution using similar methods.[30-34]

Industrial Importance

Thomas and his associates have shown the industrial importance of direct concentration measurement through studies in which they have utilised a continuously recording dielectric constant apparatus.[45] As mentioned before, an electrodeless instrument could be used equally as well and, in fact, would probably be more satisfactory for general application in the study of diverse chemical systems.

In summary, it should be pointed out that most of the work to date has been in the development of new instruments for use in high frequency studies. A wide variety of instruments has been described in the literature, and reference to published circuits will enable anyone to find an instrument suitable for most analytical applications. In addition to the circuits that have been described for laboratory construction, it should be mentioned that a commercial instrument is now available which is designed particularly for direct concentration measurement applications. The Sargent Model V Oscillometer has now been on the market about a year and is finding a number of applications in both routine analyses and in theoretical studies.[44] The instrument is readily adapted to recording applications and a jack is provided for the connection to a standard strip chart recorder. In addition to the Sargent instrument, the Beckman Instruments Company is in the process of producing a high frequency titrimeter. Their instrument will probably be best suited for work with electrolyte solutions while the Sargent Oscillometer will be best applied to very dilute solutions of electrolytes and to organic systems.

The present status of the theory of high frequency methods of analysis is somewhat uncertain. A good deal of work still remains to be done before all phases of the theory are worked out, but two excellent articles have recently appeared, one by Blaedel and his associates[13] and the other by Hall[28] which serve to summarise our present knowledge of the principles applying to this field.

BIBLIOGRAPHY

[1] Anderson, K., Bettis, E. S., and Revinson, D., *Anal. Chem.*, **22**, 743 (1950).
[2] Anderson, K., and Revinson, D., *Anal. Chem.*, **22**, 1272 (1950).
[3] Arditti, R., and Heitzman, P., *Compt. Rend.*, **229**, 44 (1949).
[4] Axtmann, R. C., *Anal. Chem.*, **24**, 783 (1952).
[5] Bever, R. J., Crouthamel, C. E., and Diehl, H., *Iowa State College J. Sci.*, **23**, 289 (1949).
[6] Blaedel, W. J., Burkhalter, T. S., Flom, D. G., Hare, G., and Jensen, F. W., *Anal Chem.*, **24**, 198 (1952).
[7] Blaedel, W. J., and Malmstadt, H. V., *Anal. Chem.*, **22**, 734 (1950).
[8] Blaedel, W. J., and Malmstadt, H. V., *Anal. Chem.*, **22**, 1410 (1950).
[9] Blaedel, W. J., and Malmstadt, H. V., *Anal. Chem.*, **22**, 1413 (1950).
[10] Blaedel, W. J., and Malmstadt, H. V., *Anal. Chem.*, **23**, 471 (1951).
[11] Blaedel, W. J., and Malmstadt, H. V., *Anal Chem.*, **24**, 450 (1952).
[12] Blaedel, W. J., and Malmstadt, H. V., *Anal. Chem.*, **24**, 455 (1952).
[13] Blaedel, W. J., Malmstadt, H. V., Petitjean, D. L., and Anderson, W. K., *Anal. Chem.*, **24**, 1240 (1952).
[14] Blake, G. G., *J. Sci. Instruments*, **22**, 174 (1945).
[15] Blake, G. G., *Chemistry & Industry*, **1946**, 28.
[16] Blake, G. G., *J. Sci. Instruments*, **24**, 77 (1947).
[17] Blake, G. G., *J. Sci. Instruments*, **24**, 101 (1947).
[18] Blake, G. G., *Australia J. Sci.*, **10**, 80 (1947).
[19] Blake, G. G., *Analyst*, **75**, 32 (1950).
[20] Critchfield, F. E., 'High-Frequency Study of the Cyanides of Cobalt and Nickel,' M.S. Thesis, West Virginia University, 1951.
[21] Duke, F. R., Bever, R. J., and Diehl, H., *Iowa State College J. Sci.*, **23**, 297 (1949).
[22] Flom, D. G., and Elving, P. J., Tech. Rept. to Office Naval Research (1950).
[23] Forman, J., and Crisp, D., *Trans. Farady Soc.*, **42A**, 186 (1946).
[24] Fujiwara, S., *Repts. Univ. Electro-Comms.*, **1**, 119 (1950).
[25] Fujiwara, S., *Bull. Chem. Soc. Japan*, No. 2, 315 (1950).
[26] Fujiwara, S., *Bull. Chem. Soc. Japan*, No. 3, 93 (1951).
[27] Hall, J. L., and Gibson, J. A., Jr. *Anal. Chem.*, **23**, 966 (1951).
[28] Hall, J. L., *Anal. Chem.*, **24**, 1236 (1952).
[29] Hall, J. L., *Anal. Chem.*, **24**, 1244 (1952).
[30] Hara, R., *J. Pharm. Soc. Japan*, **71**, 1122 (1951).
[31] Hara, R., *J. Pharm. Soc. Japan*, **71**, 1128 (1951).
[32] Hara, R., *J. Pharm Soc. Japan*, **71**, 1134 (1952).
[33] Hara, R., *J. Pharm. Soc. Japan*, **71**, 1140 (1951).
[34] Hara, R., *J. Pharm. Soc. Japan*, **71**, 1144 (1951).
[35] Jensen, F. W., and Parrack, A. L., *Texas Engrg. Expt. Bull.* No. 92 (1946).
[36] Jensen, F. W., and Parrack, A. L., *Ind. Eng. Chem., Anal. Ed.*, **18**, 595 (1946).
[37] Jensen, F. W., Watson, G. M., and Beckham, J. B., *Anal. Chem.*, **23**, 1770 (1951).
[38] Jensen, F. W., Watson, G. M., and Vela, L. G., *Anal. Chem.*, **23**, 1327 (1951).
[39] Milner, O. I., *Anal. Chem.*, **24**, 1247 (1952).

[40] Monaghan, P. H., Moseley, P. B., Burkhalter, T. S., and Nance, O. A., *Anal. Chem.*, **24**, 193 (1952).
[41] Nance, O. A., Burkhalter, T. S., and Monaghan, P. H., *Anal. Chem.*, **24**, 214 (1952).
[42] Nishigai, M., Okabayashi, H., and Tanaka, N., *Repts. Radiation Chem. Research Inst.* (Tokyo Univ.), **5**, 45 (1950).
[43] Okabayashi, H., Nakano, K., and Fujiwara, S., *Repts. Radiation Chem. Research Inst.* (Tokyo Univ.), **4**, 23 (1949).
[44] Sargent, E. H., and Company, 'Scientific Apparatus and Methods,' Volume 4, Chicago (1951).
[45] Thomas, B. W., Faegin, F. J., and Wilson, G. W., *Anal. Chem.*, **23**, 1750 (1951).
[46] West, P. W., Burkhalter, T. S., and Broussard, Leo, *Anal. Chem.*, **22**, 469 (1950).
[47] West, P. W., Robichaux, T., and Burkhalter, T. S., *Anal. Chem.*, **23**, 1625 (1951).
[48] West, P. W., Senise, P., and Burkhalter, T. S., *Anal. Chem.*, **24**, 1250 (1952).

'Education in Chemistry'

A DISCUSSION on 'Education in Chemistry' will be held on Wednesday, 18 February, at 6.30 p.m. under the joint auspices of the London Sections of the British Association of Chemists and the Royal Institute of Chemistry at the Wellcome Research Institution, 183 Euston Road, London, N.W.1.

The principal speakers will be: Professor C. K. Ingold, D.Sc., A.R.I.C., D.I.C., F.R.I.C., F.R.S., Professor of Chemistry, University of London; Dr. J. W. Skellon, T.D., B.Sc., M.Sc., Ph.D., F.R.I.C., Head of Department of Chemistry, Acton Technical College; Dr. O. L. Brady, B.A., D.Sc., D.I.C., F.R.I.C., Reader in Organic Chemistry, University College, London; R. W. Blount, B.Sc., H.M. Chief Inspector, Ministry of Eduction; Dr. Norman Booth, B.Sc., Ph.D., F.R.I.C., Chairman, London Section R.I.C. and Research Manager, British Oxygen Company.

The aspects of education covered in this discussion will be: 'The Aim of the Revised Regulations in Science,' 'External Degrees in Science,' 'Professional Qualifications in Chemistry,' 'National Certificate in Chemistry,' 'Requirements of Industry.'

Visitors will be welcome and intending speakers are advised to intimate their intention in advance to: F. C. Hymas, M.Sc., F.R.I.C., Hon. Sec., London Section, Royal Institute of Chemistry, 30 Russell Square, London, W.1, or T. Bewley, Hon. Sec., London Section, British Association of Chemists, 14 Harley Street, London, W.1.

French Phosphorus

Technical and Economic Problems

ECONOMIC factors affecting the production of phosphorus in France and possibilities of developing the industry were recently discussed by M. J. Sorel in his conference (No. 2786) at the Centre de Perfectionement Technique (*Chimie et Industrie* **68**, 771-778).

Adequate power is, of course, the basic requirement but other problems are the price of sulphuric acid and the costs of transport of raw materials and products.

Taking these into account it is suggested that there are several advantages in using the electric furnace rather than the acid method: purity of product, possibility of dealing with low grade phosphates (25-27 per cent P_2O_5), and reduced transport charges. Under these conditions the best sites for further extensions in the French phosphorus industry would be in the region of the Alps and Pyrenees.

Development of the phosphorus industry in France is described from its beginning on a large scale by Jean-Francois Coignet in 1838 up to the Monnet plan of 1952 under which it was proposed to establish two electric furnaces totalling 18,000 kVA, which would increase output of phosphorus by 5,000 tons a year.

Ample Raw Materials

France has ample sources of raw materials, notably from the Sétif-Tocqueville region of Algeria and around Kalaa Djerda in Tunis. Other phosphates of North Africa would be suitable after some preliminary treatment. Further supplies of raw material exist in French West Africa, of which exploitation has only been recently begun. These latter contain alumina which might produce problems if the acid treatment was used, although cement could probably be obtained as a by-product.

Technical and economic aspects from the French point of view are discussed by the author in some detail, including the production of various products such as the sodium phosphates and their industrial applications.

Production of phosphorus in France is at present small, about 12,000 tons a year, but the aim is to develop it as far as the electric power resources of the country permit.

National Exhibition

Chemical Industry Well Catered For

THE third National Packaging Exhibition opens at Olympia, London, on Tuesday, 20 January, and will continue for 10 days.

Among the items being shown for the first time by John Feaver, Ltd., London (National Hall, Stand No. 23, first floor), is a new range of square slip cover tins available in dimensions ranging from 3 in. to 10 in. An important feature of these tins is that both the cover and the body are curled for safety. A wide selection of cans, drums, and kegs for the chemical, paint and food industries will also be shown, including cans for essential oils, essences and ether.

Resistant Containers

A product which will be of particular interest to chemical suppliers among the 'Telcothene' chemically resistant containers exhibited by The Telegraph Construction and Maintenance Company, London (National Hall, stand No. 23, first floor, centre row), is the new Winchester quart bottle. The bottle, which is neither of blown nor injection moulded construction, is made in 'one piece' and possesses great mechanical strength. Standard 'Telcon,' four, eight, and 16 oz. bottles with easy pouring caps useful for handling acids and alkalis and particularly recommended for hydrofluoric acid will also be on view. Other items include examples of gutta percha acid-resisting ware and 'Telcothene' coated white sulphite papers used as facing papers for wads in container caps.

Eighty Years' Experience

Containers of all types of interest to the chemical industry—steel and aluminium drums, kegs, cans, and tin boxes—will be among the exhibits of Reads of Liverpool (National Hall, stand No. 4B), which has had over 80 years' experience in satisfying chemical requirements. A range of round and square tins will be displayed especially suitable for the packing of liquids, semi-liquids, powders, pastes and solids, with suitable types of necks or fitting according to the commodity to be packed. The company is always willing to consider the design and development of any specialised shapes or sizes of container to meet specialised needs.

In connection with the exhibition a special convention, organised by the Institute of Packaging, will be held in the conference hall, Olympia, at which a number of interesting papers will be read and discussed. The programme will be:—

'Packaging in Relation to Clean Food and Hygiene' (11.0 a.m., 21 January); 'Packaging Standards for NATO Defence' (11.0 a.m., 22 January); 'Packaging for Britain's Defence Programme' (11.0 a.m. and 2.30 p.m., 23 January); 'Packaging for Export' (11.0 a.m., 26 January); 'The Mechanisation of Packaging' (11.0 a.m., 27 January); 'Packaging and Air Freight' (11.0 a.m., 28 January); and 'Packaging and Unitisation' (11.0 a.m., 29 January).

All visitors to the exhibition are invited to attend the convention for which no special tickets are required.

The Institute of Packaging is also organising 'The Packaging Ball' which will be held at Grosvenor House, Park Lane, from 7.0 p.m. to 1 a.m. on Monday, 26 January, when there will be dancing to Sidney Lipton and his band.

South African Visit

IN January, 1951, Mr. J. Arthur Reavell, M.I.Mech.E., M.I.Chem.E., F.Inst.F., F.I.M., chairman of Kestner Evaporator and Engineering Co., Ltd., visited South Africa in connection with the activities of Kestner (South Africa) (Pty.), Limited, of which he is also chairman. Now he has just left for a further three months' visit to the Union and also to Southern Rhodesia.

The activities of Kestner (S.A.) (Pty.), Limited have increased considerably in the last two years and they have designed, manufactured and erected a wide variety of chemical, food and dairy plants throughout the Union. During his stay in South Africa, Mr. Reavell will be visiting many old friends in the process industries, where Kestner plants have been installed and put into commission, as well as discussing new projects with leaders of the South African chemical, food and allied industries.

Recently Kestner (S.A.) (Pty.) Limited have moved into new premises and their address is now Argent House, Loveday Street South, Johannesburg.

Tests for Phosphate Fertilisers

Potentialities of Dicalcium Phosphate

CLOSELY identified with the achievements of British agriculture is the fertiliser industry, which is playing a key part in the drive to increase the production of home-grown foodstuffs. The output of superphosphate was trebled in a single decade and now exceeds 1,000,000 tons a year. There is also a production of almost 1,000,000 tons of ammonium sulphate annually, which supplies over 70 per cent of the total fertiliser nitrogen consumption in the United Kingdom.

With the assistance of chemical manufacturers the industry has been able to keep pace both qualitatively and quantitatively with the country's growing requirements of nitrogenous and phosphatic fertilisers, and to overcome the difficulties of the war and post-war period. Yet the scope for this enterprising industry is handicapped by restrictions which are unduly rigid.

Current regulations under the Fertilisers and Feeding Stuffs Acts of 1926 stipulate the use of the water-solubility test for phosphate fertilisers. These regulations are inadequate and appear to be in urgent need of revision. The water-solubility test, though of established value where superphosphate is used alone or in mixtures with ammonium sulphate, is prejudicing the introduction of other fertilisers of good availability but low water-solubility.

Alternative Methods

It is doubtful whether water-solubility or citric-solubility is the more efficient method of finding out the amount of phosphates that becomes available to plants when the fertiliser under examination is put into the ground, for there is no means of reproducing accurately what happens in the soil when plants start feeding on the constituents of a fertiliser. Several tests have been proposed as criteria of the availability of phosphates to plant. In the water-solubility test stipulated under the Act, the fertiliser is extracted with water and the quantity of phosphates in the water solution is then determined. Alternative methods for estimating available phosphate are extraction with 2 per cent citric acid solution and extraction with neutral ammonium citrate solution.

To determine the most efficient test for a particular application it is necessary to take into consideration a number of variables such as the climate and the nature of the soil. Under the Act, however, a fertiliser which was citrate-soluble but not water-soluble could not be used in Britain. It is partly because of this restriction that Britain has stuck so closely to superphosphates, which are almost completely water-soluble. On the other hand, citric-soluble fertilisers are being used extensively on the American continent and in various European countries.

Soil Sulphur Efficiency

In some parts of the world there are vast areas which suffer from soil sulphur deficiency. In Britain, however, through the established use of sulphur-bearing fertilisers such as ammonium sulphate and superphosphate, sulphur deficiency in soil is not a problem. The sulphur radicle in these fertilisers is not required by British soils, and it has been estimated (1) that for this reason over 700,000 tons of sulphuric acid used annually by the fertiliser industry are not of direct value to agriculture. In certain countries nitrates constitute the bulk of the nitrogenous fertilisers. In Holland, for example, calcium nitrate and ammonium nitrate/calcium carbonate mixtures supplied 12 per cent and 58 per cent respectively of the fertiliser nitrogen consumed in 1938/39. In the U.S.A. and Canada considerable quantities of ammonium nitrate, suitably treated to minimise caking, fire and explosive risk, are used as fertiliser. Increased use of nitrates in Britain would help to relieve the pressure on sulphuric acid.

Dicalcium Phosphate

Much work has been done at the Chemical Research Laboratory on the production of dicalcium phosphate, which is not water-soluble and could not, therefore, be developed commercially in Britain at the present time, though the phosphate content is well over double that of superphosphate.

Superphosphate contains about 20 per cent phosphorus (as P_2O_5), much of the remainder being calcium sulphate, which is not required. Dicalcium phosphate with a 48

per cent P_2O_5 content has been produced at the Chemical Research Laboratory, this product being completely soluble in ammonium citrate. An obvious advantage is that transport costs could be more than halved by delivering phosphorus to the farmers in this more highly concentrated form.

Principal Objection

The principal objection is that the process is based on nitric acid, which is both expensive and in varying supply. Bearing in mind the shortage that arose during the war because of the priority requirements of explosives manufacture, there may be short-term advantages in the present policy of improving the supply of sulphur instead of switching over to nitric acid. There is little doubt, however, that in the long run Britain will be forced to use nitric acid for fertiliser manufacture as a result of the world's sulphur resources becoming exhausted.

An additional advantage of using nitric acid to make dicalcium phosphate lies in the fact that the nitrite value of the acid can be recovered as ammonium nitrate yielding a second valuable fertiliser. British soils require considerable quantities of nitrogen, which is usually applied as ammonium sulphate, but the latter material has not so high a nitrogen content as ammonium nitrate. The production of ammonium nitrate by neutralising ammonia with nitric acid is obviously a far less economic process than using nitric acid to break down phosphate rock to produce dicalcium phosphate with a 48 per cent P_2O_5 and recovering a high proportion of the acid in the form of nitrate.

Chief disadvantages of dicalcium phosphate from the manufacturers' point of view seem to be that nitric acid is more expensive than sulphuric acid and that there might be difficulties associated with the plant owing to the corrosive properties of nitric acid. Operating costs should not greatly exceed those for making superphosphate, since a part of the cost could be offset by the sale of ammonium nitrate. A major difficulty, however, is the cost of the plant itself, which is likely to be high.

Choice of Methods

Many methods of producing dicalcium phosphate from phosphate rock are given in the literature. For example, a series of processes has been worked out by the Dutch State Mines for producing mono- or dicalcium phosphate, or both, by the action of nitric acid in solution. According to a German patent a product consisting of dicalcium phosphate and anhydrous calcium nitrate is obtained by evaporating to dryness a solution of phosphate rock in nitric acid and recovering the nitric acid by distillation. The same basic reaction is found in B.P. 364,035, according to which a solution of phosphate rock in nitric acid is fed into a boiling saturated solution of calcium nitrate, when dicalcium phosphate is precipitated.

A process for producing dicalcium phosphate from phosphate rock has also been developed in the U.S.A. and the Tennessee Valley Authority has been experimenting with this fertiliser for several years. In fact, published reports suggest that the CRL and the TVA are working on very similar lines.

Absolutely Non-Diliquescent

The process developed at Teddington yields a precipitate in finely divided form, which is readily available to plants and is absolutely non-deliquescent. So far production has only been on a laboratory scale, but the results of the investigation are available to industry for further exploration. The effects of dicalcium phosphate on British soils have not yet been widely investigated, however, and before this fertiliser was produced and applied on a commercial scale its properties would require thorough examination. They are at present being studied at Rothamsted, where samples from various sources in Britain, the Continent, and the U.S.A. are being investigated. This work should yield valuable data and until these are available no significant developments can be expected.

More Effective

There is little doubt that for some purposes and in some British soils dicalcium phosphate will prove more effective than superphosphate. Once this has been clearly established, the potentialities of this type of fertiliser might be considered sufficiently promising to justify the expense of trying out the CRL process on a pilot scale, providing that the regulations can be altered to permit the use of phosphate fertilisers which are not water-soluble.

REFERENCE.

' Fertilisers and the Sulphur Shortage', by J. Idris Jones, M.Sc., F.R.I.C., *Industrial Chemist*, April 1951.

Revolutionary Sludging

by W. RANDALL, M.M., M.Sc., North Thames Gas Board

IT is well known that the sludge in settling tanks of water softening plants packs down into a tough mass which is difficult to move. When sludge is run off, a conical funnel of sludge is removed from over the inlet end of the pipe. The angle of this cone depends on the length of time that has elapsed without sludge being removed. With only day work on the plant, the cone formed may have an included angle of 80° or even 60°, and the useful volume of the tank lost in consequence, depending on the number of sludge pipes, may be considerable.

In a tank 15 feet diameter and 15 feet high, where the inlet water was led into an annulus by a curtain plate extending down to 3 feet from the flat bottom of the tank in order to facilitate settlement, the sludge was to be removed by 17 pipes; eight short, eight longer and one to the middle of the tank. Sludging was laborious and incomplete. It was found that there were permanent deposits of sludge at least 2 feet deep between the outlets.

Result of Experiments

Experiments showed that fitting an equal tee on the inlet end of a sludge pipe did not always result in two cones being formed, but by fitting simple flexible valves, mounted on a rod of suitable length guided in the tee, sludge could be made to flow alternately from either end, thus forming two cones instead of one. In addition, the rapid oscillation of the valves caused strong shock waves in the liquid, but the effect on the settled sludge was negligible; a few inches away from the moving valves it remained undisturbed. Hence it was seen that it was necessary to make the sludge pipes move towards the sludge. This has now been done by utilising some of the potential energy of the flow from the tank during sludging.

For a permissible rate of sludging this potential energy is equivalent to only a fraction of a horse power and is insufficient to be useful directly or with gearing, but by using automatic valves to make the flow intermittent, pressure variations can be set up and used to provide forces sufficiently strong to make a tee turn by small amounts on a bearing and outlet connection at the centre of the tank. Although the tee is fitted with rakes which move the sludge towards the inlets near its ends it rotates after standing overnight. The ends are similar, and the two flows keep in step, thus developing a couple to turn the tee.

Description of Action

For simplicity a description is given of the action at one end of the tee. It has a vertical inlet tube in which a rod carrying several baffles, and a disc valve at its upper end, is free to move, its downward movement being limited by a stop. When the master valve is opened, the resulting flow up the tube creates a differential pressure on the baffles, which are of such an area that the upward force exceeds the weight of the valve assembly, and the valve is lifted. As the valve moves near its seat the flow is restricted and an increasing pressure difference across the valve slams it on to its seat. Just after the valve has closed the pressure on the downstream side of the valve falls still lower as the flow on the tee and outlet pipe is brought to rest. This low pressure is used to turn the tee. A horizontal branch, near the valve, behind the tee in relation to the direction of rotation, carries a cylinder, piston and spring, or their equivalent in the form of a strong bellows which is collapsed by the low pressure. This brings the rear end of the bellows forward, and this in turn brings forward an anchor device which is free to move one way only on a circular ring fixed in the tank. The sludge flow in the outlet now having come to rest, the valve is held shut by a force equivalent to the working head on its area. The weight of the valve assembly is greater than the holding force, so the valve opens, and immediately following this the pressure inside the bellows rises. Now overloaded, the bellows is able to do work. The rear end presses on the anchor and cannot move backwards, so the front end pushes the tee forward and makes it rotate on the centre bearing. During this turning of the tee a sprag device, carried by the tee, is advanced

on the ring. This sprag prevents the tee being moved backwards, and ensures that the anchor is advanced, when the bellows collapses.

The valve action cannot be stalled by resistance to turning of the tee. If the resistance is high the bellows will not unload as far as when the turning is easier, and the advance per stroke will be less. If the resistance is low the tee may gain sufficient momentum to enable it to free-wheel some distance on each stroke.

Throughput of the softener is 80,000 to 100,000 gallons/day, and sludging for 1½ hours at 22 gallons/minute, say 2,000 gallons per day, is sufficient to keep the tank in very good order. The curtain plate has now been extended down to 2 feet from the bottom of the tank. The sludge outlet pipe delivers at a height of 7 feet above the bottom of the tank, and this enables sludge to flow by gravity to collecting pits built above ground level. These have weirs and the clean water overflow is pumped back to the softener, so over-sludging does not cause loss of softened water.

Since this installation went to work the arrangement has been developed further. It can be made more direct acting by putting the bellows in front of the tee, so that the tee turns further during the collapsing of a weaker bellows which is required to store only sufficient energy to enable it to expand again and advance the anchor. A more recent development goes a stage further by eliminating the bellows and applying variations of pressure to make a piston reciprocate as required to turn the tee.

The North Thames Gas Board has applied for a patent covering the principle of the device.

Chemical Industry in Italy

Progress of Some Main Products in 1952

PRODUCTION of sulphuric acid in Italy during 1952, in comparison with the previous year, showed satisfactory progress mainly because of the increased demand for the production of fertilisers. Other factors were the high level of use maintained in the metallurgical and mechanical fields and the development of new markets in the petroleum industry which offset the reduced quantity taken up for artificial fibres.

Synthetic ammonia, nitrogen fertilisers and urea all showed a similar improvement in output over 1951. Consumption of the nitrogen and phosphorus containing fertilisers failed to reach the estimated level, but production programmes were unaffected because of the better export opportunities.

Output of nitrogen fertilisers in the 1951-52 season amounted to 186,415 metric tons, an increase of 9,007 tons over the 1950-51 season. Other comparisons of the same periods showed a big rise in exports and a 5 per cent increase in internal consumption.

Phosphatic fertilisers exports were also considerably greater in value but production was only slightly higher, and internal consumption fell by about 3 per cent.

Sales of copper sulphate and cupric oxychloride were higher in the 1951-52 season, partly due to doubts about the availability of future supplies.

Better resources of electrical power enabled the demand for calcium carbide to be fully met, while output of calcium cyamide had also been ample to satisfy not only the requirements of national agriculture but also some exports.

Production of sodium carbonate had been maintained at a satisfactory level, despite a reduced activity in the glass industry.

Aberdeen Plant Ready Soon

THE new £450,000 sulphuric acid plant being built by Scottish Agricultural Industries Limited at their Sandilands Chemical Works, Aberdeen, is nearing completion and the flash roasting section is expected to be in operation some time in April. The output of the plant is likely to be in the region of 37,000 tons of acid per year and the roaster will burn some 80 tons of iron pyrites per day. It is said to be the largest flash roasting pyrites furnace in the world and a Peterson tower plant is also incorporated in the project.

The six towers are 70 feet high and three will be packed with granite from nearby quarries in place of the usual quartz. This is said to be the first time that granite has been used in Britain although it has been successfully tried in a Norwegian nitric acid plant. Sulphuric acid works in Belgium, Germany, Sweden and Finland were visited by the planning staff before construction of the new plant was started.

The Organic Chemist in Industry

Fine Chemicals and Medicinals Afford Widest Scope

A GLIMPSE of the activities of the organic chemist industry, with special reference to fine and medicinal chemicals, was the theme of a talk addressed to students by Dr. H. J. Barber (May & Baker Ltd.), at a joint meeting of the London section of the Royal Institute of Chemistry and the Battersea Polytechnic Chemical Society held in London on 18 November, 1952. Dr. C. W. Herd was in the chair.

In relation to chemistry (said Dr. Barber who has had a long experience on the research, development and production sides) industry could be divided into two main classes—users of and makers of chemicals.

The major human activities were concerned with constantly disturbing the balance of Nature in favour of man by encouraging the life of animals and plants that he wanted and eliminating those he did not want.

Must be Humble

In this vast field, the organic chemist played his part, but he must be humble in applying chemicals to living biological systems, either macro or micro. He must be careful to take a long-term view and not apply his product prematurely. An important principle for young chemists to remember was that an organic chemical reaction, occurring in a biological system, was still an organic chemical reaction.

The fine chemicals and medicinal industry probably offered the widest scope to the organic chemist. It was not easy to define a fine chemical. Dr. F. H. Carr's aphorism that it was a 'substance made by a fine chemical manufacturer' was a definition more profound than would appear at first sight, because it implied that a fine chemical was the kind of chemical which would be of interest for the type of fine chemical manufacturing which had grown up in Britain over the last 40 years or more. To illustrate the general scale of the fine chemicals industry, figures were quoted for the production, weight and value of some medicinals.

Any chemical company must have as its prime object the making and selling of chemicals for profit and, in the long run, a research department must itself be profitable. There was not really an antithesis here between industrial and academic research, for the latter also must, in the long run, be profitable to the nation above all educationally. £2,800 a year had been quoted as the probable average cost of maintaining a graduate in research.

Synthetic Drugs Exemplified

Modern synthetic drugs and their extreme complexity were exemplified by the structures of chloramphenicol, mepyramine maleate and aureomycin. The microbiologist had at his command most enterprising teams of living matter which produced the most bizarre molecules such as might have been conceived by a modern de Quincy if he had been an organic chemist. The relatively crude synthetic methods of the organic chemist were unlikely to displace microbiological ones in the field of antibiotics.

Parts played by laboratory chemists, development chemists and production chemists were described by the aid of the chemical engineers concept of unit operations. It was particularly noted that the organic chemist in industry used the classical reactions of the textbook. Slides were shown illustrating pieces of equipment and typical operations in fine chemical manufacture.

Pharmaceuticals Impermanent

The impermanence of medicinal products was explained. For example, mepacrin has been displaced by chloroquin, proguanil and pyrimethamin. Such changes entailed considerable circumspection on the part of the manufacturer when special plant was involved. The research chemist should have an eye to the practicability of his reactions at an early stage and could often learn from the production people; for example, he could often use azeotropic drying for solvents instead of calcium chloride.

As to new therapeutic substances, there was no royal road to their discovery, even one small step ahead could not be predicted; the history of past discoveries was well worth studying and for the main part it was necessary to go to Nature for models. The organic chemist in industry would find it always of great profit in the widest sense to

keep fully conversant with developments in the organic chemistry of biological systems; sooner or later they would find application in the pharmaceutical industry. In fine chemicals and medicinals organic chemists could foster their love of organic chemistry and, a source of considerable satisfaction, could make contributions to the well-being of their fellow men.

During the discussion which followed Dr. Barber's talk, the speaker pointed out the difference in organisation and outlook in this country and in the U.S.A. The Americans had more readily available raw materials, more chemical engineers and more advertising. Britain was more cautious in putting out new drugs, a policy which had been justified as, for example, in relation to the use of the antihistamines for treatment of the common cold.

The Oil Industries Club

C.A.P. Southwell New President

AT the annual general meeting of the Oil Industries Club, in the Connaught Rooms, London, W.C.2, on 6 January, Mr. C. A. P. Southwell, C.B.E., of the Kuwait Petroleum Co., was elected president for 1953.

Mr. B. J. Ellis, the retiring president, conducted the early part of the business of the meeting, and reported on the activities of the Club in 1952. Mr. Ellis said there had been nine monthly luncheons during the year, at which there had been quite interesting addresses. The attendances at the annual ball and the annual dinner had been greater than in past years. The golfing society continued its successful career.

The Club's Committee had met almost monthly during the year, and sub-committees were dealing with various aspects of the Club's activities. Membership continued to expand, the total at the date of the meeting being 590, as compared with 573 at the same time last year.

Mr. Southwell having accepted the committee's unanimous nomination as president for 1953, Mr. Ellis was delighted to propose his election. He referred to Mr. Southwell's oil experience in Trinidad, Persia and Kuwait, and said that in Kuwait he had done an amazing piece of work. He had built up an organisation of extraordinary vitality in eight years, and it was producing at the rate of 50 million tons of oil a year from one oilfield, delivering the oil into ships, and refining quite a bit of it. It was a marvellous epic, said Mr. Ellis, showing what could be done by a man of determination in developing a really big organisation. In the New Year Honours List Mr. Southwell had been awarded the C.B.E., and all his friends congratulated him.

Only recently, continued Mr. Ellis, Mr. Southwell retired from the presidency of the Institute of Petroleum, a very arduous task, and the Club was to be very much congratulated on the fact that he was willing to serve as its president.

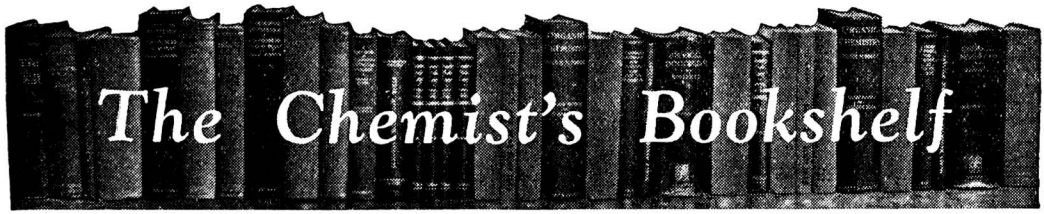
Mr. Southwell was acclaimed on being inducted, and he thanked the members for the honour they had accorded him. Next, he thanked Mr. Ellis for his work during his period of office; he had done a first-class job. The President was supported by Mr. H. W. Rocke, a vice-president, who seconded the resolution of thanks.

The following will continue in office as vice-presidents for the year 1953: Messrs. H. S. Aspinall, L. A. Callow, T. Dewhurst, J. A. Jameson, H. W. Page, S. Rhodes, H. W. Rocke and E. G. Thorn. Mr. E. G. Thorn was re-elected hon. treasurer, and Mr. P. R. Bateman hon. secretary.

The members of the committee retiring in accordance with the rules were Messrs. J. T. T. Robinson, C. E. Spearing, J. E. Jenkin, E. C. Masterson and J. A. R. Staniforth. The following were elected to fill the vacancies: Messrs: J. E. Jenkin, E. C. Masterson, J. A. R. Staniforth, J. L. N. Pollock and R. B. Rogers. These five new members, in addition to Messrs. O. F. Thompson, W. B. Heaton, H. T. Collinswood and C. Sherlock complete the Committee.

European Steel Record

Crude steel production in Europe (excluding the Soviet Union) is calculated at 73,870,000 metric tons for 1952, exceeding the 1951 output, the previous best year, by about 9 per cent, according to estimates of the Secretariat of the United Nations Economic Commission for Europe (ECE). Notable increases in the production of iron ore and metallurgical coke to keep pace with the high levels of crude steel and pig iron output are also shown in the *Quarterly Bulletin of Steel Statistics for Europe* issued by ECE.



ULTRAVIOLET RADIATION. By Lewis R. Koller. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London. 1952. Pp. ix + 270. 166 illustrations. 52s.

Although much information is available in the scientific and technical literature covering every aspect of ultraviolet radiation, it is often difficult for the non-specialist in the field of radiation to find the information required. In this book Dr. Koller has attempted to answer many of the questions which confront physicists and specialists in fields other than physics, when they find it necessary to work in this portion of the spectrum. The preparation of the book was prompted by numerous inquiries from biologists, chemists, engineers and others, over the course of the years. The work is not intended to be comprehensive but merely to deal with those subjects which in the author's experience in the Research Laboratories of the General Electric Company (U.S.A.) seem to have been of most importance to those people using or concerned with ultraviolet radiation.

After a short introductory chapter, the two main methods available for the production of light and radiation—the passage of a current of electricity through a gas or vapour with the formation of an arc, and the use of incandescent bodies—are described. Mercury, hydrogen and carbon arcs receive particular attention in Chapter 2. The following chapter is devoted to incandescent sources of radiation and to a discussion of the fundamental problems involved. The radiant energy from the sun contains both ultraviolet and infra-red radiations as well as visible light. It is therefore interesting to read in the chapter dealing with the subject of solar radiation that in the United States the sun supplies about 2,000 times as much heat energy as is at present supplied by coal, oil and gas. Such a figure suggests that the present trend towards the large-scale synthesis of naturally occurring raw materials, such as rubber and textile fibres, may have to be reversed at some time in the future unless some extensive and inexhaustible source of energy is discovered. It does seem, moreover, fundamentally unsound to neglect such an enormous potential source of energy as the sun.

The transmission of ultraviolet radiation through various media and the reflection of ultraviolet radiation from metals, glass and pigments, are of considerable importance, and these subjects are fully discussed in Chapters 5 and 6. The numerous technical applications of ultraviolet radiation are dealt with in the following chapter. These uses include therapy, sterilisation of bacteria and viruses, disinfection of water, and the production of fluorescent mercury discharge lamps for general illumination purposes. The final chapter discusses the various ways in which ultraviolet radiation can be detected and measured. The information is presented in a succinct and lucid manner, and the book should be very useful to chemists concefned in any way with ultraviolet radiation.—G.S.E.

AROMATISCHE KOHLENWASSERSTOFFE. By E. Clar. Springer-Verlag, Berlin. 1952. Pp. xxii + 481. DM. 69.

More than ten years have elapsed since the appearance of the first edition of Clar's monograph on Aromatic Hydrocarbons. In these years the field has developed at such a pace that the new edition incorporates a mass of new information, much of it contributed by Clar himself; and some so recent as to be not yet recorded in the chemical journals.

The preparation and reactions of the polycyclic hydrocarbons, their physical properties, notably their light absorption, and the various theories regarding their structure are discussed in a general way in the first part of the book; in the second part, this is done in detail for about 150 compounds. Curves of absorption spectra, many previously unpublished, are given for a great number of compounds. The book is handsomely

produced, if somewhat expensive for its size and will prove indispensable to any worker in the field of polycyclic aromatic hydrocarbons.—J.T.E.

THE DETERMINATION OF PARTICLE WEIGHTS OF ORGANIC COMPOUNDS BY DIALYSIS METHODS: A Contribution to the Problem of Solvation of Dissolved Organic Substances. By H. Spandau. Verlag Chemie, Wernheim/Bergstr. 1951. Pp. 86. DM. 12.20. (In German).

Dr. Spandau is well known for his work with Jander on the molecular weights of large inorganic ions. This monograph presents the extension of this work to the problems of association and solvation of organic substances in solution. Following a general statement of the problem, earlier work on diffusion and dialysis is surveyed, the survey including some useful tables of diffusion coefficients of organic compounds in different solvents. Values of $DM^{\frac{1}{3}}$ are also given, D being the diffusion coefficient and M the molecular weight. Contrary to theory, these latter values are not generally constant. Evidence for association and solvation is discussed, including the methods of detection and estimation, such as cryoscopic, dielectric constant, refractive index, heat and light absorption measurements.

The apparatus used and results obtained by Dr. Spandau in some new dialysis measurements are then presented. Vapour pressure and osmotic effects, important at low and high concentrations of dissolved substance respectively, are discussed and taken into account in the evaluation of dialysis coefficients. Values of these are given for many organic substances in water. The lack of constancy of the product of the dialysis coefficient and $M^{\frac{1}{3}}$ is ascribed to hydration and a molecular weight, leading to constant values of this product, is calculated for each substance. The number of water molecules attached to each organic molecule is calculated from the difference between this calculated molecular weight and the theoretical value. Dialysis coefficients of substances in ethanol are also given and solvation estimated for many organic compounds in different solvents.

Dr. Spandau's results suggest that solvation may be more common than is generally supposed. Alcohols, phenols, ethers, esters and nitriles may have 1-2 water molecules attached to each molecule. Acids, ketones and aromatic bases are more hydrated, with 2-4 water molecules. Certain sugars and amino-acids may have larger numbers attached to each molecule. Reinterpretation of the diffusion measurements previously cited gives results in general agreement with those from dialysis. Attempts are made to interpret solvation in terms of dipolar forces. Polarisability effects are suggested by results quoted for the solvation of brombenzol by non-polar polarisable molecules such as benzene, toluene, dioxan, cymene and mesitylene.

There is little reference made to any British or American work. The idea of solvation of some polar high polymers is well established. Thus, the work of Clement on solvation and the ideas of American workers on molecular complexes might have been mentioned. The views of Mulliken would seem to be particularly relevant. Dr. Spandau has, however, presented a large number of results which will interest all those concerned with complex formation and solvation in solution.—W.R.M.

PERIODICA CHIMICA. Edited by Professor M. Pflucke and A. Hawelek. Akademie Verlag, GmbH, Berlin, 1952. Pp. x + 411. $8.40.

This exceptionally useful book gives the names and particulars of all the important scientific journals in the world. This is a sweeping claim to make, and indeed the editors do not make it, but a lengthy search failed to reveal any but the most insignificant omissions. Journals from districts as far apart as Poland and the Philippines are included, their abbreviated title, publisher, and other particulars given. Every foreign journal is cross-referenced under its translated title where the language is not German, French or Italian, and cross-references are given to related journals. Those journals which have ceased publication are also given, with the last volume and issue number. If they have been resumed, similar details are shown. Authors, writers of monographs, editors and nearly all investigators and technologists doing scientific work will find this reference book extremely valuable in the work of documenting abstracts. It is by far the most comprehensive book in this field that has appeared recently.—J.C.S.

• HOME •

Polythene Coated Paper

Clyde Paper Company, Ltd., is launching production of polythene coated paper, and is said to be the first firm in Britain to install machinery for the continuous large-scale commercial production of this material by the extrusion-lamination process. Polythene coated paper is in very considerable use in the U.S.A. and has every prospect of expanded use in this country in the packaging and handling industries.

'BISOL' Prices Reduced

British Industrial Solvents, Ltd., has announced reductions in the prices of 'BISOL' diethyl oxalate and amyl alcohol (milk-testing quality), with effect from 12 January, 1953. The new schedules are as follows:—

		Diethyl Oxalate per ton £	Amyl Alcohol M.T.Q. per lb. s. d.
10 tons	(a)	335	—
1 ton	(a)	337	—
40-45 gallon drum	(a)	340	3 0
10 gallons	(b)	365	3 2½
5 gallons	(b)	375	3 3½

(a) Carriage paid, packages returnable at seller's expense.
(b) Carriage paid, packages included.

Leather Chemists' Meeting

A meeting of the Northampton Group of the Society of Leather Trades' Chemists will be held on Thursday, 22 January, at 2.30 p.m., at the College of Technology, Northampton, when Mr. J. S. Sharphouse, B.Sc., will read a paper on 'Paraffin Degreasing.' The meeting will be followed by the annual meeting of the Group and the election of officers for 1953. The address of the Group secretary is: W. G. Pebody, B.Sc., 'Mayfield.' 19 Wellingborough Road, Olney, Bucks.

Nickel Price Increased

The Mond Nickel Company Ltd. has announced that, following the announcement in Canada by the International Nickel Company of Canada Ltd., of an increase in the price of nickel effective 14 January, it has, as from the same date, raised its price for refined nickel in the U.K. to £483 per ton, delivered works, with appropriate increases for other countries.

Record Output of Cement

Cement production in the United Kingdom during 1952 reached a new record for the fifth year in succession. Output last year reached 11,200,000 tons compared with 10,100,000 tons in 1951 and 9,700,000 tons in 1950. Exports of cement in 1952 also reached a new level of just over 2,000,000 tons compared with about 1,900,000 tons in the previous year.

Society of Public Analysts

The 18th annual general meeting of the Society of Public Analysts and Other Analytical Chemists will be held in the Rhul Restaurant, 123 Sauchiehall Street, Glasgow, at 12.30 p.m., on Wednesday, 28 January. The ninth annual general meeting of the Microchemistry Group of the society will be held in London at the Sir John Cass College, Jewry Street, Aldgate, E.C.3, at 7 p.m., on Thursday, 29 January.

British Standards Institution

Lease of the former Government hospitality centre in Park Street, London, has been acquired by the British Standards Institution for use as offices. Concentration of the work in one building instead of the premises at Victoria and Gillingham Streets, will greatly help efficiency and economy. Adequate facilities will be available under the same roof for the 3,500 committee meetings which the BSI convenes annually.

Steel Output Record

A record production of 11,490 tons of steel ingots in the normal working week which ended at midnight on Saturday, 10 January, was achieved at the Ebbw Vale (Mon.) works of Richard Thomas & Baldwins, a subsidiary of the Iron and Steel Corporation of Great Britain. This was 260 tons more than the record set up in October, 1952.

Chemical Employment

There was a drop of 1,000 in the number of persons employed in the chemical and allied trades in October, 1952, according to the analysis of numbers in civil employment in the *Ministry of Labour Gazette* (Vol. LX, No. 12). The total figure was 482,000 compared with 483,000 in September, 482,000 in August, 1952, and 494,000 at the end of December, 1951.

• OVERSEAS •

Chemical Projects in U.S.A.

A new research and engineering laboratory with pilot plant operations has recently been completed by the National Aniline Division of the Allied Chemical & Dye Corporation, Hopewell, Va. Contract for a $23,000,000 fibre plant has also been awarded by the corporation to the David Construction Company, of Birmingham. The plant is expected to take two years to build and will have an annual output of some 20,000,000 lb. of nylon-type fibre and filament.

Sasol Capital Costs

Presiding at the recent annual meeting of the Industrial Development Corporation of South Africa, Dr. H. J. van Eck, the chairmain, said Sasol—the oil from coal project (cf. THE CHEMICAL AGE, **66**, 129)—was the largest single enterprise in which the corporation was financially interested. Its investment in that undertaking at 30 June, 1952, amounting to £3,530,000 in ordinary shares, out of a total capital originally estimated at £12,000,000. The corporation had agreed in principle to assume responsibility for further loans to finance Sasol up to its production stage. He foreshadowed that there would be further increases in the total capital cost of the project, of which the construction programme was proceeding satisfactorily. Shaft-sinking on the company's colliery, which would be highly mechanised, was begun in July, 1952.

Oil Search in Switzerland

Some 12 companies, Swiss and foreign—including the D'Arcy Exploration Company, a subsidiary of the Anglo-Iranian Oil Co., Ltd.—are either exploring the possibility of the existence of workable quantities of oil, or have applied for concessions to search for it. The D'Arcy Exploration Company has been carrying on geological surveys in Western Switzerland since the beginning of this year, as technical consultants to a Swiss firm, which has held an exploration concession for some time in the Canton of Fribourg. D'Arcy experts have found sufficient evidence to justify plans to begin drilling at the end of 1953 or beginning of 1954, but this is dependent on being able to obtain an exploitation concession.

New Petrochemicals Laboratory

Scientific investigations of Celanese Corporation of America in the field of petrochemistry are now being carried on in a new research laboratory which was opened at Clarkwood, Texas, on 5 January. The new office and laboratory buildings, operated by the research and development department of the company's Chemical Division, contains 21,000 square feet of floor space and houses 11 separate laboratories; 27 offices; a library; conference room; drafting room; duplicating room, and lobby. The laboratory, which is the centre of all of the company's petrochemical research, is under the direction of Henry K. Dice. Scientific investigation is aimed at discovering new products, developing new uses for existing products, and improving processes for greater efficiency and yield.

Non-Precious Metal Concessions

Concessions for the mining of non-precious metals and mineral substances have been granted under a decree recently passed in Colombia. Export of such products is authorised under conditions connected with the privilege of import rights covering certain specified goods. Capital invested in the exploitation of lead, copper, zinc, bauxite, sulphur and tin will be exempt from taxes.

Chemicals from Waste Products

A concession or some 350,000 sq. metres of land in the port area of Seville has been obtained by the Empresa Nacional Calvo Sotelo de Combustibles Liquidos y Lubricantes S.A. on which to construct a plant for obtaining chemicals from agricultural waste products, such as olive bagasse, vine shoots, cotton, and maize stems. Building must be begun within three months and the plant must be completed within four years. Waste products will be treated with sulphuric acid, and the resulting liquids and residues fermented and distilled to yield motor spirit, yeast, vegetable charcoal, creosotes, pitch, acetic acid, ethyl and methyl, alcohols, acetones and other chemicals. The Seville plant is the first step in a national scheme to build plants at La Mancha, Jaen, Badajoz and Catalonia. When completed these plants are expected to handle some 650,000 tons of waste products a year.

· PERSONAL ·

MR. R. STANSFIELD, who developed many new fuel testing techniques and was responsible for the development of the company's engine research section, has retired from the Anglo-Iranian Oil Company's Research Station, Sunbury. Mr. Stansfield was the first man to record tests showing the differences in combustion behaviour of a wide range of diesel fuels, and, with a colleague, he developed the standard Sunbury cathode-ray engine indicator which represents changes of pressure in engines under test on a television-type screen. It is still in widespread use.

Mr. Stansfield

DR. H. K. WHALLEY has resigned his post as the development and contracts manager of Petrocarbon, Ltd., and director of Refinery Equipment and Speciality Co., Ltd., in order to join British Industrial Solvents, Ltd., on 1 January, 1953.

On his retirement after 51 years' service with Messrs. Rowe Brothers & Co., Ltd., lead manufacturers, Exeter, MR. A. J. PRINCE has been presented by the directors of the firm with a radiogram and by his colleagues with a camera (one of his principal recreations is photography). In their factories in various parts of the country the firm has been engaged for over 70 years in the manufacture of sheet and pipe lead, and Mr. Prince has for many years managed the lead manufacturing side of the company's business at Exeter.

In accordance with his statement at the last annual general meeting, MR. R. W. COOPER, M.C., chairman of The British Aluminium Co., Ltd., has resigned his directorship as from 31 December, 1952. VISCOUNT PORTAL OF HUNGERFORD, K.G., G.C.B., O.M., D.S.O., M.C., who is a director of the company, succeeded Mr. Cooper as chairman as from 1 January MR. E. F. O. GASCOIGNE has been appointed a director of the company.

Messrs. Sharples Centrifuges, Ltd., of 'Tower House,' Woodchester, Stroud, Glos., have announced the retirement of their chairman, MR. W. J. MURRAY, but he will retain his seat on the board as a director. Mr. Murray will be succeeded by the present managing director, MR. A. H. KEABLE, M.I.Mech.E., M.I.Chem.E., who commenced the business in this country in 1920 and has retained his position as managing director since 1928.

MR. G. P. BALFOUR, B.Sc., A.C.G.I., A.M.I.Chem.E., will fill the vacancy created by Mr. Keable's retirement.

MR. G. J. KEADY, president of The Sharples Corporation, Philadelphia, has also joined the board of the British company.

The appointment of MR. A. M. HUTCHESON, A.M.I., Mech.E., to the board of Thompson Brothers (Bilston), Ltd., has been announced. Mr. Hutcheson joined the staff of Thompson Brothers in 1931 to develop the application of welded stainless steel products to chemical plant and, under his general guidance, his company have been very successful in the production of a large variety of plant. In 1945 he was promoted to manager of the Chemical Plant Department, a position in which he will still continue.

Mr. Hutcheson

MR. THOMAS KALE, managing director of John Moncrieff Ltd., glass makers, Perth, has retired after 50 years in the business. Mr. Kaye joined the firm, which is one of the oldest glass manufacturers in Scotland, in October 1899 after graduating from Glasgow University as a qualified chemist. On the death of his brother, Mr. John Kaye, he became managing director in 1942.

He did valuable work in the first world war on the development of chemical glassware.

The Board of Trade announce that MR. W. J. WORBOYS, B.Sc., D.Phil., has accepted the president's invitation to become chairman of the Council of Industrial Design, in succession to DR. R. S. EDWARDS, who retires on 31 January, having held the appointment for five years, and having been a member of the Council since its inception in 1944. Dr. Worboys has been a member of the Council since June 1947. He is a director of Imperial Chemical Industries, Ltd., vice-chairman of Council of the Association of British Chemical Manufacturers, and chairman of Holoplast Ltd.

MR. C. E. WRANGHAM, C.B.E., B.A.(Cantab.), has been appointed a director on the main board of the Power-Gas Corporation, Limited. MR. CHARLES INGMAN, of Stockton, has been appointed a director on the Technical and Contracting Division of Power-Gas and Ashmore, Benson, Pease & Company. Mr. Ingman joined the firm in 1912 and after spending some years in South Africa worked his way through various departments of the organisation and in 1940 was appointed contracts manager. MR. T. K. HARGREAVES, D.S.O., M.A., A.M.I.Mech.E., the works manager, has been appointed a director of the works division of the companies. MR. C. ROBSON, who has been a director of Ashmore, Benson, Pease & Company since 1944 and of the Power-Gas Corporation, Limited, since 1948; has also been secretary of both companies since 1939. He has now been relieved of the double burden he has carried by relinquishing his duties as secretary. Mr. Robson, as commercial director, will be better able to devote his time to the constantly widening activities of the group, for which purpose he has also joined the board of an associate company, Rosedowns Holdings, Limited, in Hull. Mr. LAURENCE DAVIS, F.C.I.S., who has been assistant secretary for five years, has been appointed secretary in succession to Mr. Robson.

MR. J. GORDON PARR, a lecturer in metallurgy at Liverpool University, is visiting Canada to take up a research fellowship at British Columbia Research Council in Vancouver. It is his third visit to Canada as he has twice toured the country on visits to mines and metal works.

Obituary

Col. J. L. A. MacDonald

COLONEL JAMES L. A. MACDONALD, chief chemist and a director of Tullis Russell & Co., Ltd., paper makers, Auchmuty and Rothes Mills, Markinch, Fife, has died aged 67. He retired from active business only a year ago and had been living since at Cadham, Fife. He took an active interest in Territorial Army affairs and served with distinction in the first World War.

Mr. J. E. Jones

The death has taken place of MR. JAMES ERNEST JONES, chairman and managing director of Messrs. Riddell Products, Ltd., manufacturing chemists, Axtell House, Warwick Street, London. He was 74.

Antidote to Morphine

A SPECIFIC antidote for morphine, pethidine, amidone (Methadone) and other related drugs is now available for the first time, it is announced by the Wellcome Foundation, Ltd Lethidrone, as the antidote is called, is itself a morphine derivative.

Symptoms of morphine poisoning, either through over-dosage or produced by abnormal sensitivity of the patient to the drug, can, it is claimed, be relieved by the antidote in a matter of seconds. Until the new drug was produced, poisoning either by drugs of the morphine group or by other narcotics was normally treated with non-specific stimulants.

The new drug may have wider uses in medicine. There is no evidence that it is habit-forming, and it can in fact be used to diagnose addiction. Given to a morphine addict it precipitates the symptoms which would normally develop if supplies of the narcotic were withdrawn.

How Lithidrone, which is manufactured by Burroughs Wellcome & Co., London, achieves its effects is not certain. It is thought that morphine and other drugs operate by combining with 'receptors', biochemical substances found in certain cells in the central nervous system. The new antidote, which is similar to morphine in its molecular structure but probably has a greater chemical affinity for the 'receptors', displaces the narcotic and so eliminates the symptoms of poisoning.

Publications & Announcements

A DIRECTORY of chemical engineering faculties in the nation's colleges giving courses in chemical engineering is announced by the American Institute of Chemical Engineers. The listing, which is available from the organisation at 120 East 41st Street, New York 17, N.Y., is the work of their chemical engineering education project committee under the supervision of Kenneth A. Kobe, Professor of Chemical Engineering at the University of Texas. The listing details all professors, assistant professors, and instructors, now staffing American chemical engineering departments, lists the official positions of all teaching personnel, information on degrees granted at each college, type of graduate work being done, accrediting information, and the number of unfilled staff positions.

* * *

BRICKS coming from kilns are frequently disfigured by a coating of colouring matter known as 'scum.' Prevention of this scum by the use of barium carbonate is described in a booklet 'Bricks Without Blemish,' recently issued by Laporte Chemicals Ltd. The cost of using the company's 'Crossed Keys' brand of precipitated barium carbonate is said to be small and the Company will examine samples of clay, free of cost, and recommend the quantity of barium carbonate on which trials can be based. Another booklet issued by Laporte gives a short account of the physical and chemical properties of sodium perborate and sodium percarbonate and a brief outline of the purposes for which they have come into regular use.

* * *

WELCOME and good wishes for its future to the first issue of 'The Molecule,' the new house journal of the Watford Chemical Co., Ltd. and its associated company, the Spicer Food Co., Ltd. The contents provide a happy mixture of technical information and a survey of the company's activities, together with a wide range of items of general interests including articles, poems, jokes and illustrations. Here is a 'chemical experiment' which, given the support it deserves, should prove a successful long-term policy.

CHEMICAL methods for the treatment of feed water to low and medium pressure boilers is outlined by B. Pocock, A.R.I.C., M.Inst.F., in an article in the current issue of the *Journal of Incorporated Plant Engineers* (Vol. III, number 6). Other features include an article on 'The Application and Control of Electrical Machines,' and reports from the various branches of the Incorporated Plant Engineers.

* * *

PERMEABILITY of paints in building construction is discussed by W. Leonard in the winter issue of 'Building Topics,' the house organ of Tretol, Ltd., London. Other features include a survey of the durability and protective possibilities of various types of chlorinated rubber—based coatings by F. K. Shankweiler, G. N. Bruxelles and R. E. Whitney, and new developments in temporary rust preventatives by F. S. Link.

* * *

A NEW book that describes 'Carbowax Polyethylene Glycols,' has just been published by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. This book describes with the aid of many formulae the varied uses of the water-soluble liquid and solid polyethylene glycols, and the methoxy polyethylene glycols in the rubber, pharmaceutical, textile, metal, agricultural, printing, petroleum, and electronics industries. It also discusses their use in cosmetics, cleaners, and polishes, adhesives, resins, and paper products. A section on physical properties employing tables and charts characterises these interesting compounds. Shipping and storage data for these compounds are also presented. An important feature of this new book is a section devoted to the technical and U.S.P. specifications of the polyethylene glycols as they are shipped by Carbide and Carbon. Complementing these specifications are complete and detailed descriptions of the test methods recommended by the Company to assure that the commercial material meets the specifications listed. Copies of this new book, 'Carbowax Polyethylene Glycols' (F-4772) are available from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

Next Week's Events

MONDAY 19 JANUARY

Royal Institute of Chemistry

Leeds: University, 7 p.m. Joint meeting with the Chemical Society. Professor H. V. A. Briscoe: 'Some Peculiar Properties of Mineral Dusts.'

The Chemical Society

Leicester: University College, 5 p.m. Professor C. A. Coulson: 'Resonance.'

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Crop Protection Panel of the Agriculture Group. Dr. B. A. Kilby (Biochemistry Department, School of Medicine, Leeds): 'The Biochemistry of Schradan.'

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street, E.C.1, 6 p.m. J. N. T. Adcock: 'The Economics of Industrial Painting.'

TUESDAY 20 JANUARY

Society of Chemical Industry

London: Royal College of Science, Imperial Institute Road, S.W.7, 2.15 p.m. Agriculture Group. 'The Manuring of Grassland.' Three papers by R. A. Hamilton (Imperial Chemical Industries Ltd.), Dr. A. B. Stewart (Macaulay Institute for Soil Research, Aberdeen), and Dr. W. F. Raymond (Grassland Research Station, Stratford-on-Avon), followed by discussion.

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Corrosion Group. Dr. M. Pourbaix (Centre Belge d'Etude de la Corrosion): 'The Electrochemical Behaviour of Metals and Corrosion.'

Chemical Engineering Group (SCI).

London: Burlington House, Piccadilly, W.1, 5.30 p.m. J. Griffiths: 'The New Treatment Plant of the Colne Valley Sewerage Board.'

Institute of Petroleum

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. E. S. Paice: 'The Use and Character of New Chemicals from Petroleum.'

WEDNESDAY 21 JANUARY

Royal Institute of Chemistry

London: University College, Gower Street, W.C.1, 6.30 p.m. Joint meeting with the SCI and the Institute of Metals. Dr. A. C. Menzies: 'Analysis of Metals by Spectroscopy.'

Society of Chemical Industry

Birmingham: Joint meeting of the Food Group and the Birmingham and Midland Section, 2.30 p.m. Visit to Cadbury Brothers, Ltd., Bournville, 6.30 p.m. University, Edmund Street, Dr. V. L. S. Charley and G. R. A. Short: 'The Preservation of Natural Colours and Flavours in Food.'

Liverpool Metallurgical Society

Liverpool: Liverpool Engineering Society, The Temple, Dale Street, 6.30 p.m. Joint meeting with the North Wales Metallurgical Society. Dr. S. J. Kennett: 'Alloys Resistant to Oxidation and Creep at High Temperature.'

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. D. Tabor: 'Indentation Hardness.'

Incorporated Plant Engineers

Bristol: Grand Hotel, 7.15 p.m. Western Branch. 'The Approach to Maintenance—a Discussion on the Report of the specialist team on plant maintenance on the visit to the U.S.A.,' by Colin Troup, secretary of the Anglo-American Productivity Team on Plant Maintenance.

THURSDAY 22 JANUARY

The Chemical Society

Aberdeen: Robert Gordon's Technical College, 7.30 p.m. Joint meeting with the RIC and SCI. Lecture on 'Krilium' by a member of the staff of the Monsanto Chemical Company.

Bristol: University, Woodland Road, 7 p.m. Joint meeting with the RIC and the Bristol Section and Oils and Fats Group of the SCI. Dr. T. W. Goodwin: "Biogenesis of Carotenoids.'

Liverpool: University, 5 p.m. Joint meeting with the RIC, SCI, and BAC. Professor R. T. Williams: 'Chemical Aspects of Drug Metabolism.'

London: Burlington House, Piccadilly, W.1, 7.30 p.m. Professor R. P. Linstead: 'Discoveries among Conjugated Macrocyclic Compounds,' lecture illustrated by experiments and exhibits.

Oil & Colour Chemists' Association

London: National Gallery, 3.30 p.m. A visit with J. Cosmo Clark, A.R.A.: 'How the Artist Uses Paint.'

[continued on page 154

Next Week's Events

continued from page 152

Royal Institute of Chemistry

Manchester: College of Technology, 6.30 p.m. Annual general meeting and exhibition: 'Techniques and Instruments in Chemical Analysis.'

Fertiliser Society

London: 26 Portland Place, W.1, 2.30 p.m. J. J. Porter and J. Frisker: 'The Manufacture of Triple Superphosphate.'

Institute of Welding

London: Polytechnic, Regent Street, W.1, 7.30 p.m. W. V. Binstead: 'The Joining of Aluminium and its Alloys.'

Textile Institute

Cardiff: University College, 7.15 p.m. Dr. W. T. Astbury (Leeds University): 'The Science of Fibres.'

Royal Statistical Society

Liverpool: Radiant House, Bold Street, 7 p.m. Merseyside Group of the Industrial Applications Section. J. P. L. Truesdale: 'Statistics in Glass Manufacture,' with particular reference to the statistical examination of results obtained by chemical and spectrographic methods of analysis.

FRIDAY 23 JANUARY

The Chemical Society

Birmingham: University, Edgbaston, 4.30 p.m. Professor A. Robertson: 'Usnic Acid and its Derivatives.'

St. Andrews: United College, 5.15 p.m. Dr. R. L. M. Synge: 'Chromatography.'

Southampton: University, 5 p.m. Joint meeting with RIC. Professor F. S. Dainton: 'Chemical Reactions Induced by Nuclear Radiations.'

Institution of Chemical Engineers

Manchester: 2.30 p.m. North Western Branch, annual general meeting.

Institute of Metal Finishing

Sheffield: Grand Hotel, 6.30 p.m. Dr. G. E. Gardam: 'Observations on Electroplating Research and Flatware Manufacture in the U.S.A.'

Plastics Institute

Manchester: Engineers' Club, Albert Square, 6.45 p.m.; A. H. Woodfull (B.I.P. Product Design Unit): 'Designing Plastic Products.'

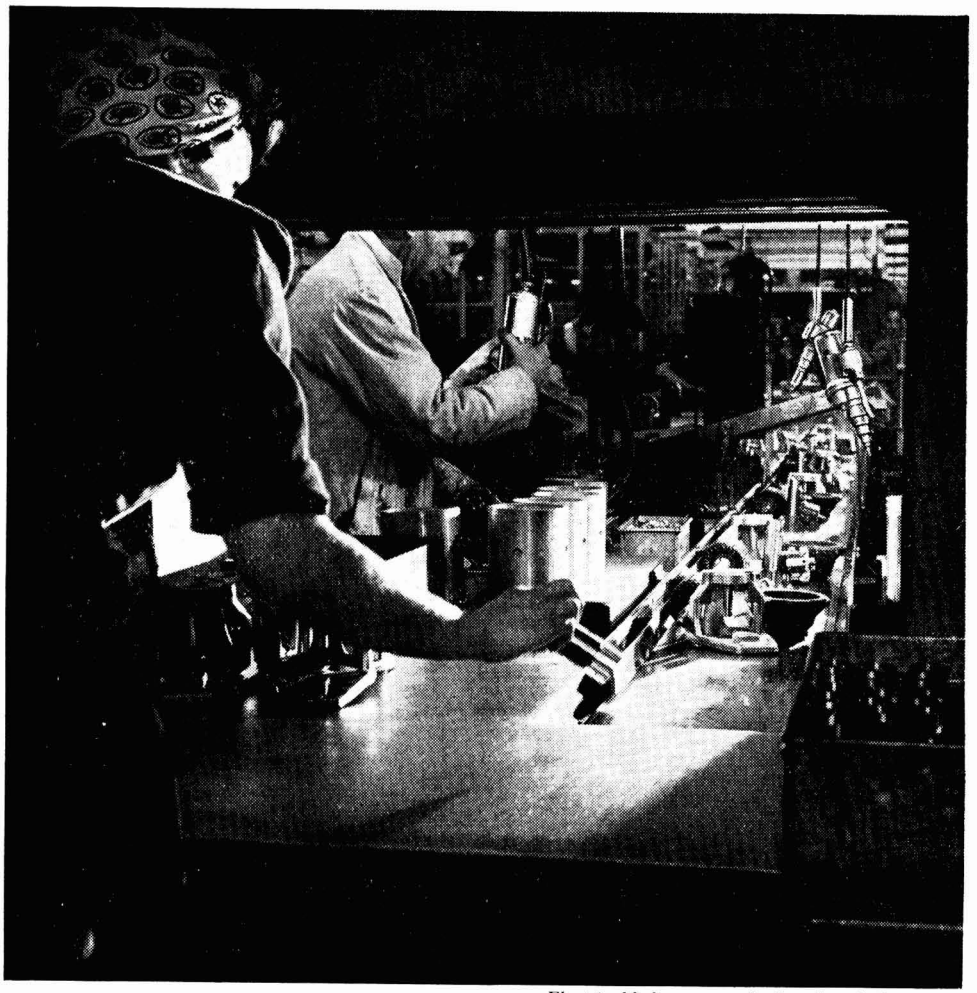
Market Reports

LONDON.—Steady trading conditions have been reported from the industrial chemical markets during the past week. A fair volume of replacement buying has been put through, and a moderate weight of new business has been in evidence. No outstanding price movements have been reported but the recent increase in transport costs is not yet fully reflected in current quotations. Antimony oxide is lower by £15 per ton and the Ministry of Works gave notice of an increase as from 1 January of £3 10s. per ton in the prices of calcium carbide. The latest basis price for dry white lead is £146 10s. per ton and for dry red lead and litharge £130 10s. per ton. An active trade is reported in the coal tar products, particularly for light and heavy grades of creosote oil and for pitch, which is also in fair request for shipment.

MANCHESTER.—Both new inquiry and actual buying of the general run of heavy chemicals on the Manchester market on home-trade account during the past week has been rather more in evidence, and cotton textile and allied trades are taking somewhat better quantities. There has been little change in the export position, with shippers calling for fair quantities. In the fertiliser market there is a steady movement of supplies of basic slag, lime and limestone, and superphosphates, with fair buying interest reported in sulphate of ammonia. There has been little change in the position of the tar products.

New Analgesic Made in U.K.

THE new local analgesic 'Efocaine' is now being made in Britain for the first time by The Crookes Laboratories Ltd., at Park Royal, London, it has been announced. Recently discovered in America, one injection of 'Efocaine' is said to banish pain for 12 days or more, and its possibilities appear to be remarkable. By the judicious selection of organic solvents a solution of 1 per cent procaine base and 5 per cent butyl aminobenzoate is prepared at a critical saturation level. Following injection, when this solution comes in contact with the tissue fluid, a micro-crystalline deposit of the two anaesthetic agents results. In this way a local anaesthetic 'depot' is established from which absorption takes place very slowly.



Electrical belt conveyor feeding directly from store

When it pays to stand still

THE LESS THE MAN AT THE BENCH MOVES ABOUT, the greater his output will be. It pays to have him standing still. If you cannot reduce his unproductive movements by changing your factory layout, you may still be able to do so by installing electrically driven mechanical handling equipment. And by giving him electrically powered hand tools you will put both the power and the work directly into his hands. By using electricity in these ways you can raise productivity and *make efficient use of the available supplies of power.*

WHERE TO GET MORE INFORMATION
Your Electricity Board will be glad to help you to get the utmost value from the available power supply. They can advise you on ways to increase production by using Electricity to greater advantage—on methods which may save time and money, materials and coal, and help to reduce load shedding. Ask your Electricity Board for advice: it is at your disposal at any time.

Electricity for PRODUCTIVITY

Issued by the British Electrical Development Association

Commercial Intelligence

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

Mortgages and 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.)

CHEMICAL ENGINEERING WILTONS LTD. (formerly Chemical Engineering & Wilton's Patent Furnace Co., Ltd.), Horsham (M., 17/1/53), 9 December, by order on terms, mortgage by way of collateral security, to District Bank Ltd., securing all moneys due or to become due to the Bank; charged on specified inventions and letters patent, etc. *£83,173. 2 January 1952.

Increases of Capital

The following increases of capital have been announced: GLYNN BROTHERS (Chemicals) Ltd., from £1,000 to £5,000. L. LIGHT & CO., LTD., from £1,000 to £2,000.

Company News

Anglo-Iranian Issue

Final subscription figures for the issue of £20,000,000 debenture stock by the Anglo-Iranian Oil Company Ltd. show that the total amount of stock applied for was £275,544,650, or nearly 13 times more than was asked for.

Benn Brothers Ltd.

The directors of Benn Brothers Limited (publishers of THE CHEMICAL AGE), have declared the following dividends, less tax, payable on 14 February 1953: 3 per cent on the preference shares for the half year ended 31 December 1952 (same) and 4 per cent (5 per cent), interim, on the ordinary shares as increased by the issue of bonus shares in December 1952.

William Briggs & Sons Ltd.

Profit of William Briggs & Sons Ltd., Dundee, after meeting all expenses, depreciation, and providing for taxation was £87,682 for the year ended 30 September, 1952. An interim dividend of 7½ per cent (less tax) was paid on ordinary shares and the directors now recommend a final payment of 17½ per cent (less tax), making a total of 25 per cent for the year. Contribution to the Employees' Pension and Superannuation Fund during the year amounted to £17,666.

British Glues & Chemicals Ltd.

Trading conditions have not been good and the immediate outlook for glues, greases, fertilisers, and animal foods, remains uncertain according to a statement issued by British Glues & Chemicals Ltd. Interim payment on ordinary stock is being reduced from 5 to 2½ per cent.

British Industrial Plastics Ltd.

A fall of 35 per cent in its trading profits in the year ended 30 September, 1952, is reported by British Industrial Plastics Ltd. Net profit was £33,489 compared with £159,957 in the previous 12 months. A dividend of 12½ per cent is to be paid for 1952. This compares with an interim of 10 per cent and a final of the same amount making a total of 20 per cent in 1951 when a bonus of ½d. per share tax free was also paid out of capital profits.

Coalite & Chemical Products Ltd.

An interim dividend of 3 per cent (less tax) payable on 18 February in respect of the year ending 31 March, 1953 (same) has been announced by Coalite & Chemical Products Ltd. The directors state that from the estimated results to date and the present prospects it appears certain that there will be a substantial fall in profits compared with the previous year and, therefore, no inference should be drawn from the present payment as to the final payment for the current year. Total payment for 1951-52 was made up to 8 per cent with a final dividend of 5 per cent.

New Registrations

Polychemical Developments Ltd.

Private company. (514,978). Capital £100. Develop, market and exploit chemical engineering and other scientific processes, inventions and discoveries, etc. Directors: Dr. A. Bane and C. A. Tierney. Reg. office: 52 Haymarket (5th Floor), S.W.1.

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.

BRITISH GEON LTD. have a few vacancies in their factory at Barry, South Wales, for **SHIFT CHEMISTS** to supervise plant, manufacturing vinyl polymers. Applicants should be between 25 and 30 years, preferably, and should possess a degree in chemistry. Salary will depend on experience and qualifications. Apply: **STAFF MANAGER, THE DISTILLERS CO., LTD., 21, ST. JAMES'S SQUARE, LONDON, S.W.1.**

CHEMICAL ENGINEERS with some years experience in design work since graduation are required for The Caltex Group of Oil Companies to work initially in England with transfer abroad later. Salaries in accordance with qualifications and experience. Apply with full particulars to **THE UNITED OVERSEAS PETROLEUM COMPANY LTD., 30, OLD BURLINGTON STREET, LONDON, W.1.** quoting " **(QX)** ".

CHEMICAL MANUFACTURERS in the Home Counties invite applications from **ASSISTANT CHEMISTS** for positions in Research Laboratories. Duties will include shift operation of experimental units (42-hour week basis), for which special shift payment is made. Preference will be given to candidates possessing Intermediate B.Sc., but applications will be considered from unqualified assistants with experience. The Company operates a Pension Scheme. Write Box No. C.A. 3187, **THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

LAPORTE CHEMICALS LIMITED require assistant chemists for their Central Laboratories at Luton. Positions are available in **RESEARCH, ANALYTICAL, EXPERIMENTAL PLANT AND SALES SERVICE LABORATORIES.** Preference will be given to candidates with Intermediate B.Sc. to B.Sc. (General) or higher according to the nature of the individual posts. All the above positions are permanant and progressive. The Company operates a Pension Scheme. Apply to the **CHIEF CHEMIST, LAPORTE CHEMICALS, LIMITED, LUTON.**

MINISTRY OF HOUSING AND LOCAL GOVERNMENT; INSPECTOR OF ALKALI, ETC. WORKS The Civil Service Commissioners invite applications from men for two pensionable appointments, one in Manchester and one in Sheffield, as Inspector under the Alkali, etc. Works Regulation Act, 1906.

Candidates must be at least 35 years of age on 1st December, 1952. They must be University Graduates in Science or Technology and preferably also Fellows or Associates of the Royal Institute of Chemistry. A wide working experience of the heavy chemical and related industries is essential.

Inclusive salary scale £1,208 (age 37)—£1,444. Starting salary according to age, e.g. £1,126 at 35; £1,294 at 39 or over. Promotion prospects.

Forms of application with further particulars from **SECRETARY, CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S4179/53. Completed application forms must be returned by 19th February, 1953.
19990/80/AR.

SITUATION VACANT

NORTH-EAST Coast Firm requires **TECHNICAL SALES ASSISTANT,** preferably with University Degree in Science or Chemical Engineering, sound basic Technical training, experience in design and/or operation of sulphuric Acid Plant. Good personality, age 30-40. Apply Box Number C.A. 3191, **THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SITUATION WANTED

SALES MANAGER experienced in the successful development of Chemical Sales and specialising in export markets, requires a position of responsibility with an opportunity for wider scope. Write to **BOX No. C.A. 3188, THE CHEMICAL AGE, 154, FLEET STREET, LONDON E.C.4.**

FOR SALE

BOILER STORAGE TANKS.
EXCELLENT CONDITION, READY FOR USE.
15—30 ft. by 8 ft. diam.,
also
LARGE AIR RECEIVERS
3—30 ft. by 8 ft. diam.,
LANCASHIRE BOILERS CONVERTED
100 lbs. w.p.
Inspection by arrangement.
MADEN & MCKEE LTD.,
317, PRESCOT ROAD,
LIVERPOOL. 13.

CHARCOAL, ANIMAL AND VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., " INVICTA " MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: " HILL. JONES, BOCHURCH LONDON," TELEPHONE 3285 EAST.

DELAFILA, THE INERT FILLER. Used in the manufacture of Fertilisers. Insecticides, Paints, Plastics and Insulating and Sealing Compounds. Prompt supplies in a wide range of fineness grades. **THE DELABOLE SLATE CO., LTD., DELABOLE, CORNWALL.**

FORGED STEEL PRESSURE VESSEL, 44 ft. long by 4 ft. 3 in. i.d. by 4 in. thick. **WORKING PRESSURE,** 2,000 lb. p.s.i. **C. W. HOGG, 42, BUSHEY WOOD ROAD, SHEFFIELD.** Telephone: 72777.

GRAVITY Roller Conveyor several lengths, Rolls. 2½ in. diam. by 16 in. 3 in. centres. Good condition. THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET MILLWALL E.14. (Tel.: East 1844.)

30 CWT. CHAIN BLOCKS, 10 ft.-12 ft. lift, ex-Government surplus. £15 per set.
5 CAST-IRON JACKETED PANS, 36 in. diam. by 27 in. deep, 1½ in. bottom outlet. £20 each.
1 MILD STEEL WELDED OPEN-TOP TANK, 60 in. by 27 in. by 42 in. by ⅜ in. plate. £25.

THOMPSON & SON (MILLWALL), LTD.,
CUBA STREET, MILLWALL, E.14.
TEL. EAST 1844.

FOR SALE

3 JACKETED **INCORPORATORS,** double "Z" arms, double geared, power-driven tipping motion, with counterbalancing weights.

1—Baker Perkins **MIXER** as above, not steam jacketed, single geared, complete with 25 h.p. A.C. motor.

3—Baker Perkins and Werner Jacketed **MIXERS** screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

4—Gardner **RAPID SIFTER MIXERS** and **MIXERS** only, various sizes, one with brass fitted interior and glass-lined end plates.

27—Various **POWDER DRESSING** or **SIFTING MACHINES,** totally enclosed with barrels from 80 in. long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven with collecting worm in hopper bottoms.

1—Simon Horizontal Tubular **DRIER,** 12 ft. long, 100 lb. steam pressure, size 3B, requiring 12 b.h.p.

4—Recessed Plate **FILTER PRESSES,** 30 in. square, 70 plates in each, centre fed.

5—Johnson **FILTER PRESSES,** 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.

1—Johnson **FILTER PRESS,** 36 n. square, plate and frame type, double inlet and enclosed delivery ports.

Johnson Oil **FILTER PRESS,** Premier type; plates 2 ft. 8 in. by 2 ft. 8 in., of which there are 45, with angle lever closing gear.

1—Johnson **FILTER PRESS,** 42 C.I. plates, 32 in. square, centre feed.

Steam-heated **FILTER PRESS,** Premier type, 32 in. square, with 30 recessed plates.

Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

1—24 in. **HYDRO EXTRACTOR,** self balancing, swan-neck type, self emptying bottom.

Heavy Cake **CRUSHING MILL,** 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam., bottom with finer teeth 12 in. diam.

5 Sets A.A. **CRUSHING ROLLS** for linseed, cotton seed, etc., 48 in. long, belt driven, with feed hopper, side frames, baseplate and striking gear.

Bennett Copper-built **EVAPORATOR,** 4 ft. diam. by 4 ft. 6 in. high, steam-jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt-driven vacuum pump.

Douglas **ROTARY PUMP** for oil, soap, etc., belt driven.

6 Various Horizontal Duplex **STEAM PUMPS,** Worthington and Tangye pattern, 1 in. to 2½ in. suction and delivery.

"U"-shaped Horizontal **MIXER,** 8 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for lineoleum paste.

1—"U"-shaped **MIXER,** as above, but 7 ft. long.

4—5-roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam., belt and gear driven, with clutch drive suitable for motor, by Baker Perkins, Ltd.

No. 2HS Hammamac **HAMMER MILL,** No. 1 size, Standard Miracle Mill, No. 2 size Standard Miracle Mill and a No. 3 Super Miracle Mill, with fans, piping and cyclones.

7 ft. Torrance Positive-driven **EDGE RUNNER,** 2 Vertica Paint Pug Mills, 2-bar Disc Paint Grinding Mills, and 2 Horizontal 40-gallon capacity Cox Pug Mills for paint.

4—Copper lined jacketed **MIXING PANS,** 4 ft. diam. by 4 ft. deep, gun metal agiators and shafts.

RICHARD SIZER, LTD.
ENGINEERS,
HULL.
Telephone 31743

FOR SALE

600

PROCESS PLANT

SIZE 2½ **DISINTEGRATOR** by Harrison Carter, 4 fixed beaters on rotor shaft. Pulley drive.

Water Cooled **BALL MILL** by Houchen, approx. 5ft. dia. by 6 ft. Cap. 500 galls. Internally lined ribbed C.I. plates.

Totally enclosed **GLASS LINED C.I. MIXER** by Clarke, 24 in. I.D. by 36 in. deep. Bolted glass lined domed cover with 6 in. inspection opening. Heavy self supporting glass covered Agitator. Vessel carried in M.S. oil or water jacket, suitable gas or oil firing.

SIFTER MIXER by Young, with Trough 70 in. by 26 in. by 26 in. deep. Blending chamber feeds material to positive action brush sifter in trough screen. Broken scroll agitator. Pulley drive.

48 in. diam. Underdriven **HYDRO EXTRACTOR** by Thomas Broadbent, with M.S. galvanised basket 48 in. diam. by 25½ in. deep, with ¼ in. perfs. at 1¼ in. pitch. Open type machine, 3 point suspension. Motorised 400/3/50.

8 FILTER PRESSES, plate and frame type, each with 51 frames forming cakes 29 in. sq. by 2 in. Individual plate discharge. Plates have ribbed surfaces.

SOLVENT RECOVERY PLANT by British Carbo Union, comprising 2 horizontal carbon charged M.S. Absorbers, each 6 ft. diam. by 3 ft., with 18 in. bolted manhole, four 8 in. diam. inspection covers, brass tube condenser, separator and distillate collection tank, 20 in. input fan and all connecting pipework. Recovery rate for naptha 10 galls. per hour.

S.J. Copper **TILTING PAN** by Collier, 30 in. diam. by 24 in. deep. C.I. Jacket to 12 in. depth. Hand tilting.

Several Unused, modern, **SECTIONAL COLD ROOMS** by G. Barker. Capacity 100 cu. ft. Timber panelled interior, sheet lead floor, lath footboards. Int. dimensions 5 ft. 8½ in. deep, 4 ft. 1 in. wide, 4 ft. 8 in. high. Protected interior light. Packed in original cases.

New ½ h.p. Slow Speed Stirrers, 400/3/50 geared to 420 r.p.m., with stainless steel shafts and marine propellers.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel.: Pudsey 2241.

SCREENLESS PULVERIZERS for fine grinding of Chemicals. Also CYCLONES, ROTARY VALVE FEEDERS. Callow (Engrs.) Ltd. Kirkby Trading Est., Liverpool.

PHONE 98 STAINES

STAINLESS STEEL GARDNER MIXER, 5 ft. by 20 in. by 19 in., electrically driven, 400/3/50.

Stainless Steel Jacketed Cylindrical Enclosed **GAS-HEATED MIXER,** 36 in. by 22 in. diam., 400/3/50.

Ten—Twin Z-Blade **TILTING MIXERS,** up to 36 in. by 30 in. by 30 in.

Steam-heated (Tray) Ovens, 12 ft. by 6 ft. by 2 ft. 4 in. deep, electric fan.

CONDENSERS—Brass, Copper and Aluminium tubes up to 300 sq. ft. area.

COCHRAN BOILER, 9 ft. by 4 ft.—850 evap., 100 w.p.

Sectional Steel **TANKS,** 24,000 gal., 24 ft. by 20 ft. by 8 ft.

Rectangular and Cylindrical **TANKS** up to 10,000 gals.

Lists on request.

HARRY H. GARDAM & CO., LTD.,
STAINES.

FOR SALE

MORTON, SON & WARD LIMITED
offer
the following

ONE s.s. tilting **TROUGH MIXER** by **CHALMERS,** 3 cwt. capacity motorised. Inter-locking lid.

ONE new 100 gall. glass lined **JACKETED EVAPORATING PAN** by **PFAUDLER.** 70 lb. p.s.i. w.p. in jacket.

ONE 500 gall. **JACKETED AUTOCLAVE,** arranged with detachable cover. 150 lb. p.s.i. in jacket, 100 lb. internally.

NEW 100, 150 and 200 gall. **JACKETED BOILING PANS** in mild steel of welded construction. Suitable for 80 to 100 lb. w.p.

ONE TROUGH MIXER by **GARDNER,** 3 cwt. capacity, s.s. lined trough and twin chrome plated scroll blades mounted on s.s. shaft, fast and loose pulley drive.

ONE . . . as above . . . motorised. Single scroll blade arranged with sifter.

ONE 300 gall. **COPPER JACKETED BOILING PAN** with s.s. agitator, direct coupled to electric motor.

ONE glass lined totally enclosed **RECEIVER** in C.I. 50 gall. capacity, with two sight glasses in top.

ALL VESSELS CAN BE ARRANGED WITH MIXING GEAR AS REQUIRED.

All types of **MIXING VESSELS** constructed to suit requirements.

A large selection of **HYDRO EXTRACTORS,** 72 in., 60 in., 48 in., and 42 in. by **BROADBENT** and **WATSON LAIDLAW** available.

VARIOUS PUMPS in stock, 2 in. to 6 in., new and second hand, in stainless steel, gun metal and cast iron.

Enquiries invited.

MORTON, SON & WARD LIMITED,
WALK MILL,
DOBCROSS, NR. OLDHAM.
LANCS.
Phone : Saddleworth 437.

SERVICING

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS, LTD.
Plantation House
Mincing Lane,
London E.C.3.

CRUSHING, MILLING, PULVERIZING, BLENDING, SIFTING, DRYING OF FINE CHEMICALS. Capacity available for work where maximum purity is the main consideration. Modern high-class equipment and full technical control.
Inquires to : **T. E. I. POWDER PROCESS DEPT. 146, GREAT CAMBRIDGE ROAD, ENFIELD.**

GLASSBLOWING by **HALL DRYSDALE & CO. LTD., 58, COMMERCE ROAD, LONDON, N.22.** Telephone : BOWes Park 7221.)

GRINDING of every description of chemical and other materials for the trade with improved mills. **THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS : "HILL-JONES, BOCHURCH, LONDON" TELEPHONE : 3285 EAST**

WET AND DRY GRINDING Micronising, Grading and Mixing of Minerals and Chemicals for all trades. Also suppliers of ground zircon, sillimanite, fused silica, precision casting materials and a wide range of ground minerals.
W. PODMORE & SONS, LTD.,
SHELTON, STOKE-ON-TRENT
Phones STOKE-ON-TRENT 2814 & 5475

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY
York House, 12 York Street, Manchester.

Telephone 1937 (2 lines) Central Manchester.

Empty Barrels & Drums

GENERAL AND EXPORT COOPERS AND DRUM RE-CONDITIONERS

T. H. FIELDING & SONS LTD.
KNOSTROP LANE, LEEDS 9
Phone : 22675 & 26394 Branch Works at Hull

For Optimum Hardness and Strength
NITRIDED
NITRALLOY
STEEL
For all parts subject to frictional wear, fatigue or corrosion fatigue.
Particulars from :
NITRALLOY LIMITED
25 TAPTONVILLE ROAD, SHEFFIELD, 10
'Phone: 60689 Sheffield 'Grams: Nitralloy Sheffield

Decolorising **CARBON**
ALL GRADES FOR ALL TRADES
HIGHEST EFFICIENCY
LOWEST PRICES
Granular Carbon for Solvent Recovery.
Regeneration of Spent Carbon.
Write for samples and quotations.
FARNELL CARBONS LIMITED
CONDUIT ROAD, PLUMSTEAD, LONDON, S.E.18
Telephone: Woolwich 1158 (2 lines). *Telegrams: Scofar, Wol, London.*

Printed in Great Britain by THE PRESS AT COOMBELANDS Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4, 17 January, 1953. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.