THE Chemical Age

VOL. LXX 19 JUNE 1954 No. 1823

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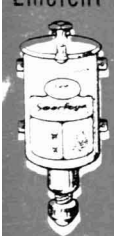

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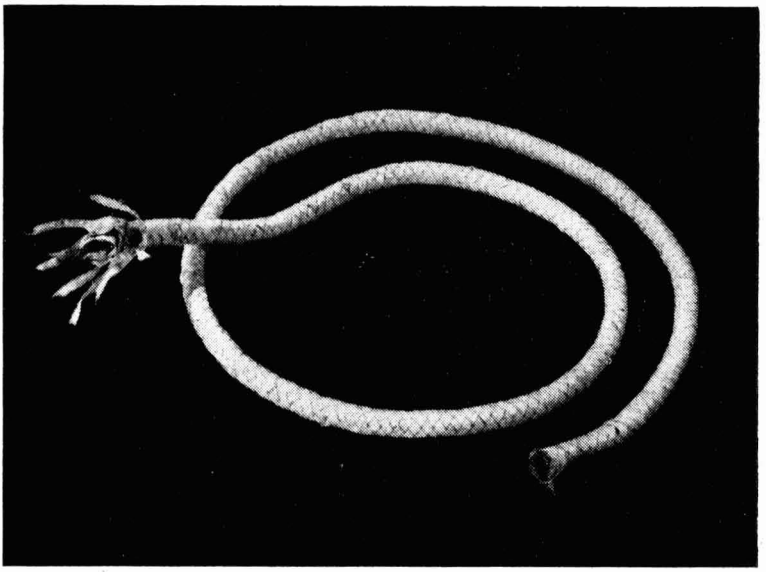

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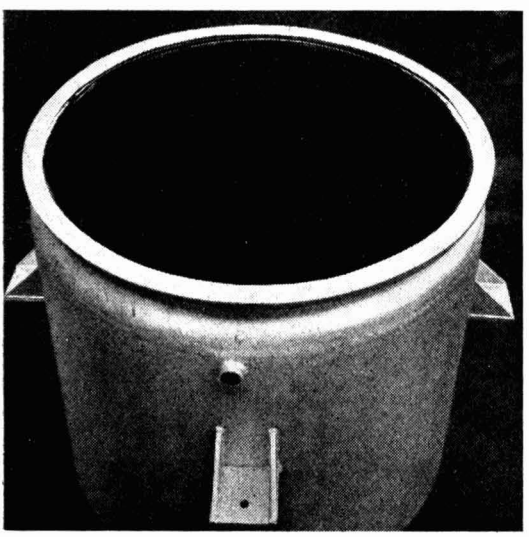

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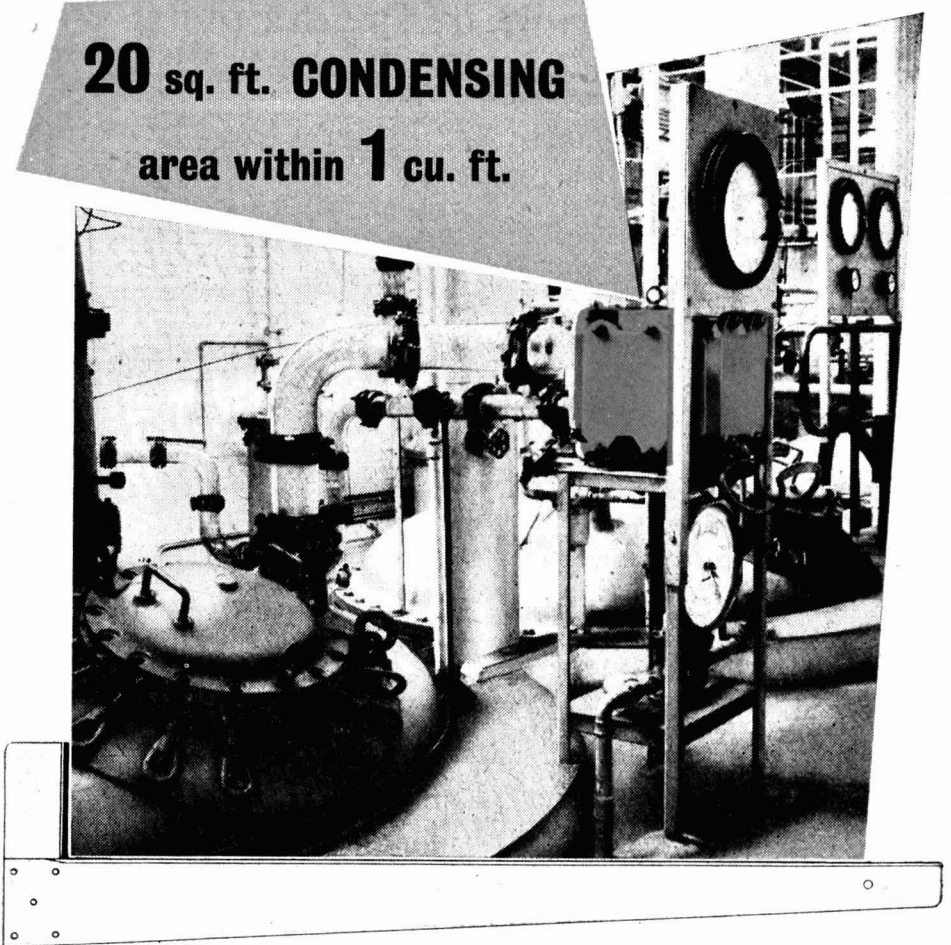

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Human Relations

BY what standard are we to judge the value of good human relations in industry? By the expedient and utilitarian standard of productivity? And, if so, by its effect upon short-term collective output or upon a worker's individual output over many years? By the effect upon the health and happiness of workers, upon their enjoyment of life both in and outside the factory? Many would be prepared to argue forthwith that a happy factory is *ipso facto* an efficient factory, in utter disregard of the fact that considerable quantities of human cheerfulness at work can be found in areas where low standards of efficiency and low levels of industrial prosperity form the prevailing pattern. It is probably sounder to argue that an unhappy factory is bound to be an inefficient one.

Last year a joint committee was appointed by the Department of Scientific and Industrial Research and the Medical Research Council 'to examine current activities concerning the study of human relations in industry and to call attention to problems of special timeliness and promise on which research . . . might be undertaken . . .' The publication of the first report this month (HMSO 1s.) has been commendably swift; though, in view of the width and depth of the subject as a whole, no one will expect so early a statement to be more than introductory. Since the appointment of the committee Conditional Aid funds to support this type of research have become available and this has enabled some pilot projects to be started sooner than had been expected. It may not be wildly speculative to assume that this opportunity for action accelerated the committee's time-table.

It is gratifying to find that the committee has discarded from the outset 'any narrow approach to welfare in industry in the sense of merely improving the amenities of work . . . .' This width of conception is amplified in another passage: 'we have in all cases tried to take a broad view of productivity needs, believing that greater human satisfaction in work is both compatible with and essential to increased efficiency and productivity.' If this at present can be no more than a belief, a theory to be proved or disproved by research, it is at least a form of faith and a dignified working hypothesis. 'Human satisfaction in work' is a sober phrase but a good one. It probably expresses the ultimate and only goal that human relations study and research can reach. What is termed happiness is an illusory and many-conditioned feature of living; satisfaction is a far less fragile state of mind. Whether work can bring happiness to the individual must depend upon the nature of the work and upon the psychological make-up and circumstances of the individual; we cannot hope for an economic system in which all kinds of essential work will be fundamentally enjoyable nor for a world in which all people will be or can be cheerfully disposed. Satisfaction is a more practical target, and a worker whose total reward from living can never be 'happy' may well find a 'satisfaction' in his work than he cannot find in his leisure or private family life. It is in this differentiation and its potentialities that the wisdom of associating the Medical Research Council with the total project is justified.

The committee has already considered 78 pocket-applications, and of these 12 with an estimated cost of £89,000 have been approved. Three of these concern incentive schemes — their effect upon productivity, their effects upon workers, and incentive schemes for management. A fourth and closely related project is the study of 'production norms,' i.e.,

standards of output that are traditionally established in certain industries and areas and which are controlled by the social attitudes of workers and management rather than by technical or economic considerations. There may well be some acute sensitivity about inquiries into this specific theme, and it is therefore worth noting that conventional production norms first achieved research recognition in studies of US industry! Three more projects deal with problems of management—a study of inter-communication and its problems of information and decision, a study of inspection processes, and another of the relationship set up between flow-line supervisors and technical specialists. There are four projects investigating factors that affect the introduction of new production techniques and methods; two of these will be general studies of change in industry, and two will be more specific —the comparison of production systems in mining and the effects of automatic control introduction. Education and training for industry have two investigations on the list — one dealing with university graduates in industry, the other with promotion and its impact upon efficiency and morale. The last of the projects selected will be a study of married women in part-time employment in a London factory. Ten of these projects will be financed by Conditional Aid Funds and two by UK funds. This 5 : 1 ratio in the financial background should indicate that many more projects can be initiated when the committee has had more time to draw up a detailed programme; for it is reasonable to expect that the Government's investment will ultimately be greater than that derived from international and quasi-charitable sources!

The centres on which these projects will be based are principally the universities — Birmingham, Manchester, London, Edinburgh, Liverpool and Cambridge. In addition well-known institutes and one technical college are taking part. What might be called the 'political independence' of the research is well assured, a major consideration when the end of the research phase is reached and the questions of assimilation and application have to be faced. No research whose findings seem to have been coloured by the opinions of 'interested' parties, whether on the side of ownership or labour, is likely to win respect.

At this stage it is virtually impossible to pass judgment on the initial programme. A comparative study of labour-management relationships in small and large factories might well have been given priority but the projects dealing with incentive schemes and management organisation can easily throw an abundance of indirect light on this potentially important theme. The influence of 'type of industry' upon the problems of organisation is another field of high significance; indeed, many people with sound and long industrial experience will have already concluded, and perhaps with some natural irritation, that generalisation in 'human relations' studies is more foolish than useful. However, it is clear that this point, too, is well recognised by the committee and will be covered in the initial programme. In the study of relationships between flow-line supervisors and technical specialists, types of industry will be differentiated and compared; it is already realised that the requirements of processing manufacture (and, here, the chemical industry has been particularly specified) are very different from those of the assembly manufacturing industry. It is to be hoped that the initial emphasis so wisely placed upon this difference will not fade as the research programme widens. In the past too much of this kind of work, small though the total volume of genuine research has been, has exclusively dealt with manufacturing flow-lines than can be organised for sectional assemblage. By no means is all the production that matters to Britain of this nature; on the contrary, the extent to which an article's production can be thus organised is also a measure of the extent to which it can be cheaply produced by other countries as well.

Insofar as early comment is justified, the joint DSIR-MRC committee can be congratulated for making a good and speedy start, and this in itself encourages the hope that their further endeavours will be of even greater value and importance.

Notes & Comments

Titanium Progress

THE problem of reducing the costs of isolating titanium from its ores is not enduring for lack of ingenuity, for several new processes were reported recently at the 105th meeting in Chicago of the US Electrochemical Society. A number of these processes aimed at the production of the pure monoxide as the principal stage, the most promising being the reaction of titanium carbide with zinc or magnesium oxides, which yields zinc or magnesium, carbon monoxide, and pure titanium monoxide. High temperature distillation removes the zinc or magnesium. The production of 99 per cent purity titanium can be achieved by electrolysing molten calcium chloride to which the finely divided monoxide has been added. Another new process gives commercially pure titanium by electrolysing di-potassium titanium hexafluoride in molten sodium chloride. In both of these new electrolytic methods the other reagents used must have a high purity standard themselves. Titanium without occluded salt impurities tends to be found in the outer layers of the cathode deposit; the inner material requires crushing and waterwashing. The addition of chlorine to the molten chloride solvent is reported to facilitate the refinement of crude titanium by electrolytic methods. This addition plates solid titanium firmly on the cathode rather than a loose spongy and salt-mixed deposit around the cathode. This process seems particularly suitable for developing pure titanium from scrap or from the crude form produced by magnesium reduction of the oxide. Nevertheless, none of these methods seems likely to bring low-cost production into this new and expanding field of metallurgy. The economics of titanium can hardly be expected to become more pleasant for buyers for the demand is rising at a much sharper rate than that at which progress is being made towards cheaper or easier extraction. The market is ardently seeking the material, and such cost reductions as can be made will in all probability be immediately followed by a widening of usage and demand.

Atomic Weights

ABOUT a year ago the International Commission on Atomic Weights recommended changes in the accepted atomic weights for ten elements, including such common elements as carbon, manganese, sodium and gold (see THE CHEMICAL AGE, 1954. **70**, 1046). The changes are, of course, small in most cases though for so long-known an element as gold a change from 197.2 to 197.0 is surprisingly large. By comparison the change for carbon—from 12.010 to 12.011—is minute. No doubt some people might think that absolute measures of atomic weights should already have been reached but the changes are in themselves a reflection of improved technique in measurement. In recommending that the International Commission's suggestions be accepted by the American Chemical Society, the chairman of the appropriate ACS committee points out that larger changes represent the clearing-up of notable discrepancies between two methods of atomic weight determination —the older chemical or stoichiometric method and the more modern mass-spectrometric method (*Chemical & Engineering News*, 1954, **32**, 1794). For a number of other elements, discrepancies still remain but these are much smaller and cannot be resolved at present.

Comfort in Failure

THE advances of nuclear science have not revolutionised methods of atomic weight determination. For elements which do not exist in naturally isotopic forms — only 22 can be thus classified—the chemical method is completely out-dated. Mass spectrometer measurements and evidence from nuclear energy transformations are much more reliable. But this does not hold good for the rest of the elements for it is difficult to measure the abundance-ratios of isotopes with the same high standard of accuracy that simple mass weights can

be determined. Where small discrepancies remain, the real truth cannot be arrived at unless chemical methods can be improved or unless natural isotope ratios can be more reliably assessed. Perhaps it is comforting rather than depressing to realise that imperfections still exist in our detailed fundamental knowledge. They are imperfections that rarely have any significance for chemical calculations.

Water and Liquid Fires

RESEARCH by the Joint Fire Research Organisation on the mechanism of fire extinction by water sprays has been reported in *Chemistry and Industry* (1954, **24**, 693) and the cases studied—burning inflammable liquids — are obviously of great importance to the chemical industry. Alcohol, benzole, petrol, kerosene, gas oil, and transformer oil were all used in the experimental test work. It is not by any means clear why water sprays can extinguish such fires; certainly no single mechanism is universally operative and many extinctions are the result of combined effects. These appear to be the extinction of the flame through heat transfer in the actual flame, the extinction of the flame by steam formation at the heated liquid surface, and the cooling of the liquid below the fire point. With alcohol a further influence is at work for water dilutes surface layers until they are no longer composed of inflammable material. The size of spray drops is a factor of spray efficiency but this influence varies with the type of liquid that is burning. For alcohol, benzole, kerosene and petrol the larger spray drop sizes took longer to be effective, but the opposite trend was shown with gas and transformer oils. It is believed that flame extinction by heat transfer is the dominant mechanism for such liquids as petrol and benzole and for this reason the fine spray is more efficient than a coarse-particled spray; with heavier oils, the dominant factor is the steam-surface effect and here the coarser spray can more quickly penetrate the flame area and reach the hot surface. This very likely theory is well supported by test evidence obtained with kerosene, a liquid with intermediate characteristics. It is a reasonable conclusion, therefore, that for very volatile liquids fine water sprays will most rapidly extinguish fires but for heavier and high boiling liquids coarser sprays are required. As time is usually the essence of safety with such fire outbreaks in both chemical works and laboratories, this new research deserves the widest assimilation.

Sixty Years of Trading

CELEBRATING their diamond jubilee of trading this year are Ronuk Ltd., who last week invited a party of trade journalists to look over their modern factory at Portslade, near Brighton, and see the manufacturing process of Ronuk wax polish and other products marketed by the company. The party were met at the works by Mr. P. I. Felton, chairman and managing director, Dr. W. F. Felton, director, Mr. A. J. Attwood, chief chemist and production manager, and Mr. C. E. Achard, advertising manager, and after lunch were shown the various departments of the extensive works. Ronuk polish had its inception some sixty years ago as the result of exhaustive laboratory research and practical tests to discover a durable, easily, renewable antiseptic dressing for the cleaning and maintenance of floor surfaces in hospitals and similar institutions. One of the newest products of the company is Colron wood dye for staining floors and furniture, which is available in a range of twelve shades and made in sizes from ½-pint upwards.

Scottish Branch Formed

Chemical engineers in Scotland have decided to form a Scottish branch of the Institution of Chemical Engineers. Dr. W. M. Cumming, former Professor of Technical Chemistry in the Royal Technical College, Glasgow, who presided at the inaugural meeting, said that although the first British university degree in chemical engineering was instituted at Glasgow the number of graduates taking that course was still too small to meet current demands. The technical chemistry degree was more popular, and it remained to be seen how the two courses could be modified.

Gas Industry's Expansion Plans

Achievements Claimed Since Nationalisation

MANUFACTURING capacity of gas must be increased from the 1953 total of 11,189,000 therms per day to 12,795,000 therms by 1960, to meet the estimated demands of industry and the domestic consumer. In the next seven years expenditure on capital equipment will reach £366,000,000, of which the industry will provide £92,000,000. The present borrowing powers are limited to £250,000,000, and the Gas Council is applying for the limit to be raised to £450,000,000.

These facts are brought out in a booklet, 'Fuel for the Nation; the Gas Industry's Programme,' published last week by the Gas Council, at 1s.

The additional capacity, it is stated, will be provided partly by an increase in carbonisation plant from 7,564,000 therms to 8,078,000 a day and partly by an increase in water gas and other plant from 3,625,000 therms to 4,727,000. These increases, however, will not meet the whole of the additional demand for gas. It is expected that the amount of gas purchased, mainly from coke ovens, will increase from 342,000,000 therms to 483,000,000 therms during the period.

The booklet which, as well as looking into the future, reviews the achievements of the industry since it passed into national ownership in May, 1949, states that the daily capacity of the gasmaking plant taken over by the industry was 2,000,000,000 cu. ft. or 9,700,000 therms. By 31 March, 1953, it had increased to 2,300,000,000 cu. ft. or 11,200,000 therms. For much of this period progress was seriously retarded by the steel shortage, but in spite of difficulties, manufacturing capacity was increased between 1 May, 1949, and 31 March, 1953, by 15 per cent. The gas industry possessed the great advantage of being able to meet daily fluctuations in demand by drawing on reserves of gas stored in holders; but seasonal variations could not be met in this way, and the ultimate test of the adequacy of gasmaking plant was its ability to meet the sustained peak demand.

Of the increase in capacity of 15 per cent rather less than half was in carbonisation plant, and rather more than half in other gasmaking plant, mainly for the manufacture of carburetted water gas. This increase in capacity represented, however, only a part of the total plant constructed, since, in addition, obsolete plant which had finished its useful life had been replaced. In many cases the plant replaced was in works at which, as a result of the interlinking of undertakings, gasmaking had ceased, so that the work done by the old plant was now done far more efficiently by part of a large installation at a modern works.

Even if there had been no other incentive, continuous increases in the cost of coal since vesting date, now amounting at the pithead to approximately 20s. 9d. a ton, would have compelled the Gas Boards to do their utmost to obtain the maximum yields from the coals available to them. In fact, by improved methods of working, by the replacement of obsolete with modern plant, by the closing down of small and uneconomic works, and by the concentration of production in large and more economic units, a progressive and substantial increase in the efficiency of gas production had been obtained.

Increased efficiency in production over the past three years is shown in the figures reproduced in the accompanying table:—

	1950/51	1951/52	1952/53
1. Coal used in gasmaking (thousand tons)	26,369	27,422	27,587
2. Coal gas made (million therms)	1,885.5	1,995.5	2,031.9
3. Coal gas made per ton of coal (therms)	71.62	72.77	73.65
4. Coke and breeze made (thousand tons)	14,567	15,141	15,296
5. Coke and breeze made per ton of coal (cwts.)	11.05	11.04	11.07

This improvement in production efficiency, it is pointed out, represented a reduction, in terms of coal carbonised, of 440,000 tons of coal in 1951/52 and a further 330,000 tons in 1952/53; and, as can be seen, the yield of coke and breeze had been maintained. The increased yield of gas per ton of coal had been continued in 1953/54.

So far as the improved yields were due to

new plant, the financial savings must, of course, be set against the capital charges on plant.

On the subject of research the booklet says that the Council had established two research stations, one in London and the other in Birmingham, and had arranged for work to be continued at Leeds University. Coal was now costing the gas industry £29,000,000 a year more than it would have cost at the prices ruling before the vesting date, and supplies of the qualities most desirable for gasmaking were becoming shorter.

Main Research Objectives

The main research of the Gas Council was, therefore directed (1) towards increasing the efficiency of existing processes for the carbonisation of coal and the manufacture of water gas; (2) towards the development of processes for the complete gasification of coal, particularly of coals which are suitable for carbonisation but are in better supply than carbonisation coals; and (3) towards improvement in the efficiency of utilisation of gas and coke. The first of these objects was being pursued at the London station, while the Birmingham station, to which the greater part of the personnel and equipment of the Gas Research Board had been transferred, was at present concentrating on complete gasification. At Leeds University the main effort was directed towards fundamental studies of problems of combustion and heat transfer.

Other items in the London station's extensive programme included the improvement of processes for the purification of gas, including the recovery of sulphur in a pure form, and for the recovery of tar, benzole and other by-products. The Birmingham station was also pursuing investigations into fundamental problems affecting the industrial uses of gas.

The Council's expenditure on research was about £240,000 a year. In addition, area boards spent considerable sums on the development of processes, and the Council and the Boards subscribed about £50,000 a year to a number of research organisations whose work was of interest to the gas industry. Investigations into the production of gas from sources other than coal included those relating to processes for the gasification of heavy oils.

Rapid extension of refineries in this country had resulted in the marketing of considerable quantities of heavy oil residues. This was of particular importance to the gas industry because of the increasing demand for diesel oil which, as gas oil, had been used for many years in the water gas process.

Consideration was being given to two ways in which heavy oil might be used in the gas industry. First, it could be and was being used for water gas plants in place of gas oil for the enrichment of water gas made from coke. This process would only partially replace coal. Secondly, heavy oil could be used in separate oil-gas plants specially designed for the purpose. Two experimental plants, both of which employed catalysts, but different types of catalyst, were being operated by the West Midlands and South Eastern Boards. The North Eastern Board also had in course of erection at York a catalytic plant of the type developed by the South Eastern Board, and other Boards were proposing to erect one plant of each type to gain experience of both.

Latest line of inquiry had been into the possibility of finding natural gas in Great Britain in quantities sufficient to be of commercial value. In spite of the knowledge that the gas industry operated the process which made the most efficient and most economical use of coal, the Gas Council had felt its duty to investigate the possibility of making the further contribution to the conservation of the nation's coal which the discovery of natural gas would allow.

Advisory services had been provided for industrialists throughout the country, whether the fuel to be used was gas or coke, and many improvements in gas processes had resulted from collaboration between industrialists and the industrial departments of the gas industry. An outstanding example was the use of gas in potteries.

Coke Uses Extended

Use of coke had been extended to many processes. A semi-producer furnace had been developed and applied to many operations, including bread making, the refining and curing of cast concrete products, heavy clay products such as tiles and bricks, and certain chemical processing work.

Among investigations into the use of by-products other than coke were experiments on the use of ammoniacal liquor as a fertiliser. In the 12 months to September, 1953, more than 6,000,000 gal. were applied.

German Production Continues to Rise

Export Sales Expanding Rapidly

A STEADY increase in production has been reported by all sections of the German chemical industry during recent months and prospects are viewed with confidence. The chemical production index for April was 171, compared with 153 in April, 1953, and the month of May witnessed a further substantial improvement. The chemical price index which had remained unchanged from July, 1953, until March this year yielded one point in April, thus following at last the general slight decline in German industrial prices.

The value of German chemical production in the first three months of this year is now returned as DM. 2,915,000,000, compared with DM. 2,558,000,000 in the first quarter of 1953, and that of German chemical exports as DM. 691,000,000, compared with DM. 512,000,000. The export business thus expanded by 35 per cent while domestic sales appear to have risen by only 9 per cent. The prosperity of the German chemical industry is thus largely due to its success in foreign markets. The chemical industry now accounts for 9-10 per cent of Germany's total industrial production and 13-14 per cent of her total exports. Before the war the chemical industry used to supply 17-18 per cent of all German exports, and chemical manufacturers for this and other reasons hope for a further expansion of their foreign sales. Of late, however, other industries, especially those providing capital goods, have been able to make swifter progress, both in the home market and in the export business.

Dividends Reflect Progress

Recent dividend announcements reflect the favourable course of business in the past year. Badische Anilin- und Soda-Fabrik AG and Cassella Farbwerke Mainkur AG pay 7 per cent, Chemische Werke Albert 5 per cent, and Knoll AG Chemische Fabriken 8 per cent; all four had paid no dividend last year. Farbenfabriken Bayer and Farbwerke Hoechst raise their distribution from 4 to 7 per cent, Süd-Chemie from 8 to 10, Scheidemandel from 5 to 7, and Wasag from 3 to 6 per cent.

The West German potash industry reports a brisk demand from abroad, especially for high-grade salts. Production in the first quarter of this year amounted to 416,000 tons (K_2O), an increase of 21 per cent over last year. Total sales were substantially higher—476,000 tons—with the results that stocks were substantially reduced. Stocks in overseas ports were also lowered. Domestic sales were 7.6 per cent higher than in January-March, 1953, exports 16.5 per cent, and sales abroad, including releases from stocks in overseas ports, were as much as 42.5 per cent above the preceding year. In April and May domestic sales, retarded by cold weather in January and February, underwent a considerable expansion.

Soviet Zone Radio Isotopes?

While the production of radio-isotopes in the Federal Republic is prohibited, West German specialists forecast that the Soviet zone, which is no longer subject to this restriction, will shortly appear as a supplier of radio-isotopes for requirements outside the zone.

In the more competitive conditions created by the erection of new refining capacity for imported mineral oils at Hamburg, some of the inland refineries specialising in the treatment of indigenous crudes from Emsland seem to have run into difficulties, and an approach has been made to the Federal Government to secure official support, possibly in the form of special depreciation allowances for plant erected since the war. The problem of these inland refining plants is of some interest to the chemical industry because several of the former coal-oil plants have been converted to refining petroleum. If, as a result of the erection of new and modern refining plant at coastal ports, oil refining becomes less remunerative, further adjustments may be made in the production programmes of the oil refineries in the Rhineland.

A new catalytic cracking plant was opened by Esso AG at Hamburg-Harburg some weeks ago; its cost of about £4,000,000 accounts for half the total expenditure incurred by Esso on refinery extensions at Hamburg since the war. Nearby, at Hamburg-Finkenwärder, B.P. Benzin- und Petroleum GmbH is erecting a platforming cracker which is to

come into operation this summer. The expansion of the oil refining industry at Hamburg will give rise to a substantial by-products output of potential interest for chemical utilisation. On behalf of Esso AG it has been stated that no decision has as yet been taken on the use of by-products as chemical raw materials. For the time being it is intended to separate the gases and sell various purified gases.

Of the former coal-oil plants, that of Gelsenberg Benzin AG at Gelsenkirchen is now treating over 1,000,000 tons of crude. A modern catalytic cracking plant was put into commission about the middle of last year, and further extensions are under way. Scholven-Chemie AG at Gelsenkirchen-Buer has an oil refining capacity of 400,000 tons which is to be raised to 750,000 tons a year. Both companies are considering an extension of their chemical interests on the basis of their refining and cracking activities.

UK Platformers Started

ERECTION begins this month of the platforming units being installed at two of Anglo-Iranian's refineries in the United Kingdom—Llandarcy and Kent. In each case, the concrete foundations are almost complete.

Several towers—the biggest of them 88 ft. in length and weighing 52 tons—have recently travelled overland from works in Scotland and northern England to the refineries. Other smaller towers and vessels for the units are due for delivery shortly.

Construction of the platforming unit at Kent should be finished by the end of this year, and of that at Llandarcy early in 1955. Completion of these units will mark the end of the construction work planned for Kent oil refinery and the expansion programme at Llandarcy.

In all, six 'platformers,' which produce a high grade motor spirit component by a reforming process using a platinum catalyst, are being installed at refineries operated by Anglo-Iranian and its associates. Those in the United Kingdom, France, Germany and at Kwinana, Western Australia, will have an annual capacity of about 250,000 tons a year, while the platformer at Aden Refinery will have a capacity of approximately 500,000 tons.

Superphosphate Conference

THE International Superphosphate Manufacturers' Association had a successful series of meetings in Lisbon towards the end of May, which were attended by a record number of delegates from twenty-one countries.

At the annual general meeting Count Dr. Carlo Faina, of Montecatini Soc. Gen. per l'Industria Mineraria e Chimica, Italy, was elected vice-president in place of Mr. B. Colbjornsen, of A. B. Ferenade Superfosfatfabriker, Sweden, who retired by rotation.

The delegates were entertained by the three superphosphate manufacturers of Portugal, Companhia Industrial Portuguesa, S.A.P.E.C. Products et Engrais Chimiques du Portugal, and Companhia Unico Fabril; by the Portuguese pyrites producers, SA Belge des Mines d'Aljustrel, Mason and Barry Ltd. Mines et Industries SA and by the Comptoir des Phosphates de l'Afrique du Nord. Generous hospitality was also received from His Excellency Don Manuel de Melle.

A golf competition took place at Estoril where players and some of the delegates were entertained at a luncheon given by the Egyptian Phosphate Co. Ltd. The cup was won by Mr. J. L. Townsend, of the Pan American Sulphur Company.

After the meetings a visit was paid to the Barriere works of the Companhia Uniac Fabril.

Synthetic Rubber Plant

IN an extensive review of Dunlop's world-wide activities, Lord Baillieu, at the company's annual meeting on 14 June, referred to the new synthetic rubber plant to be built at Fort Dunlop, and mentioned that work on the site had already commenced.

'The new plant has not been designed to manufacture established general purpose rubbers on a large commercial basis but to produce, as they become available from our research centre, a wide range of new rubbers in sufficient quantities for development in the company's products,' he declared.

The chairman pointed out that both for commercial and strategic reasons it was important for Britain to have full access to adequate supplies of synthetic.

Lord Baillieu stated that the trading position so far this year of Dunlop Rubber had 'continued on a satisfactory basis.'

Indian Newsletter

FROM OUR OWN CORRESPONDENT

AN indication of a liberalisation of import control in view of the favourable foreign exchange position was made by the Minister for Commerce and Industry of the Government of India at a recent meeting of the Import Advisory Council. It was pointed out that increased imports would be necessary to offset the effects of increased domestic expenditure in the public field and of deficit financing which was estimated to be of the order of Rs.2,500,000,000 (£187,500,000) in 1954-55. The need for diversification of imports to provide increased opportunities for employment and to enrich the range and quantity of imports was also stressed. Though there was a fall in export earnings in 1953-54 as compared to the previous year, it was offset by a fall in imports. There was an adverse trade balance of Rs.380,000,000 (£28,500,000) in 1953-54, as compared to Rs.830,000,000 (£62,250,000) in 1952-53. Manganese ore among other things fetched more foreign exchange during 1953 while exports of mica and lac declined. It may be interesting to note in this connection that the Government have just announced some concessions to exporters of manganese ore in the current quarter. The targets for exports fixed for the first half of this year for chrome ore and gypsum are 15,000 and 3,000 tons respectively while the figures for the full year for kyanite, sillimanite and vanadium ore (free from uranium) are in the order 20,000, 3,000 and 30,000 tons. A comprehensive handbook on export trade control has been published.

* * *

The Atul Products Ltd., Bombay, have reached an agreement with Imperial Chemical Industries Ltd. for joint manufacture of certain dyestuffs. The application of Atul Products Ltd. to the Government has been approved recently under the Industries (Regulation and Control) Act. It is learnt that the capital outlay will be of the order of Rs.10,000,000 (£750,000) and I.C.I. will provide a half of the share capital, in addition to providing technical assistance. They will also help in the marketing of the finished products. The manufacture of dyes in India was first started by the Associated Research Laboratories in 1940 and some other firms took up manufacture of stabilised azoics and developing salts, the demand for both of which is currently estimated at 3,000,000 lb. Some varieties of indigosol are also manufactured in the country. The raw materials in many cases are imported. The Government of India have hitherto been permitting liberal imports to assist the dyestuff industries. It is learnt that lately the policy has been modified to encourage the manufacture of such varieties of dye-stuffs as can be wholly or partly produced in India. This industry is now recognised as a key one and the question of giving protection to it is before the Indian Tariff Commission. In addition to the Atul Products scheme, the Government have before them a number of other applications for manufacture of dyestuffs in collaboration with German and American interests. It is reported that Tatas, apart from their proposal to manufacture dyes at Jamshedpur are also interested in setting up a small dyestuff manufacturing unit either at Bombay or Poona with the assistance of the German firm of Bayers.

* * *

A standard specification prescribing the requirements and methods of test of analytical and technical grade potassium dichromate has been issued by the Indian Standards Institution. Standards have also been prescribed for benzole, xylole, amyl and butyl alcohol, which are used as industrial solvents and also for oxalic acid, eucalyptus oil, geranium oil and activated carbon.

* * *

The manufacture of chemicals seems to have caught the fancy of many leading industrialists in India as has been pointed out earlier. (CHEMICAL AGE, 1954, **70**, 779.) It was lately reported that the jute and textile firm of Birlas were desirous of establishing a rayon factory in Bombay and a soda ash plant in Saurashtra. The Minister for Finance told the Indian Parliament that the Government were not favourably inclined to start another soda ash plant in Saurashtra. The soda ash plant in the region is the Tata Chemicals Ltd., Mithapur. It was pointed out that transport would be a serious bottleneck if another plant were located there.

The Government have appointed a special officer to investigate the possibilities of

expansion of the industry in the light of the Planning Commission's recommendations. The possible alternatives for the erection of soda ash plants are in Madras, Orissa and Bengal. The working of the lignite deposits in Madras State, it is said, would create conditions for the manufacture of heavy chemicals in that State. It may also be added that Rohtas Industries Ltd. are also contemplating a heavy investment on rayon, caustic soda and soda ash manufacture.

* * *

It is likely that plans will materialise in the next few months for the annual production of 60 tons of sulpha drugs in Hyderabad, with State aid and collaboration with a Swiss firm. This is in pursuance of a trade agreement between India and Switzerland. Such of the machinery as is available locally has been selected and further shipments are expected shortly. The erection of the plant is scheduled to be completed by October and production expected to commence before the end of the year. The manufacturing programme will be finalised by foreign technical experts in consultation with State Government representatives. It should be remarked here that Atul Products Ltd., Bombay, have been manufacturing sulpha drugs at their Bulsar factory for over a year now.

* * *

Four of India's National Laboratories and certain Government technical service departments will receive specialised equipment under two operational agreements signed between the Governments of India and the United States of America at a joint cost of $27,000,000 and Rs.2,775,000,000. The dollar contribution will be utilised for the procurement of equipment and other costs while the rupee expenditure will defray inland transport, handling and installation charges. The National Chemical Laboratory will receive copies of a wide range of patents in the chemical field from the US Patent Office, an extensive list of periodicals, books and other technical literature, a description of the US Commodity Specifications in selected fields and microfilm equipment. The Fuel Research Institute will receive equipment for additional research in coal carbonisation, making synthetic fuel and combustion of pulverised coal. The Geological Survey of India will get mineralogical and other equipment while the Bureau of Mines will receive equipment for beneficiation of low-grade ores. It may perhaps be added here that under a separate agreement the Forest Research Institute is to get special facilities and equipment for furtherance of research and pilot plant work.

There was recently an exhibition in New Delhi of products of experiments at the National Laboratories, specially for the benefit of the members of the Indian Parliament. It was stated there by the Deputy Minister for Scientific Research that 118 investigations of the National Laboratories had been referred to the Research Development Corporation recently set up, for commercial exploitation.

Petroleum Congress

A LAVISH brochure is now available from the general committee of the 4th World Petroleum Congress, which will be held in Rome, 6-15 June, 1955. The purpose of the congress is to take stock of the present status of petroleum science and technology, facilitating the meeting and exchange of ideas and experience among men who, in different parts of the world, are daily faced with similar problems.

The plenary sessions and the meetings of sections will be held in the congress building of the Rome Universal Exhibition Centre. The provisional programme includes a cocktail party in the Capitoline Gardens, a concert at the Basilica di Massenzio, an official dinner at the Excelsior Hotel, a visit to the opera, and a tour of Rome by night. There will also be a number of plant visits and conducted tours. Four speakers of international repute will give lectures on petroleum subjects of general interest during the congress.

The general secretary is Mr. D. A. Hough, c/o Institute of Petroleum, 26 Portland Place, London, W.1.

Silicones Exhibition

The many applications of silicones in industry will be shown in an exhibition being held by Midland Silicones Ltd. at the Nottingham and District Technical College, Shakespeare Street, Nottingham, from 22 to 26 June inclusive. It will open each day from 10.30 a.m. to 6.30 p.m., except Saturday, when the opening hours will be from 10.30 a.m. to 4 p.m. There is to be a film show and discussion each day at 11 a.m. and 6.30 p.m. On Saturday it will be at 11 a.m. only.

Newer Reagents for Metals—Part II*

by W. C. JOHNSON, M.B.E., F.R.I.C., and J. T. YARDLEY, F.R.I.C.
(Hopkin & Williams, Ltd.)

EACH separate group of reagents that we have considered, so far, has tended to provide selective reactions for the same or similar elements. Since the reaction products have, in the main, been coordination compounds we should anticipate that the metallic participants in the reactions would be those most readily able to accept the coordination valencies made available. This circumstance gives rise to a certain broad selectivity but reduces the likelihood of specificity or selectivity within the group.

Putting the matter another way, we see that we can expect a wealth of reagents for certain metals and a paucity for others and predictions along general lines are possible with some success. This is particularly true when the 'theoretical' data can be augmented by largely empirical matter as we have already seen exemplified by the selective effect of substitution at certain points in the phenanthroline nucleus.

Salt forming reagents on the other hand are far less predictable in general behaviour and are less likely to show discrimination. In either case, the prediction of compound or complex formation is only a first step along the road to a useful reagent. The reaction products must obviously be endowed with a sufficient number of the attributes enumerated in our introduction and the gap left by theoretical principles can only be bridged by the empirical methods of trial and error.

It is this that is indirectly responsible for the fact that out of every hundred new reagents appearing in the literature probably one only, on average, may show any obvious advantages over those already available and a far smaller proportion ever achieve sufficient popularity to find their way into standard text-books. Life is short, and chemists on the average live no longer than lesser mortals, so that one cannot examine the potentialities of any but a few that may seem to offer a key to the particular problem on hand. There can be no doubt at all that among some of the soon-to-be-forgotten papers of the moment there is a second dimethylglyoxime; to be overlooked for many years perhaps, because the author was mainly and legitimately preoccupied with his own restricted problem of the moment and failed to emphasise some feature that might have had much wider applications outside his particular interests.

All the reagents considered in the first part of this survey have contained nitrogen as part of a functional group in the molecule; indeed, the vast majority of organic reagents are nitrogenous substances—with the exception of salt or lake forming compounds. The next few paragraphs have been devoted to a brief survey of reagents containing sulphur as a functional constituent. We cannot refer to these substances as a class since our remarks will cover rather widely differing chemicals falling into a number of more or less unrelated families.

Familiar Dithizone

Pride of place in this section must unquestionably be given to diphenylthiocarbazone and its near relations. Under the name of Dithizone, the parent compound must have become familiar, at least by name, to every analyst in every country. More has been written about dithizone than about any other reagent and as a means of separating and estimating such metals as lead, zinc, copper and so on it must be used at least as frequently as any but the commoner inorganic bench reagents. The great advantage of dithizone is that the metal complexes are soluble in organic liquids over varying ranges of acidity and alkalinity. In this way, certain separations are easily made and, as is always the case, the concentration of the colour in the organic layer means a manifold increase in sensitivity.

The chief disadvantage of dithizone on the other hand is due to the colour given by the reagent in the presence of ammonia and other basic substances. Unfortunately, this colour is practically indistinguishable from that given with lead and some other metals and the colour is, moreover, incompletely extracted from the organic layer except in the presence of cyanide, and in some cases

* Based on a lecture delivered to the Sheffield Section of the National Trades Technical Societies, at Sheffield on 30 March, 1954. Part I appeared in last week's issue.

other electrolytes of high ionic strength. Often there is no great disadvantage in this and the addition of cyanide may have the incidental function of complexing ions that would otherwise interfere, but many other related substances have been prepared in the hope of eliminating undesirable properties. Of these, the only notable compounds are di-β-naphthylthiocarbazone[15], a few substituted phenyl derivatives and di(*p*-diphenyl)-thiocarbazone[16].

Effective for Arsenic

None of these is as distinguished as the parent substance, although the last named is said to be a very effective reagent for arsenic and certain of the others are rather less prone to oxidation. Much recent work has been devoted to establishing the constitution of the metal dithizonates and to the devising of more efficient preparative methods. The authors' laboratories are currently engaged on this aspect of the matter and we think that many of the minor difficulties that are encountered with this reagent will be removed when really pure material is available. Certainly, the purer materials are far more stable than the crude products.

Next to dithizone in importance in this rather arbitrarily chosen group comes sodium diethyldithiocarbamate[17], the principal use for which is the determination of minute amounts of copper in alkaline, neutral or slightly acid solution, the coloured product being extractable into organic solvents. The diethylammonium salt is similar in most respects but has the advantage of being soluble in chloroform, a property that is of value in the separation of zinc from most other metals. In this procedure zinc is partitioned into the organic layer in company with copper, lead and a number of other metals, but since none of the accompanying metals form acidic anions, zinc may then be returned to aqueous solution as zincate by extraction with alkali.

A number of disubstituted dithiocarbamates have been prepared. The latest are derivatives of piperazine, morpholine, thiazine and pyrrolidine and these have made possible one or two new separations. For example, it is claimed that nickel may be completely separated from cobalt by the pyrrolidine compound in the presence of hydrazine. The salts of dibenzyldithiocarbamic acid show a useful advantage over the diethyl compounds insofar as the copper complexes are produced in strongly acid solution and the zinc salt has been used in the American brewing industry for estimating copper in what they are pleased to call malt beverages[18].

Among other sulphur compounds, toluene-3,4-dithiol[19] remains unsurpassed in its class as a reagent for tin, molybdenum and tungsten, and rubeanic acid (dithio oxamide)[20] is still much used as a qualitative copper reagent. Thioformamide and thioacetamide might also be included in our list since they have been employed as precipitants for Group II metals. Recent additions to the list of gravimetric reagents are 2-mercaptobenzoxazole and 2-mercaptobenzthiazole. These have been employed as precipitants for rhodium in acetic acid solution[21] and phenylthiosemicarbazide in alcoholic solution is recommended as a precipitant for platinum[22].

Although far from new, we can hardly omit some mention of thioglycollic acid from our list of sulphur containing reagents. Thioglycollic acid is, of course, widely used in the iron test of the BP and in recent years has achieved some fresh fame as a sequestering agent for iron in acid solution. This procedure has effected a vast improvement in the determination of aluminium with aluminon, which under ordinary circumstances reacts with iron as effectively as with aluminium, and these remarks will serve as an introduction to a few words about the lake-forming reagents mentioned in our introduction.

A Typical Reagent

Aluminon—the ammonium salt of aurine tricarboxylic acid—is fairly typical of this class, all of which, as our definition implies, are dyestuffs. The selection of dyes suitable for metal lake formation or for that matter for any purely chemical purpose is complicated by the nomenclature used in the industry, ostensibly for purposes of identification. However, in spite of these difficulties quite a range of dyes is now available in purified form for analytical purposes, but investigators usually turn to the technical dyes for fresh materials to examine.

Aluminium seems to have a rather special affinity along with magnesium for reagents of this class and quite a number of dyes of the triphenylmethane type have been used for its estimation. Likewise a num-

ber of derivatives of alizarin, in addition to the well known alizarin red, which is the sodium salt of alizarin-3-sulphonic acid, have found similar applications. It is doubtful if any of these newcomers will supersede their established counterparts, except for specialised applications, but eriochrome cyanine R has been employed in the US as a means of estimating aluminium in steel, iron being largely removed by extraction of the chloride into *iso*propyl ether and the remainder by precipitation as cupferrate[23].

Magneson 1 and 2, both azo phenols, are in constant demand for determining small amounts of magnesium; likewise Titan Yellow, which might have served as an example of the confusing nomenclature that we mentioned earlier. It is quite impossible to be certain whether or not workers in this field have all used the same dye or not. We may also mention the 'cadions,' aminoazo dyes having extraordinarily high sensitivities for cadmium as well as for certain other metals. These dyestuffs stand in a slightly different light from most of the other classes. As we have seen, the approach is a rather more empirical one: a sort of trial and error selection from the colorists' repertoire of ready made materials.

Somewhat of an exception comes in a systematic investigation of a number of arsenical azo dyes. It was found that these compounds yielded colour reactions with niobium, hafnium, tantalum, thorium, titanium, uranium and zirconium. A number of such compounds have been prepared and examined and one of them has been applied successfully to the colorimetric determination of thorium and has been given the trivial name 'Thorin'[24].

Reagents of Special Interest

At this point we must abandon the somewhat loose system which we have so far tried to follow and deal with some rather more miscellaneous reagents of special interest.

Ethylenediamine tetra-acetic acid, EDTA, or, as our own company's purified product is called, 'Sequestric acid,' was first used by Schwarzenbach for the determination of hardness in waters. A brief account of this application will serve to illustrate the properties of these substances in general, for there are now many of them, known in a loose generic way as Complexones.

The parent, sequestric acid, forms soluble stable complexes with a large number of metals including the alkali-earths, Mg, Fe (III), Zn, Th, Ti and Pb. So far as the water hardness determination is concerned, the underlying principle of the original method is simply that an equivalent amount of acid is liberated when a neutral solution of the sodium salt is complexed with calcium or magnesium. This acid can be titrated with alkali but the later modification of the method is much more elegant and works in the following way.

Titration of Lakes

Certain dyes, for example Eriochrome Black T, which is blue in alkaline solution, form wine red lakes with calcium and magnesium, and, if a solution containing these metals is titrated with sequestric acid disodium salt in the presence of the eriochrome and a suitable alkaline buffer, the following sequence of events occurs.

Before the addition of the titrant, the solution is wine red in colour due to the presence of the eriochrome lakes of magnesium and calcium. Also, uncomplexed ions of these metals are present. As the sequestric acid is run in, so it complexes with the metal ions in the order of the stability of the complexes it forms with them. Both the calcium and the magnesium complexes are of much greater stability than the corresponding dye lakes and the calcium complex is the stronger of the two, so that the free calcium ions are first complexed, then the calcium is withdrawn from the dye lake and complexed.

When all the calcium available is in stable combination with the reagent it commences to complex the free magnesium ions and, finally, the end point of the titration is reached when the last magnesium is withdrawn from its red dye lake and the dye, stripped of its metal adducts, shows its indicator colour, which in the presence of the alkaline buffer is bright blue. This account has been rather over simplified but it will be noted that it is not possible to detect the point at which all the calcium has been titrated and only the sum of magnesium and calcium can be found by this process. Calcium may be determined alone by titration with sequestric acid in the presence of murexide (ammonium purpurate) or murexide screened with Naphthol Green B. Magnesium has no effect in this titration[25].

Although this titration is of considerable use and the principle may be extended to the macro titration of these elements and many others including zinc and nickel, the wider use of the reagent and its relatives is in the rôle of reaction inhibitor or sequestering agent. The various complexes have differing ranges of stability and this, of course, leads immediately to the possibility of separation.

Other Sequestering Agents

Although ethylenediamine tetraacetic acid is, as yet, the most important analytical reagent in the series, a number of other members exhibit sequestering properties that have already found application in analysis and it is quite certain that more will follow. Generally the series may be regarded as derivatives of iminodiacetic acid and the following are available from our own company:—

Anthranilic acid diacetic acid
1,2-Diaminopropane diacetic acid
Iminodiacetic acid
Methyliminodiacetic acid
Nitrilotriacetic acid
Sequestric acid
Uramildiacetic acid.

Two of the latest complexones reported in the current year are 3-hydroxypropyliminodiacetic acid and 2-hydroxethyl iminodipropionic acid[26] and these show a property that we think may prove of very considerable value in analytical operations, namely that of forming ferric iron chelates which are stable in acid solution but which precipitate ferric hydroxide on the addition of alkali. So far as we know, this represents a new feature among the series. One of the drawbacks of sequestric acid and probably the other members is the instability of the complexes under acid conditions.

In general, the reduction potentials of the metal-complexone chelates are sufficiently different from those of the simple metal ions to open up fresh possibilities of wave separation to the polarographer. Many such applications have been already reported and this new property may provide a way of effectively inhibiting the polarographic discharge of iron at inconvenient potentials, a point that is now being investigated by one of the authors.

Some recent work in Sweden has been concerned with the colour reactions given by copper with certain carbonyl compounds. Of these, the most promising so far is *bis*-cyclohexanone oxalyldihydrazone. The blue complex given with copper in a slightly ammoniacal citrate buffer shows a sensitivity of at least one part in 25,000,000 of solution and the reaction is highly selective. Amounts of copper of the order of 1-100 μg. may be determined without serious interference from 100 μg. of Zn, Al, Hg, Be, Fe (III), Mn, Cd, As, Sn or Sb. We certainly feel inclined to predict a very successful future for this new reagent and we have sponsored a monograph[27] written by one of our colleagues in collaboration with the original authors, to assist in popularising it in this country.

The next item on our list is not, strictly speaking a new reagent. This is 9-methyl-2,3,7-trihydroxyfluorone ('methylfluorone' for short) and was introduced by Duckert in 1937 as a spot test for antimony, but its quantitative possibilities were not then fully exploited. We have recently made up for this omission and, in a newly published monograph[28] the quantitative applications are fully described. The colour given with Sb shows a sensitivity of 1 in 100,000,000 and in an acetate buffer at *p*H 2 the reaction is highly selective.

An additional feature of some interest is the by-passing of such interference as is encountered by separating the antimony as stibine and absorbing this in a solution consisting essentially of methyl fluorone in silver sulphate solution. The mechanism of this absorption is not yet perfectly clear to us and the results are empirical but we have nevertheless found the method to be of use in such problems as the determination of antimony in titanium compounds, titanium being one of the few elements which interfere in the direct estimation. On the whole we consider this reagent to be superior to Rhodamine B—which has been hitherto widely employed for antimony estimations.

A Close Relative

A very close relative of methyl fluorone, its phenyl analogue to be precise, is an excellent reagent for germanium and is finding fairly wide application in the estimation of this element in coal, coke and flue dust[29].

We have also been lately interested in reagents for boron, particularly 1,1-dianthrimide, which gives a very sensitive blue-colour reaction between boron and a solu-

tion of the reagent in concentrated sulphuric acid. Quinalizarin is also an excellent reagent for boron and a paper by two of our colleagues describing a rapid estimation is at present awaiting publication.

The organic arsonic acids have been widely studied as reagents for tin, zirconium, titanium, thorium and a number of other metals. *p*-Hydroxyphenylarsonic acid, for example, yields white precipitates with titanium and zirconium and qualitative and quantitative methods for these two metals have been based on this reaction.

One of the most recent reagents for the gravimetric determination of zirconium is *p*-bromomandelic acid. Mandelic acid has been used quite successfully in the past for this purpose but has to be added in very large excess and the precipitate has to be washed with a solution of the precipitant because it is slightly soluble in water. The *p*-bromo acid, though more expensive, can be used in much smaller amounts and the precipitate can be washed with water. The method affords a direct separation of zirconium from a large number of other metals and has been employed for the determination of zirconium in alloy steels[30].

Alkali Metals

The alkali metals have always presented their own particular difficulties and the development of the flame photometer has provided an alternative, and generally a very satisfactory alternative, physical method that is now very widely used for sodium and potassium. This has not completely discouraged the investigation of new reagents and in recent years a new potassium reagent has come from Germany in the shape of tetraphenylboron sodium[31]. This compound precipitates potassium quantitatively from solutions slightly acid with acetic acid and the potassium compound (BPh_4)K is filtered off and weighed. Other alkali metals do not interfere and the lithium compound has been used as an alternative form of the reagent. In common with most other reagents for potassium these tetraphenylboron compounds also precipitate ammonia, but fortunately this is a radical that can easily be removed preliminarily.

To conclude with a word on the future, it is clear that to a great extent such developments as occur will simply be extensions of existing lines of approach: the almost routine outcome of the analysts' never ending search for more sensitive and more selective reactions. In one respect, however, future developments may owe much more to systematic exploration than in the past. New substances prepared primarily with a view to studying their analytical possibilities—as was true to some extent in the case of the phenanthrolines—may be the order of the day.

Expense Considerations

Too often in the past the analyst has been content to experiment with an odd selection of compounds prepared with quite different objectives in view and such an approach can hardly be considered as conducive to rapid progress. However, there is one severely practical difficulty in the way of the speedy introduction of new methods—the expense angle. Analysts in general are not unwilling to give new methods and new reagents a trial but they are, as a rule, too busy to afford the time necessary to prepare the new compounds for themselves. Suppliers on the other hand sometimes find themselves in some difficulty over the manufacture and marketing of these discoveries.

Some new or modified reagents, while offering the scientific advantages claimed by their discoverers, present difficulties. The cost of producing almost any commodity varies inversely with the scale of production and this consideration is at least as important in chemical production as in any field of manufacture. Many of the new reagents are required only for special applications and the consumption often does not warrant manufacturing batches of more than a few hundred grams whereas some of the older and better established reagents are produced in batches of several kilos. When reagents such as 8-hydroxyquinoline are made by the cwt. for another field of application, supply houses are often able to offer purified reagent grades at relatively low price levels.

Certain modified reagents appear to be inherently more difficult to make than their more classical precursors. The naphthyl analogues of dithizone and cupferron, for example, are extremely expensive for this reason. Sometimes difficulties also arise from instability of the product (the α-naphthyl analogue of cupferron is an example) and in such cases the reagent, more often than not, dies a natural though sometimes lingering death.

In spite of the tendency for some of these

newer reagents to be rather costly, one should not overlook another factor that, from the consumer's point of view, tends to offset this expense. Many of these compounds more readily lend themselves to micro-procedures in which only small amounts of reagent need be consumed.

Looking back over the last 50 years one is tempted to conclude that progress in this field has produced less striking results than in many others. It is salutory to observe that dimethylglyoxime is still unsurpassed as a general example of an organic precipitant and that many other time honoured reagents are still deservedly best sellers. Quite inevitably, too, one has the impression of a vast multiplicity, partly due to discoveries that are no better than the next but, in fairness one must observe, equally due to specialised reagents and methods.

In the Third Annual Review of Analytical Chemistry[32], Dr. Mellon wrote, 'The endless discovery of new organic compounds maintains the analysts' hope that some will serve as reagents to provide methods better in some way than those now available. Although advances are made each year, the immediately noticeable changes are not striking.' This slightly enigmatic observation seems to provide a fitting conclusion for our survey.

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US Merger Plan

Olin Mathieson Chemical Corporation?

THE boards of directors of two US companies, Mathieson Chemical Corporation and Olin Industries Inc., have decided to submit to their stockholders at special meetings on 29 June, a proposal to merge the two companies.

The announcement was made jointly by Mr. John M. Olin, president of Olin Industries, and Mr. Thomas S. Nichols, president and chairman of Mathieson. The suggested name of the new company is Olin Mathieson Chemical Corporation. Following the merger Mr. Olin would be chairman of the new board, and Mr. Nichols president.

If and when the merger becomes effective, each outstanding share of Mathieson preferred stock and each outstanding share of Olin preferred stock would be one share of Olin Mathieson $4.25 convertible preferred stock, and each outstanding share of Mathieson common stock and each outstanding share of Olin common stock would be one share of Olin Mathieson common stock.

The proposed combination will be one of America's most important diversified processing and manufacturing enterprises. Both companies were founded in 1892, generally are of the same size and each has approximately 18,000 employees.

Mathieson is a leading producer of industrial and agricultural chemicals, petrochemicals, and—through its E. R. Squibb & Sons Division—drugs and pharmaceuticals. Its operations are world wide and include 25 plants in the US and 16 in other countries. Olin Industries is a large producer of metals and fabricated parts, industrial explosives, military and sporting firearms and ammunition, cellophane, polyethylene, fine speciality papers, forest products, power-actuated fasteners and tools, and electrical products, and maintains a large research staff to develop new and improved products. Olin operates 18 plants, all in the US.

In June, 1953, Mathieson and Olin entered into an agreement to form the jointly-owned Matholin Corporation to manufacture, sell and conduct research on hydrazine, a new industrial chemical of great promise.

Natural & Synthetic Rubber

Relative positions of natural and synthetic rubber are discussed by Sir John Hay, chairman of the United Sua Betong Rubber Estates Ltd., in a statement accompanying his company's annual report and accounts. Natural rubber, he points out, has shown an increased ability at the present price level to compete with synthetic. Consumption of the two products is now running almost equal, whereas for 1953 it was 59 per cent synthetic to 41 per cent natural.

The Queen's Birthday Honours

Knighthood for Professor A. R. Todd

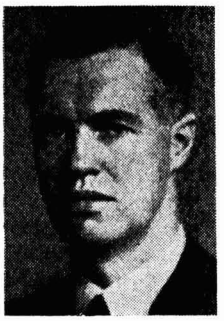
SEVERAL well-known personalities in the field of chemical engineering and industrial chemistry figured in the honours announced on June 10, on the occasion of the Queen's official birthday.

PROFESSOR ALEXANDER ROBERTUS TODD, who receives a knighthood, has been Professor of Organic Chemistry, University of Cambridge, since 1944. He is a Fellow of Christ's College, Cambridge, and has been chairman of the Lord President of the Council's Advisory Council on Scientific Policy since 1952. Born in Glasgow in 1907, Professor Todd was educated at Allan Glen's School and Glasgow University, being a Carnegie Research Scholar at the University from 1928-29. He was Assistant in Medical Chemistry, 1934-35, and Beit Memorial Research Fellow, 1935-36, University of Edinburgh, and Reader in Biochemistry, University of London, 1937-39. Prof. Todd is a Lavoisier Medallist, French Chemical Society. In 1949 he was awarded the Davy Medal of the Royal Society. He is author of numerous scientific papers in chemical and biochemical journals.

PROFESSOR FRANCIS EUGENE SIMON, who is also awarded a knighthood, is Professor of Thermodynamics, University of Oxford. Educated at the Universities of Munich, Goettingen and Berlin, he became Professor Extraordinary for Physics, Berlin, in 1927, and Professor Extraordinary and Director, Laboratory of Physical Chemistry, Breslau, 1931. Resigning in 1933, he was appointed to a research position at the Clarendon Laboratory, Oxford. He was awarded the Rumford medal of the Royal Society in 1948, the Kamerlingh Onnes medal in 1950, and the Linde medal in 1952. He is the author of 'The Neglect of Science,' and co-author of 'Low Temperature Physics.' He has contributed papers to periodicals, chiefly on the physics of very low temperatures.

A knighthood is also awarded to MR. FREDERICK SCOPES, president of the Joint Iron Council.

MR. JOHN REX WHINFIELD, who receives the C.B.E. for services in the invention of Terylene, is a member of the Terylene Council of Imperial Chemical Industries Ltd., which is responsible for the production of this product. Aged 52, Mr. Whinfield was educated at Merchant Taylors School and Caius College, Cambridge, and in 1923 joined the Calico Printers' Association as a research chemist. Between 1939 and 1941 he worked in their laboratories and in 1941 discovered Terylene when working with Dr. J. C. Dickson. During the war Mr. Whinfield was assistant director of chemical research and development for the Ministry of Supply. When I.C.I. acquired the rights of Terylene in April, 1947, from the Calico Printers' Association, Mr. Whinfield joined I.C.I. and since then has been associated with the commercial development of Terylene. He was appointed a member of the Terylene Council in 1952.



Professor A. R. Todd and Mr. J. R. Whinfield

Other recipients of honours include the following:—

Companion of the Order of St. Michael and St. George

MR. ALAN JAMES RUTHVEN MURRAY, joint managing director, Trinidad Leaseholds Ltd. Mr. Ruthven Murray joined Kern Trinidad Oilfields Ltd. in Trinidad in 1928, becoming general manager of the company early in 1929, in which position he served until July, 1942, when he became general manager of Trinidad Leaseholds Ltd., in Trinidad. After serving 19 years in Trinidad, during which time he visited most of the islands of the West Indies, he was transferred to London in May, 1947, as manager (London) and the next year became assistant managing direc-

tor. Mr. Ruthven Murray is also a director of the Siparia Trinidad Oilfields Ltd., and the Premier Consolidated Oilfields Ltd., and is both a Fellow and a member of the council of the Institute of Petroleum.

Knight Commander of the Order of the British Empire

MR. IVAN ARTHUR RICE STEDEFORD, chairman and managing director, Tube Investments Ltd., Birmingham.

Commanders of the Order of the British Empire

MR. WILLIAM GORDON ALEXANDER, O.B.E., deputy secretary, Agricultural Research Council; MR. ARTHUR BAKER, president of the Employers' Federation of Papermakers and Boardmaker; MR. HAROLD DAVIS, chief pharmacist, Ministry of Health; MR. HUGH GEOFFREY HERRINGTON, managing director, High Duty Alloys Ltd., Slough, Bucks.; MR. WALTER IDRIS JONES, director-general of research, the National Coal Board; SIR WILLIAM ARBUTHNOT LANE, BT., managing director of Kaylene (Chemicals) Ltd., and Commandant-in-chief, Metropolitan Special Constabulary; MR. HERBERT LESLIE VERRY, assistant secretary, Department of Scientific and Industrial Research.

Officers of the Order of the British Empire

MR. WILFRED MARSH HAMPTON, technical director and general manager, Chance Brothers Ltd., glassworks, Smethwick, Staffs.; MR. ARTHUR GEORGE MELLOR, chief accountant, National Sulphuric Acid Association Ltd.

Members of the Order of the British Empire

MR. MICHAEL JOSEPH BARRETT, chemical plant manager, British Titan Products Co. Ltd., Billingham-on-Tees; MR. GEORGE HOLT CORKER, manager, Derwenthaugh Coking and Chemical Works, Blaydon-on-Tyne, National Coal Board; MR. ERNEST CRADDOCK, director and general manager, West Hunwick Silica and Firebrick Co. Ltd., Willington, Co. Durham; MR. PERCIVAL FRANCIS ELLIS, training superintendent, National Oil Refineries Ltd.; MR. REGINALD NELSON LE FEVRE, training and education officer, North Thames Gas Board; MR. HOWARD JAMES TABOR, senior experimental officer, the Royal Mint; MR. REGINALD DAN WEEKS, higher executive officer, Forest Products Research Laboratories, Department of Scientific and Industrial Research; MR. WILLIAM OLIVER WILLIAMS, shift manager, Treforest Chemical Co. Ltd., Glamorgan.

British Empire Medal

MR. ARCHIBALD FREDERICK BUCKLE, foreman, Jealott's Hill Research Station, Berkshire.

Nonyl Phenol Available

IT has been announced that Jefferson Chemical Company Inc., New York, is now offering nonyl phenol in the UK through Cyanamid Products Ltd., London. This alkyl phenol when reacted with ethylene oxide is ideally suited to the preparation of nonionic surface active agents.

In view of the good colour and narrow boiling range of nonyl phenol, the nonionic surface active agents prepared from it are characterised by good colour and low odour. Oil-soluble surface active agents result from the addition of limited amounts of ethylene oxide, whereas the addition of larger quantities of ethylene oxide lead to water-soluble products.

Alkylaryl phosphites are excellent stabilisers for GRS rubbers and this is probably the second major use of nonyl phenol.

The properties of this alkyl phenol suggest its usefulness in numerous other applications such as solvents, corrosion inhibitors, plasticisers, tackifiers and adhesives.

Grangemouth Developments

APPROVAL has been given by Grangemouth Dean of Guild Court to plans for the further development of the town's petroleum chemical industry at an estimated cost of £2,510,000. About £1,160,000 of that sum is for the extension of the plant of Forth Chemicals Ltd., at Bo'ness Road (THE CHEMICAL AGE, 1954, **70**, 726), where the company are expanding their styrene monomer plant with the object of doubling its capacity.

British Petroleum Chemicals Ltd., also at Bo'ness Road, Grangemouth, are expanding their plant at an estimated cost of £1,140,000 to keep pace with increased demands for detergent products.

Protection for Tanker

It has been reported that cathodic protection is being successfully used in the Shell Petroleum Company's tanker 'Auris.'

ORGANIC ANALYSIS. Volume I. Edited by J. Mitchell, I. M. Kolthoff, E. S. Proskauer and A. Weissberger. Interscience Publishers Ltd., London. 1954. Pp. viii + 473. 68s.

This is the first volume of a projected annual series, and consists in effect of a number of concise but comprehensive monographs on individual organic determinations. The subjects included in the present volume are the determination of hydroxyl groups, both alcoholic and phenolic, of alkoxyl groups (with a section on the determination of N-methyl groups), and of α-epoxy groups, the determination of active hydrogen by organometallic compounds and by diazomethane, the determination of carbonyl compounds, of acetals, of a wide range of organic sulphur groups ranging from mercaptans through sulphonic and sulphinic acids to thiocyanates and isothiocyanates, and finally, the use of the spectroscope in functional group analysis.

Each section is dealt with by acknowledged experts, although the names of the editorial board ought to be sufficient guarantee of the excellence of the contents. The treatment varies according to the needs of each section, but both macro and micro procedures are fully treated where such exist.

Organic functional group analysis is not well served in the literature, and few critical works exist to which one can turn for guidance. Because of the modern tendency to hand over all organic analysis to the specialist, few chemists have had any appreciable amount of practical experience of this type of work, and it is probable that fewer still have any useful knowledge of the literature on it. Undoubtedly this book and future volumes in the series will do much to rectify this regrettable state of affairs, and in some ways the series could be regarded as the natural companion to the two *Syntheses* series. In particular, their critical approach will be welcomed by all those who seek information on the most useful method of tackling their specific problem, and who have in the past often had to rely on a method chosen at random from the periodical literature.

The general standard of production of the book is the usual high one which we associate with the better type of scientific textbook from the United States of America.—CECIL L. WILSON.

EXPERIMENTAL INORGANIC CHEMISTRY. By W. G. Palmer. Cambridge University Press, London. 1954. Pp. xx + 578. Figs. 141. 50s.

EXPERIMENTAL INORGANIC CHEMISTRY. By R. E. Dodd and P. L. Robinson. Elsevier Publishing Co., Amsterdam; distributed by Cleaver-Hume Press, London. 1954. Pp. xii + 424. Figs. 162. 42s.

Although the coincidence of title may prove to be somewhat confusing, it is no accident that these two books should appear at this time. Preparative inorganic chemistry, with which both of them deal, has had a relatively scanty modern literature, and the rapidly expanding interest in this field has stressed the lack.

Very fortunately the authors' approaches are sufficiently individual to make the appearance of both books equally welcome. Indeed, it is hardly an exaggeration to forecast that in many respects workers may come to regard these two books as they would the two complementary volumes of a single work. No one interested in inorganic syntheses should rest content until he has both of these books on his shelves.

It is generally realised by those who have given serious thought to the matter that the presentation of inorganic chemistry to students leaves much to be desired. A satisfactory treatment of modern theory specifically linked to a carefully chosen practical course has been wanting. Most teachers have been content to marry a practical course hallowed by the years to a theoretical course which has advanced with the times,

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sometimes claiming that conventional courses in qualitative analysis completed the requirements. Palmer's book aims at obviating these weaknesses.

The first sixty-odd pages are devoted to structural inorganic chemistry—interpreted in the widest sense of both atomic and molecular species or states of aggregation—and are sufficient to lay a foundation for the theoretical parts of the remainder of the book. The treatment is lucid and refreshing, but is inevitably so compressed that it will make far from light reading for the student. Nevertheless, he who works through it conscientiously and thoroughly will have a first-rate grasp of principles which should be excellent for his understanding of inorganic phenomena. Next in the introductory part of the book is a valuable section on crystallisation which stresses the bearing of the theoretical aspects on practice. There is also a section on analysis, since in many of the individual preparations described later emphasis is rightly laid on the assay of the product as the final stage in the synthesis. The introduction closes with a short account of electrochemistry in its relation to inorganic processes.

The remainder of the book follows a recognisable pattern. The elements are discussed group by group according to the Mendeleef classification, an arrangement which will not appeal to all teachers. Each chapter first provides a general introduction to the chemistry of the group as a whole where this is appropriate, although in most cases it necessarily consists of little more than a presentation in tabular form of the more important physical constants. The elements are then divided into suitable subgroups, each of which is discussed at more length, and the more important compounds and groups of compounds are treated in detail. Throughout these sections the comparative treatment lays a most desirable emphasis on the systematic approach to inorganic chemistry. Finally, each chapter includes detailed instructions for the synthesis of a range of individual compounds chosen either for their theoretical or for their practical significance. Thus, to take examples completely at random, the compounds of molybdenum for which syntheses are given illustrate the various oxidation states of this element; and the section on lanthanons includes the preparation of ammonium hexanitratocerate and a separation of lanthanum from neodymium based on controlled precipitation. In a good proportion of cases, as already mentioned, methods are given for the assay of the purity of the products. It is claimed by the author that all the syntheses and analyses have been tested personally, reported procedures being amended where this has been found necessary or desirable.

If Palmer's book can for convenience be roughly classed (without suggesting any restriction of its more general application) as in the first instance for teachers and students, the book by Dodd and Robinson, with the same reservation, could equally loosely be referred to as aimed at the research worker. It is, in effect, primarily a book on techniques rather than on theory; it is sub-titled ' A Guide to Laboratory Practice.' As a consequence, it helps to emphasise the common structure of synthesis, whether organic or inorganic, which is not always clearly appreciated. Indeed the first 150 pages, dealing with general techniques, would, with very few changes, be an appropriate introduction to a book of similar scope in the organic field. It therefore serves admirably to place in a proper context those processes such as precipitation, crystallisation, distillation, sublimation, heating, cooling and vacuum technique, which the inorganic chemist has usually had to seek in organic textbooks, always with a certain unease.

A section on elementary glass-working is included. The authors rightly point out that the research worker should know the principles and the limitations of glass-blowing, and should not be dependent on a technician for the simpler operations. Whether their reason for this valid assertion, that ' it involves a deplorable waste of that craftsman's time ' is the right reason is, however, open to some doubt. Economic requirements might suggest that it is at least an equal waste of a (more highly paid) research worker's time to use his hands, where other hands are supplied and where he is being paid to use his brains. There are other reasons than *ad hoc* ones for the learning of any craft by a practising research chemist. However that may be, in general there is a great store of useful practical information made available in compact form here.

Somewhat inadequate proof reading, evidenced by mis-spellings and other minor errors, may occasionally irritate the reader, but do not detract seriously from the value of the work as a guide to practice.

The actual synthetic processes are divided into three main sections: the preparation or purification of volatile compounds; the preparation or purification of water, acids, alkalis and solvents; and colloids and disperse systems. Considerable emphasis is laid on purification as distinct from preparation, and this is most valuable. As might be expected, the practical work frequently demands more complicated apparatus than the preparations described by Palmer. At the same time, the instructions are usually less detailed in the sense that they frequently require correlation with the earlier section on techniques.

A lengthy chapter, again pointing the parallel with organic work, describes the determination of physical properties; and the book ends with a brief treatment of miscellaneous topics such as literature and safety.

It must again be emphasised that these books are almost completely complementary. As a final indication of this it may be noted that a comparison of the indexes suggests that of nearly 200 syntheses in Palmer's book and an almost equal number of processes in that by Dodd and Robinson, only about half-a-dozen are common to the two books. Even if this were not so, the treatments are diametrically opposite; and it may properly be claimed that each book presents an approach to the field which must be comprehended and used by anyone who would aim at becoming a practising inorganic chemist.—CECIL L. WILSON.

OXIDATION OF METALS AND ALLOYS. By O. Kubaschewski and B. E. Hopkins. Butterworths Scientific Publications, London. 1953. Pp. 239. 35s.

The oxidation of metals and alloys is a most interesting topic for both technologist and theoretical scientist. The authors of this book state they have written from the point of view of an individual midway between these two types of people. The reviewer, however, can recommend it to anyone interested in problems of metal gas reactions.

The first chapter is a useful source of thermodynamic data on metals, alloys and their oxides, nitrides, etc. In this chapter, also, is a satisfactory, though brief, discussion of diffusion and electrical conductance in solids. Chapter two discusses the principles of the experimental methods available for the study of oxidation processes. As is quite proper, in a book of this kind, little technical detail of the methods is given. The survey of the field will be very helpful. The third chapter deals with the results and limitations of the theories current for the mechanism of oxidation. The authors emphasise that these theories will doubtless be modified in the future, but point out how, in particular, Wagner's theory of parabolic oxidation is of value in the development of oxidation-resistant alloys. The fourth and final chapter reports, in condensed form, the experimental results for the oxidation of pure metals and alloys.

Altogether then, this book may be thoroughly recommended to anyone interested in this important topic of metal-gas reactions. The authors are to be congratulated on filling this gap in the literature.—W. W. HARPUR.

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MINERALS FOR THE CHEMICAL AND ALLIED INDUSTRIES. By Sidney J. Johnstone. Chapman and Hall Ltd., London. 1954 Pp. 692. 75s.

Many who produce minerals or who use them in the chemical, metallurgical, refractories and similar industries will welcome this book by the former principal of the Mineral Resources Department of the Imperial Institute, London. It succeeds admirably in its aim which is to present in a concise form essential information on the properties of minerals and metals, their sources of supply, processing and metallurgy and uses.

The author suggests that there is need for closer liaison between the producers of crude minerals (particularly the non-metallic ones) and those concerned with their utilisation and that the producer may not always be aware of the specifications to which his products must conform in order to be acceptable to the consumer. The book, therefore, pays special attention to specifications laid down for the use of minerals and metals in particular industries. These include not only British Standards but also ASTM and US National Stockpile Specifications.

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The author also stresses the fact that the physical condition of a mineral may be a more important factor than its chemical composition in determining its possible uses. A considerable amount of useful practical information on physical properties is included in the book.

Statistics are included (there are 174 tables) showing the consumption of minerals and metals by particular industries. Many of these are drawn from official data published in the USA since such information is rarely obtainable for the United Kingdom. Market prices, however, are not given as the author considers that fluctuations in these are nowadays too frequent and too large to justify their inclusion.

This book represents the patient compilation and critical assessment of a vast amount of miscellaneous information on minerals and their uses by one who is particularly well fitted by virtue of his long experience in this field to undertake the task.

It is clearly arranged and indexed and information on any particular mineral or metal may quickly be located; the materials are listed in alphabetical order from aluminium to zirconium.

The book should find a place in all technical libraries and apart from its value as a reference book to producers and users of minerals, it should prove useful to teachers of inorganic and industrial chemistry in providing information more recent than that to be found in many of the books dealing with these subjects.—R.L.

A Text-book of Macro & Semimicro Qualitative Inorganic Analysis. By Arthur I. Vogel. 4th edition. Longmans, Green & Co. Ltd. 1954. Pp. 663. 22s.

The earlier editions and impressions of this work are widely known and used in universities and analytical laboratories as standards of instruction and reference. The last impression of the third edition, under the title of:—'A Text-book of Qualitative Chemical Analysis including Semimicro Qualitative Analysis,' was published in 1952 and since the bulk of the material is the same in the present edition this review will stress mainly the changes.

In this 4th edition Dr. Vogel has obviously completely revised and reset the text and the book has been enlarged (663 pages compared with 578) by extended treatment of some topics and the introduction of new ones. Chapter I, entitled 'The Theoretical Basis of Qualitative Analysis' now covers 140 pages and is reaching the magnitude of a book in its own right. New features in this section are, (1) the Brönsted-Lowry treatment of acids and bases, and (2) the treatment of hydrolysis from the standpoint of the proton theory of acids and bases. Both these features are neatly set down and clearly explained and are desirable since the book is recommended for the use of university honours students. An extended treatment of activity coefficients is given and the determination of *p*H by the comparator method is included. Worthy of mention in this section of the book are the increased number of worked examples, a very effective and too often neglected method of assisting the students to understand the subject.

The second chapter has now the title of 'Experimental Technique of Inorganic Analysis,' and contains macro, semimicro- and micro-techniques, a big improvement over the 1952 impression in which these were in different sections of the book. The two following chapters give the reactions of cations and anions respectively, and are unchanged except for the elevation of lithium to the rare metals (Chapter 9) and the inclusion of the reactions of hydrosulphites. While it is probably good procedure to include as many reactions of a metal as possible, nevertheless, for the benefit of students, it is felt that one recommended confirmatory test should be indicated, e.g. for magnesium (six confirmatory tests stated) Magneson I might be recommended. Group separation tables on macro and semimicro scales have been revised; some are new. The separation of Group IIA and Group IIB metals by the potassium hydroxide method is included and the precipitation of Group IV modified. A very satisfactory introduction is the zirconyl nitrate method for the separation of phosphate.

On page 503 line 21 the treatment of insoluble substances is referred to Section VII, 21—this should read Section VII, 20, there being no subsection 21. The reactions of the rare metals in Chapter 9 now include the palladous and lithium compounds. A case could be made for the inclusion of caesium, a metal now being encountered

more and more frequently in analysis. The great advance in the application of paper chromatography for analytical purposes has no doubt influenced the introduction of a chapter under that title in the present edition. The selection of separations offered is wide and will serve as a useful guide for students of chromatography, although, in some cases, other separations are in existence which are perhaps more effective. The separation of the alkaline earth and alkali metals as acetates using dilute acetic acid and ethyl alcohol (page 626), although it is not indicated, is carried out by upward displacement of the solvent.

One does not have to read much of this edition to realise that the 3rd edition and impressions have been carefully checked, revised and expanded. There are few chapters where no alterations have taken place and the resetting makes the book much easier to follow. In the elementary (macro) section, amounts of substance and volumes to be used have been reduced, and it is possibly reaching the stage soon where this section might be omitted. The book, as is claimed, will be of immense value to students of university grade and to practising analytical chemists and at 22s. can most certainly be considered a very cheap and excellent purchase. The plates of semi-micro apparatus and centrifuges facing page 186 and 187 respectively are not included in the table of contents as formerly.—R. J. MAGEE.

CHEMICAL ENGINEERING: VOL. I. By J. M. Coulson and J. F. Richardson. Pergamon Press Ltd. London. 1954. Pp. viii + 370. 38s. 6d.

Until recently the student of chemical engineering in this country had been obliged to use American text-books and although some of these have well-deserved their high reputation it is a pleasure to review a British book upon the subject. This book is, in fact, the first British text-book intended primarily for use in universities. It is based upon courses of lectures given by the authors over a period of years and benefits from their wide experience of teaching chemical engineering to both undergraduate and post-graduate students at the Imperial College of Science and Technology.

The aim of the authors has been to deal with the physical basis of many chemical engineering operations and this first volume

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is confined to the mechanisms of fluid flow, heat transfer, mass transfer, humidification and water cooling. The second volume will show how the fundamental principles are related to the design of individual units of plant to effect the unit operations of filtration, distillation, absorption, evaporation and so on.

A valuable feature of the book is that the important relationships necessary to the understanding and design of chemical plant are derived from first principles. Each section of the book is well-provided with references to original papers, many of them recent ones. The book is clearly set out and printed and is well-illustrated. It also contains an appendix providing useful data and three folding charts.

Practical aspects of chemical engineering are also dealt with; there are useful descriptions of instruments for the measurement of fluid pressure and flow, of pumps for chemical works and of heat exchangers.

The book should prove useful not only to university students but also to those already engaged in industry who wish to refresh their memories about the fundamentals of the subject. In all chapters certain sections are in small print so that the more difficult theoretical portions may be omitted in a first reading. There is one advanced chapter on 'the boundary layer' which 'may be omitted by those who are more concerned with the practical utility of the subject.'

Certain minor criticisms may be made, although it is undoubtedly true as the authors point out in their preface, that in such a book 'the choice of material must be a matter of personal selection.' The method of dimensional analysis is dismissed in a few lines in Chapter 1. It is used later in Chapter 6 to derive the familiar relationship containing dimensionless groups by means of which experimental data on convection may be correlated, but it would have been valuable in the reviewer's opinion to have introduced and illustrated the method and mentioned its limitations in Chapter 1. The section on heat transfer by radiation is rather short and the use of 'Geometrical Factors,' although briefly mentioned, is not illustrated by examples. In the section on thermal insulation it might have been useful

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to illustrate the graphical method of equating the heat flow by conduction to the heat lost from the external surface, as a means of determining the rate of heat loss.

The book contains worked examples in each chapter but its value would have been enhanced, to the student working privately, by the inclusion of an additional collection of problems (with answers provided).

This book will undoubtedly become a standard text-book and it represents a distinct contribution to chemical engineering education in the United Kingdom. As it is more up-to-date than the standard American texts on the subject and more thorough in some of the derivations it is to be hoped that it will also be adopted for use in chemical engineering schools in the USA. —R.L.

ELECTRON STRUCTURES OF ORGANIC MOLECULES. By Lloyd N. Ferguson. Constable & Co. Ltd., London. 1953. Pp. xi + 335. 48s.

Since it is the distribution and behaviour of the electrons around the nuclei which govern the fundamental character of a molecule it is clear that a description of the electron structure of a molecule is, in the widest sense, a description of its chemical bonds. This book is therefore essentially an account of the electron theory of valence, the treatment being confined to molecules in their normal or non-excited states. In one way the title may be thought to be slightly misleading since the treatment, at any rate in the first half of the book, is not by any means confined to organic molecules.

An introductory section which gives an up-to-date account of the modern theory of valence is followed by a series of chapters on the methods which have been employed to elucidate the electron structures of molecules. Chapters are included on the polar nature of covalent bonds, covalent bond distances and bond angles, intra-molecular forces, induction and electric dipole moments, magnetic susceptibility, resonance, absorption spectroscopy and aromatic substitution.

This is a very readable book which succeeds in making the subject clear and interesting and, if anything, too simple. It suffers, in fact, from all the usual defects of a qualitative approach to a difficult subject and conscientious teachers at university level may not wish to place it in the hands of students without prescribing for them a fair amount of supplementary reading. Well selected references to modern work are in fact given by the author and form a useful feature of the book. The best section is the chapter on resonance theory which is particularly well done and, by itself, would make the book worth recommending to honours students.

While it is understandable enough that the emphasis throughout should be on the work of the American school, readers in this country will be surprised to find, in a book with this title, no more than four references to the work of such an English authority as C. K. Ingold. The book is well produced and providing with a large number of clear and interesting illustrations. In this country, however, the price may well be prohibitive.—R. C. PINK.

POLYVINYLPYRROLIDON. By W. Reppe. Monograph No. 66 on Applied Chemistry and Chemical Engineering Technique. Verlag Chemie, Weinheim. 1954. Pp. 72. DM. 9.80 (in German).

Professor Reppe is well known for his work on the synthesis and polymerisation of vinylpyrrolidon. In this monograph he surveys the origin, preparation and uses of the polymer. Following a brief introduction giving the history of its development, details are given of the synthesis of vinylpyrrolidon using acetylene and formaldehyde as starting materials. Diagrams illustrating the plant used in stages of the synthesis are given and methods of polymerisation, producing materials of different molecular weights, are discussed.

Sections deal with chemical and physical properties of the polymer and its analytical estimation. There is a summary of its uses in the textile, plastic and cosmetic fields. Since polyvinylpyrrolidon has found considerable application in medicine a detailed account of its uses in this field are given and include its use in transfusion, as a substitute for blood plasma and in regulation of water content. Its pharmacological properties are summarised. The remainder of the book consists of references (283), many of which refer to medical applications, and an author index.—W.R.M.

HOME

Symposium on Cellulose Applications

The Royal Institute of Chemistry has issued the programme for a symposium at the University of St. Andrews, on recent advances in the chemistry and industrial applications of cellulose. It will be held from 28 June to 2 July, and will be opened by Professor J. Read. The first address will be given by Professor E. L. Hirst.

Ammoniacal Liquor as Fertiliser

Use of gas works ammoniacal liquor as a fertiliser is stated to have achieved successful results in the Scottish Border area. Until recently disposal of the liquor aroused objection in Hawick where the Town Council refused to accept it into their sewage system. Special equipment has now been obtained and local farmers and landowners have been convinced of the value of the liquor if suitably applied.

£5,000 Scholarship Fund

Mr. Fred Ellison, of Birkenshaw, near Bradford, an executive director of Yorkshire Tar Distillers Ltd., Cleckheaton, who has been associated with the chemical industry for over 50 years, has inaugurated a £5,000 fund for founding scholarships for the benefit of pupils at Whitcliffe Mount Grammar School, Cleckheaton. The scholarships will be tenable at universities and other further education centres in Great Britain and preference will be given to candidates wishing to pursue further study in chemistry and other sciences.

Flies Beaten on Beaches

Total cost of ridding the Shoreham to Seaford foreshore of the seaweed flies which threatened to ruin the summer season is calculated provisionally at £1,190, according to a recent report by the Brighton MOH, Dr. W. S. Parker. This figure is made up of £760 for cost of insecticides and £430 for labour costs and hire of machines. The insecticides used were Gammexane (I.C.I.) and Dieldrin (Shell). 'A very great measure of control has been effected,' says the report, 'and the Brighton foreshore is clear of flies so far as can be ascertained. . . . Should small numbers of flies emerge . . . . they will in any case be fewer in number even than in a normal year.'

Chemicals For Detergents

A new chemical plant to make a raw material for detergents is to be erected by British Petroleum Chemicals Ltd., at their Grangemouth, Scotland, works. It is expected to be in operation during the latter half of 1955. Part of the raw material for the new plant will be drawn from the adjacent refinery of Grangemouth Petroleum Refinery, a wholly owned subsidiary of the Anglo-Iranian Oil Co. Ltd.

The Only Way, Says Sir Ewart

Sir Ewart Smith, technical director of Imperial Chemical Industries Ltd., told 800 industrialists at a British Institute of Management conference on 'work study' at Harrogate recently that only through advance in productivity could employees hope to obtain an increase in real wages, shareholders an increase in purchasing power of their dividends, or customers lower retail prices. Work study, he said, was finding out scientifically how to do a job more efficiently.

Fluorine Experiment in Scotland

Kilmarnock, in Scotland, has agreed by 12 votes to 9 to make an experiment in the addition of fluorine to the town water supply in an effort to restrict dental caries among the local child population. The proposal has the support of the Department of Health for Scotland, which originally invited the town to undertake this work. A move by councillors to have the policy abandoned was turned down and although there was a proposal to await an address by the MOH —who is in favour—the policy was carried.

Research in Coal Products

It was vital to seize the lead in the field of coal structure, and keep it, or coal would not be able to fight back against its competitors in the heating and chemical fields, declared Mr. A. Whitaker, director of extramural research, National Coal Board, addressing the National Association of Colliery Managers, at their annual conference at Buxton. As a source of chemicals, he said, coal now had to compete with oil. Better ways were needed to open up coal than by carbonisation, which he described as a process akin to opening a tin of sardines by putting it on the gas until it burst.

• OVERSEAS •

Fertiliser Production

Production of fertilisers by Consolidated Mining & Smelting Company of Canada last year amounted to 600,000 tons and will this year be around 700,000 tons largely through extending of the new plant at Kimberley, B.C. This plant, which first produced last October, has a capacity of over 70,000 tons a year.

Oil In France

Search for oil in Metropolitan France and the French Union will be stimulated by a new enterprise, Societe Financiere des Petroles, which has been established by a group of big French banks and the principal oil refining companies. The company propose to take interests in several companies carrying out explorations.

Austria's Magnesite Exports

Austria's export of magnesite rose to 302,789 tons in 1953 from a level of 280,115 tons in 1952. It is pointed out in Vienna, where these figures have just been made public, that this branch of Austrian industry remains one of the most important producers of foreign exchange, in spite of stiffening competition in world markets.

Storing Power From Sun

The United States Air Force has developed a 'solar generator,' using cadmium sulphide which, it is claimed, stores the sun's energy and turns it into electricity for the home, says a message from Baltimore. The powder is processed into crystal, which picks up the sun's rays. A wafer-thin sheet of this crystal, 4 ft. by 15 ft., it is stated, would supply enough current for a normal house.

Soda Ash Production

The Brazilian National Alkali Company have signed contracts to finance the annual production of 100,000 tons of soda ash, 20,000 tons of caustic soda and various quantities of other chemicals. The contracts were signed with the Brazilian National Bank for economic development and two French concerns for the manufacture in France of the necessary equipment. The first two units of the new plant are planned to be in operation in Brazil in less than two years from now, and the entire plant, it is stated, should be working within 26 months.

Oil-Gas Strike in Australia

A major oil-gas strike at Roma, about 275 miles west of Brisbane, has been reported by Associated Australian Oilfields N.L. Gas, it was stated, was flowing at an estimated rate of 1,500,000 cu. ft. per day. At least three more bores will be necessary to test the extent of the strike, the report added.

Manganese Deposits Located

A message from Georgetown states that large manganese deposits have been found by the Union Carbide Corporation in the North-West district of Guiana, and mining there is expected to begin soon. The discovery is reported of deposits of between 4,000,000 and 5,000,000 tons of ore, with a 40 per cent manganese content.

Low-Bake Converter

A colourless, low-bake converter to prevent wrinkling during forced drying, has been developed for the refinishing trade by the Canadian Industries Ltd., Paint and Varnish Division. The converter will also minimise low-bake yellowing in light colours and permits normal spraying techniques when reducing enamel to spray viscosity with a recommended reducer. The new product is being marketed under the name of 'Cilux' low-bake converter.

Austria's Salt Mines

Austria's salt mines are at present being modernised by a change to the thermo-compression system, which is intended to raise output by from 50 to 90 per cent. Current annual production is 45,000 tons of table salt, 33,000 tons of industrial salt and 14,000 tons of rock salt.

Oil Refinery for Melbourne

The Standard Vacuum Company, which is building a new oil refinery in the Melbourne suburb of Altona, says that production of high octane fuel for Australian defence and civil aircraft is likely to begin by the middle of 1956. The estimated capacity of the new refinery is 20,000,000 gal. of aviation petrol a year, about half Australia's present aviation needs. Hitherto Australia has had to import all its aviation petrol. The company's managing director says that the extra refining equipment will cost £A1,250,000.

PERSONAL

When the University of London celebrates Foundation Day on 26 November, among the recipients of honorary degrees will be SIR RUDOLPH PETERS, Professor of Biochemistry in the University of Oxford, on whom an Hon. D.Sc. will be conferred.

SIR HAROLD ROXBEE COX, Ph.D., D.I.C., B.Sc., M.I.Mech.E., F.R.Ae.S., F.Inst.F., Chief Scientist of the Ministry of Fuel and Power since 1948, is resigning from the public service on 30 June next, in order to take up appointments in the engineering industry.

DR. E. C. BARTON-WRIGHT has entered into partnership with MR. L. D. GALLOWAY, industrial microbiologist, at 36 St. James's Street, London, S.W.1. The partners will act as microbiological and biochemical consultants under the style Galloway & Barton-Wright.

VICTOR G. BARTRAM, president of Shawinigan Chemicals Limited, and executive officer of the other Shawinigan chemical enterprises in Canada, the United States and the United Kingdom, has been appointed honorary consul of Peru in Montreal, representing the republic in the province of Quebec. Appointment confers upon Mr. Bartram, in his honorary status, the diplomatic perquisites accorded in each country to consular representatives of another.

The wedding took place at St. Wilfred's Church, Lidget Green, Bradford, on 7 June, of DR. CLIFFORD M. FLETCHER and MISS PAULINE VEVERS. The bridegroom is acting divisional analyst, National Coal Board, West Midlands Division, and the bride at present holds a science teaching post in Birmingham.

MR. JAMES S. WHYTE, chief engineer of Shawinigan Chemicals Ltd. at Shawinigan Falls since 1927, has been appointed a vice-president of the company, in charge of engineering, it was announced recently by MR. V. G. BARTRAM, president. Mr. Whyte will continue to make his headquarters at Shawinigan Falls, but will act also as consultant to the engineering department of Midwest Carbide Corporation, which is associated with Shawinigan Chemicals, in connection with its carbide plants.

Their many friends in Britain and on the Continent will be pleased to learn that MR. and MRS. G. C. INSKEEP now have a daughter, Ann Elizabeth. Mrs. Inskeep gave birth to a 5 lb. 13 oz. baby in the London Clinic on 4 June and both child and mother are said to be in the best of health. Mr. Inskeep is Associate Editor of all the American Chemical Society's publications, with his headquarters in London but covering all of Western Europe.

SIR DALLAS G. M. BERNARD has been appointed a director of Courtaulds Ltd. Sir Dallas, who retired from the post of deputy governor of the Bank of England in March, received his baronetcy in the New Year Honours List.

The following officers of the Association of British Sheep and Cattle Dip Manufacturers were elected at the recently held annual general meeting:—*Chairman*: MR. J. N. HOPE (Standardised Disinfectants Co. Ltd.); *vice-chairman*: MR. W. A. C. HALL (Prince Regent Tar Co. Ltd.); *honorary treasurer*: MR. W. E. O. WALKER-LEIGH (Cooper, McDougall & Robertson Ltd.); *honorary auditor*: MR. R. J. HOPE (Standardised Disinfectants Co. Ltd.); *secretary*: MR. W. A. WILLIAMS.

MR. FREDERICK HEAP, director and manager of the Liverpool branch of Fredk. Braby & Co. Ltd., of 352-364 Euston Road, London, N.W.1, completed fifty years in the service of the company on 4 June, and to mark the event his staff presented him with an inscribed silver cigarette box at a ceremony held in the office. Mr. Heap has many friends in business circles, particularly in the steel drum industry. He is an ex-captain of Childwall Golf Club.

The President of the Board of Trade has approved the appointment of MR. J. L. GIRLING—a Superintending Examiner in the Patent Office—as Comptroller-General of Patents, Trade Marks and Designs, in the place of the late SIR JOHN BLAKE. Mr. Girling joined the Patent Office in 1921 and has worked there throughout his career apart from a period of war service with the RAF.

The Minister of Food, MAJOR THE RT. HON. GWILYM LLOYD-GEORGE, M.P., has appointed MR. W. J. B. HOPKINSON, O.B.E., to be his Principal Private Secretary with effect from 14 June, 1954, in succession to MR. H. PITCHFORTH, who is being transferred to other duties in the Ministry on promotion to Assistant Secretary.

The Lord President of the Council has appointed SIR HUGH BEAVER, M.Inst.C.E., M.I.Chem.E., to be chairman of the Advisory Council for Scientific and Industrial Research in succession to PROFESSOR SIR IAN HEILBRON, D.S.O., D.Sc., LL.D., F.R.I.C., F.R.S., who retires on 30 September, 1954, on completion of his term of office. The Advisory Council for Scientific and Industrial Research is composed of persons eminent in industry and science. Its task is to advise the Lord President of the Council on the policy and activities of the DSIR. Sir Hugh Beaver, who has been a member of the Advisory Council since 1952, is managing director of Arthur Guinness, Son & Co. Ltd.

MR. ROBERT N. GRAHAM and MR. WILLIAM F. REICH, JR., have been appointed executive vice-presidents, and MR. N. C. BABCOCK, MR. E. E. FOGLE and MR. H. D. KINSEY have been appointed vice-presidents of the Carbide and Carbon Chemicals Company, a division of the Union Carbide and Carbon Corporation, of New York.

MR. L. H. GRIFFITHS, technical manager of Semtex Ltd., has been appointed its assistant general manager. Mr. Griffiths, who is 43, joined Dunlop's Manchester factory as a junior laboratory assistant when he matriculated at the age of 17. He left the following year to enter Manchester University where, in 1932, he took his B.Sc. and his Master's degree in technological science the next year. He thereupon re-joined Dunlop as an assistant to the chief chemist at Manchester. Next year he was elected an Associate of the Royal Institute of Chemistry and in 1940 became a Fellow after presenting a thesis on 'Rubber Latex and Cement.' Mr. Griffiths had meantime, in 1938, joined the newly formed Semtex company, of which he became technical manager in 1946. He joined the Institute of the Rubber Industry in the same year and was elected an Associate in 1949. Mr. Griffiths is succeeded as Semtex technical manager by MR. WALTER SAUL, who is 46 and joined Semtex in 1942 in order to further the development of latex-cement compositions. To prepare for the manufacture of Semastic tiles he went on, in 1946, to the Castle Bromwich factory of which he was appointed works manager in 1948.

Obituary

The death occurred last week, after a short illness, of COL. CYRIL M. CROFT, a past-president of the Institution of Gas Engineers and of the International Gas Union. He was 67.

Coalite & Chemical Products, Ltd.

An expenditure of £350,000 over the next two years, in addition to the capital commitments of £147,000 outstanding at the end of year, will be needed to finance further plans for the extension of production capacity to meet the growing demand for the company's products, says Commander Colin Buist, chairman of Coalite and Chemical Products Ltd., in a statement accompanying the company's accounts for the year to 31 March, 1954. He reveals that three new batteries of retorts, together with ancillary equipment, are to be built at Bolsover and it is hoped that these will be operating in time for the 1955 autumn demand for Coalite. Arrangements have also been made for extensions which will increase the capacity for production of phosphate plasticisers to four times what it was a year ago. Commander Buist adds that the possibilities of additional production increases are being considered, but most of the available space has been absorbed and not much more can be done without seeking a fresh site and building new works. Group trading profit for the past year was £601,631 (against £475,309), and the dividend 10 per cent (against 8 per cent).

New Scottish Headquarters

The Minnesota Mining and Manufacturing Co. has opened new Scottish headquarters at 90 Mitchell Street, Glasgow. At an informal gathering to mark the opening Mr. J. D. McKenzie, of the firm's Birmingham Office, announced the marketing of their new resinite abrasive cloth for the metal working industries and a new cellulose masking tape, impervious to synthetics, lacquers and enamels.

Publications & Announcements

INTRODUCTION of a new range of tube, combining the colourful and durable qualities of plastics with the rigidity of steel, has been announced by George Burn Ltd., of Smethwick, near Birmingham. The new product, marketed under the name of 'Burcol' tubing, consists of normal steel tube covered with a skin of PVC material. The adhesion of the PVC to the steel is effected by a new process developed by the company. Large scale production is envisaged. At present 'Burcol' is being produced in four standard colours—off white, black, red and apple green—but almost any colour or shade will be manufactured to special requirements. Six standard sizes are made, varying from $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. OD. Full information on 'Burcol' is available from the manufacturers.

* * *

TWO reports of economic interest have recently come from OEEC. One, 'OEEC at Work for Europe,' contains a series of contributions from the various executive heads of the organisation, describing six years of economic cooperation in Europe, and outlining plans for the future. The other, 'Foreign Trade Zones in the USA,' is the report of a mission which recently visited the USA to study what fuller use could be made of the advantages offered by Foreign Trade Zones.

* * *

'INTEGRON' is a finned non-ferrous tubing in which tapered helical fins at right angles to the centre-line are produced by rotary cold forming from the body of the original plain tube. The fin is thus an integral part of the parent tube. The process employed permits manufacture of finned tubes of various diameters, fin heights, fin spacings and lengths. 'Integron' is made by I.C.I. Ltd. Metals Division, Witton, Birmingham, and is supplied in two forms. Low-Fin is available in copper, 70/30 or 70/29/1 brass, 'Alumbro' aluminium-brass, 'Kunifer' 30 and 30A (copper-nickel-iron-manganese with 30 per cent nickel) or aluminium and aluminium alloys. It is $\frac{5}{8}$ in. ID, with various wall thicknesses, and fin spacing is 19 per inch. High-Fin is at present available in copper, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 in. ID, with fin spacing at 4, 6, 7 and 8 per inch. A particular advantage of Low-Fin is that the method of manufacture makes it possible not only to delay finning at the tube end, but also to interrupt the process for any desired length along the body of the tube. A booklet describing the manipulation of 'Integron' may be obtained from I.C.I., together with one describing its use in Freon-12 water-cooled condensers.

* * *

FOUR new sections in the 1954 catalogue of Hopkin & Williams Ltd., Chadwell Heath, Essex, are concerned with 'Polaritan' reagents for polarographic analysis; reagents for the determination of lead in foodstuffs; bacteriological sugars and related substances; and silanes and other organo-silicon products. Other items of interest in this extremely well-produced publication are an interesting account of British Reagent Specifications and a schematic representation of the complicated nomenclature of the xylenols.

* * *

AN entirely new type of transformer oil has been put into production by Manchester Oil Refinery Ltd., Trafford Park, Manchester. The product is known as Passivated Transformer Oil because it contains chemical additives which 'passivate' the oil against metals. The new oil has three outstanding advantages: First, unlike normal transformer oil, it has no tendency to dissolve copper or iron; secondly, if soluble copper compounds are accidentally introduced into the oil, they are rendered harmless; and finally, in addition to the passivating compound, the new oil contains an anti-oxidant—so that its life is extended still further.

* * *

DEVELOPMENTS in the British chemical plant industry in recent years are discussed by Mr. S. C. M. Salter, technical officer of the British Chemical Plant Manufacturers' Association, in the 15 May issue of 'Teknillisen Kemian Aikakausilehti' (Journal of Industrial Chemistry) published by the Central Chemical Association in Helsinki. The same issue also carries an article on 'Chemistry and International Life' by Dr. Alexander King, chief scientist, DSIR, Intelligence and Overseas Liaison Division, and vice-chairman, Scientific Committee for Productivity and Applied Research, OEEC. Mr. R. T. Butlin, the British Council's representative in Finland, writes on the British Council's work in science.

Law & Company News

Commercial Intelligence

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

Satisfactions

METALLURGICAL CHEMISTS LTD., London, W. Satisfaction, 11 May, of debenture registered 25 June, 1947.

KAY'S (RAMSBOTTOM) LTD., soap manufacfacturers. Satisfaction, 11 May, of debenture registered 8 November, 1952, to the extent of £10,000.

Receiverships (Appointment or Release)

H. HEYWOOD & CO. LTD., manufacturers of washing, cleansing and scouring powders, etc., Littlebank Street, Oldham. Lionel D. Harrison, of 18 Clegg Street, Oldham, ceased to act as Receiver on 31 December, 1953. (Notice filed 10 May, 1954.)

H. & G. PLACE & CO. LTD., manufacturers of chemicals, drugs, gases, medicines, etc., Poplar Grove, Sale, Cheshire. Derek E. O'Connor, of 70 Spring Gardens, Manchester, was appointed Receiver and Manager on 7 May, 1954, under powers contained in debenture dated 11 July, 1947.

LANDORE CHEMICAL CO. LTD. (354,332.) Manufacturing chemists and fertiliser manufacturers, etc., Millbrook Works, Landore, Glam. Roland W. Perrott, of Orchard Chamber, Neath, Glam., was appointed Receiver on 30 April, 1954, under powers contained in debenture dated 30 October, 1939.

New Registrations

Vitapro (U.K.) Ltd.

Private company. (533,739.) Capital £2,000. To manufacture, sell and advertise the appropriate registered trade marks or any future registered trade marks the products known as 'Vitapointe,' 'Vitabrill,' 'Vitabronze,' referred to in an exclusive licence granted to C. E. Fulford Ltd., by the Laboratoires Vitapointe on 22 January, 1954; and to carry on the business of manufacturers of and dealers in medicines and medicinal preparations and drugs, etc. Directors: Col. W. F. Jackson, R. T. Fulford, A. Wiseman, Sir G. B. Lomas-Walker, F. W. Bailey. Reg. office: Carlton Hill, Leeds.

Stergene Ltd.

Private company. Capital £100. Manufacturing, research, dispensing and analytical chemists and bacteriologists, etc. Directors: Wilfred A. Handley, Ivy I. C. Handley, Arthur R. Glenton and Robt. Muckle. Reg. office: College Works, Albion Row, Newcastle-on-Tyne.

Company News

A.P.V. Co. Ltd.

A final dividend of 5 5/6 per cent, making 10 per cent for 1953 (the same as the previous year) is announced by the A.P.V. Co. Ltd. The parent company's net profit is £226,556 (against £327,426), while the group net profit is given as £248,833 (against £378,261).

Berry Wiggins Ltd.

The accounts of Berry Wiggins Ltd., oil refiners, etc., for 1953, show that the parent company's net profit was £69,127 after tax (against £58,080 for the previous year). Group profit is given as £66,936 after tax. Group accounts were not prepared for 1952. It is stated that during 1953 £139,079 of the carry-forward was capitalised. Dividend for six months ended December, 1953, is 5 per cent on £520,625 ordinary capital, as reorganised. There is no further dividend for 1953.

British Celanese Ltd.

The board of British Celanese Ltd. announce an increase of 2 per cent to 18 per cent in the annual rate of equity dividend, together with a 100 per cent free scrip issue proposal in its preliminary statement for the 53 weeks, ended 3 April, 1954. Group profits, before tax, were £4,069,209. For the previous nine months' accounting period the figure was £1,841,346. A final dividend of 12 per cent is proposed making an 18 per cent total on the £3,759,267 ordinary stock, compared with the previous period's 12 per cent, or the equivalent of 16 per cent for a full year.

Crookes Laboratories Ltd.

Application has been made to the Council of the London Stock Exchange for permission to deal in and for quotation for the whole of the issued share capital—£150,000 in 600,000 shares of 5s. each—of the Crookes

Laboratories Ltd. During the past 35 years the company has been engaged in the research, development and manufacture of medicinal preparations, all of which are sold under the name of 'Crookes,' one of the company's 60 trade marks. The company has branches in India, Pakistan, Australia and Singapore and its own representatives in South Africa, New Zealand, Ceylon and Burma, and maintains a close collaboration in research and the marketing of new products with the Crookes Laboratories Inc., of New York.

Gibbons (Dudley) Ltd.

Gibbons (Dudley) Ltd., manufacturers of refractories, are recommending a 12½ per cent final dividend, which makes a total of 20 per cent for the year 1953. This is the same as for the previous 12 months, when the total included a 2½ per cent Coronation bonus. At the same time a 5 per cent interim dividend is declared for 1954. The company's consolidated trading and investment income balance of £345,854 compares with £321,486 in 1952.

Hardman & Holden Ltd.

Hardman & Holden Ltd., chemical manufacturers, have announced a final dividend of 10 per cent, making 15 per cent for the year to 31 March, 1954, on capital increased to £500,000 by one-for-one scrip issue in August, 1953. This compares with a final dividend of 17½ per cent, making 22½ per cent on £250,000 capital. The profit, after providing for depreciation, is £208,356 (against £115,357). After deductions in respect of directors' emoluments and tax, etc., the net profit is £90,990 (against £29,801).

Permutit Ltd.

In a statement with the annual accounts of Permutit Ltd., manufacturers of water-treating equipment, Mr. R. T. Pemberton, the chairman, says that a new and enlarged engineering plant is essential to meet future requirements; that the expansion of the chemical plant at Pontyclun continues to require capital outlay; and that it is necessary to rebuild a large area of office and laboratory accommodation. He adds that it is hoped that issue schemes will be effected in time to rank for 1954 dividends. The company continues to work to capacity and the capital programme, he says should lead to a maintenance of the steady progress made in recent years.

Courtaulds Ltd.

Total distribution by Courtaulds Ltd. for the year to 31 March, 1954, is being raised to the equivalent of 8 per cent on the existing £48,000,000 ordinary shares, or one per cent more than foreshadowed by the board when announcing the 100 per cent scrip issue proposal in December. The interim dividends totalling 6¼ per cent have already been paid on £24,000,000 and a final of 4⅞ per cent, against 3⅞ per cent forecast, is now recommended on the doubled capital. The total of equivalent to 8 per cent on the present equity compares with the equivalent of 5⅝ per cent for 1952-53. After providing some £6,400,000 more for UK taxation provisions and reserves, the group's net profit balance is increased from £5,242,258 to £7,564,726.

Next Week's Events

MONDAY 21 JUNE

Institute of Metal Finishing

London: The Northampton Polytechnic (room 153, Connaught Building), St. John Street, London, E.C.1 6.15 p.m. R. L. Samuel and N. A. Lockington: 'Chromium Diffusion as a Commercial Process.'

TUESDAY 22 JUNE

Royal Institute of Chemistry

Orpington: Tip-Top Bakeries Ltd., Orpington, Kent, 2.30 p.m. Visit by London Section.

WEDNESDAY 23 JUNE

Royal Institute of Chemistry

Welwyn Garden City: Imperial Chemical Industries Ltd., plastics division. Visit by London section to the Technical Service, Development and Research Laboratories, 2.15 p.m.

THURSDAY 24 JUNE

The Fertiliser Society

Sprowston, Norfolk: Norfolk Agricultural Station. All day visit of members, followed by the Society's annual general meeting.

Royal Institute of Chemistry

London: BBC Television Studios, Lime Grove, London, W.12, 2.30 p.m. Visit by London section.

SATURDAY 26 JUNE

Royal Institute of Chemistry

Harwell: AERE, 11 a.m. to 4 p.m. Visit by London section.

Market Reports

LONDON.—A steady movement characterises most sections of the industrial chemicals market, and a good volume of new inquiry has been reported. So far as prices are concerned there have been no important changes on the week and the undertone remains firm. In the coal tar products market there has been a steady call for refined tar, creosote oil and phenol, but the market for pitch and the pyridines is quiet.

MANCHESTER.—The Manchester market for chemical products has made a satisfactory recovery during the past week from the holiday setback. Contract deliveries of a wide range of the alkalis and other compounds have been going forward to the main industrial outlets in good volume and there has been a fair number of fresh inquiries from home users. New shipping business during the week has been on a moderate scale. Values are maintaining a steady front pretty well throughout the range. A seasonably quiet trade has been reported in fertilisers, but the demand for most of the light and heavy tar products has been on steady lines.

GLASGOW.—An extremely busy week has again been reported from practically all branches of the trade. Some dislocations have unfortunately been experienced with regard to deliveries, particularly from the South, mainly due to the Whitsun holidays. However, next week should see deliveries back to normal. Agricultural chemicals are again in good demand and the past week has been notable for the number of interesting inquiries which have been received from the export markets.

Prize for Clayton Aniline Band

Clayton Aniline Works Band won the third prize in the *Daily Herald* Open Brass Band Festival Championship section contest at Brighton, on 12 June. It was the first time the Manchester band had competed in the Festival, in which top-class competitors from the Midlands and the South took part. The band was selected to appear at the Festival's massed bands concert in the evening, when Mr. Harry Mortimer, BBC supervisor of brass and military band broadcasts, conducted.

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.

A. BOAKE, ROBERTS & CO., LTD., STRATFORD, E. 15, requires **SENIOR CHEMISTS** for their Process Development Department. These appointments would appeal to qualified men with some years of experience of Organic Chemistry, seeking the opportunity to lead a team in developing new projects from laboratory to plant scale, so as to provide new or improved products. The minimum salary envisaged is £800 per annum.

The Company also requires **ASSISTANT CHEMISTS** to participate in these projects. Industrial chemical experience is desirable in these appointments. Minimum salary is £550 per annum. Applications in detail to **PERSONNEL MANAGER.**

A VACUUM ENGINEER for interesting work developing new types of industrial furnaces and processes in the Nelson Research Laboratories, **THE ENGLISH ELECTRIC CO., LTD., STAFFORD.** Graduate or equivalent with experience on one or other of vacuum or electric furnace design. **METALLURGIST** for work on Metallography, some experience essential. Reply to **DEPT. C.P.S. 336/7, STRAND, W.C.2,** quoting Ref. 1336.

CHEMICAL ENGINEER wanted by expanding company of contracting chemical engineers. Excellent prospects. Age 24/27. Pension scheme. Canteen facilities. Applications, in confidence, stating age, qualifications, experience and salary required to the **SECRETARY, NORDAC, LTD., UXBRIDGE, MIDDLESEX.**

DIVISIONAL MANAGER, PETROLEUM INDUSTRY Projects, required for progressive company, to control the execution of projects in co-ordinating all efforts in engineering, progressing, inspection, erection, operation and costs. Apply, giving full particulars to **BOX NO. C.A. 3329, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

NORTH WESTERN GAS BOARD
LIVERPOOL GROUP
SENIOR INSTRUMENT ENGINEER

APPLICATIONS are invited for the above pensionable appointment, at the Central Laboratory, Wavertree Works, Liverpool, at a salary within Grades A.P.T. 11 or 12 (£715-£840 or £765-£890 per annum), according to qualifications and experience.

Applicants should possess suitable technical qualifications in Physics or Electrical or Mechanical Engineering, minimum standard Higher National Certificate, and should have a wide experience of installation, maintenance and calibration of all types of industrial instruments. Ability to supervise an Instrument Section covering all the works in the Group is essential.

Apply, by letter, to the **CHIEF PERSONNEL OFFICER, NORTH WESTERN GAS BOARD (LIVERPOOL GROUP), RADIANT HOUSE, BOLD STREET, LIVERPOOL,** within fourteen days.

SITUATIONS VACANT

LAPORTE CHEMICALS, LTD., KINGSWAY, LUTON, BEDS, require young, active men who have completed their National Service commitments to train for shift supervisory duties. Minimum standard required is General Certificate or equivalent in Chemistry, Mathematics and English. Salary according to age, qualifications and experience. Pension scheme; social and sports club; canteen facilities. **APPLY TO WORKS MANAGER**

QUALIFIED ORGANIC CHEMISTS required, preferably with experience in petroleum technology and/or technology of fats. Salary according to age and experience. This appointment offers excellent opportunity for men to specialize in both academic and applied petroleum chemistry. Details to **DR. A. C. PEPPER, ALEXANDER DUCKHAM & CO., HAMMERSMITH, LONDON, W.6.**

SCIENCE GRADUATES, aged 25-35 years, are invited to apply for a Technical Service appointment covering sizing and associated problems in the Paper and Board Industry. Field training will be given, but prior experience of the industry would be an advantage. The vacancy calls for integrity, keenness and enterprise, coupled with sound scientific background and agreeable personality, and readiness to travel normally in the U.K., and offers commensurate rewards. Full details, please, of academic and industrial background, to **HERCULES POWDER COMPANY, LTD.** (Technical Personnel), **140, PARK LANE, LONDON, W.1.**

SENIOR ASSISTANT (male) to Chief Chemist required. Applicants should possess Chemistry Degree or equivalent and have a sound knowledge of analytical chemistry. Previous practical experience in the light engineering industry also essential. Salary according to age, experience and ability. Good working conditions and prospects. Pension Scheme, Canteen, Recreation Club and other welfare amenities. Apply in writing to **PERSONNEL MANAGER, FRIGIDAIRE DIVISION OF GENERAL MOTORS, LTD., STAG LANE, KINGSBURY, N.W.9.**

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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" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.
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"MORWARD" "U"-shaped TROUGH MIXERS—in stainless steel or mild steel, made in sizes up to 3 tons. Scroll and paddle-type agitators, jacketed or unjacketed.

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100g., 150g. and 200g. **NEW** in mild steel for 100 lb. w.p., with or without mixing gear.

200g. stainless steel jacketed Pan and one jacketed **AUTOCLAVE** with detachable cover, 150 lb. in jacket.

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30 in., 36 in., 42 in. and 72 in., by **BROADBENT** and **WATSON LAIDLAW.**

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