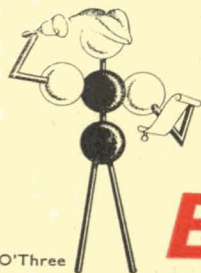


THE Chemical Age

VOL. LXXIII

17 DECEMBER 1955

No. 1901



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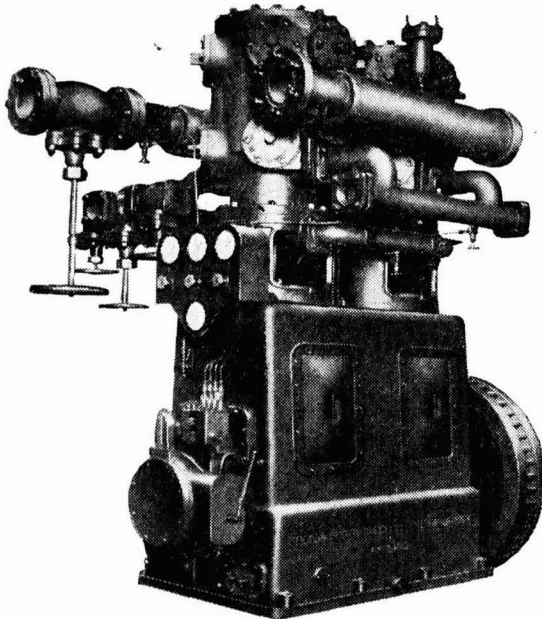
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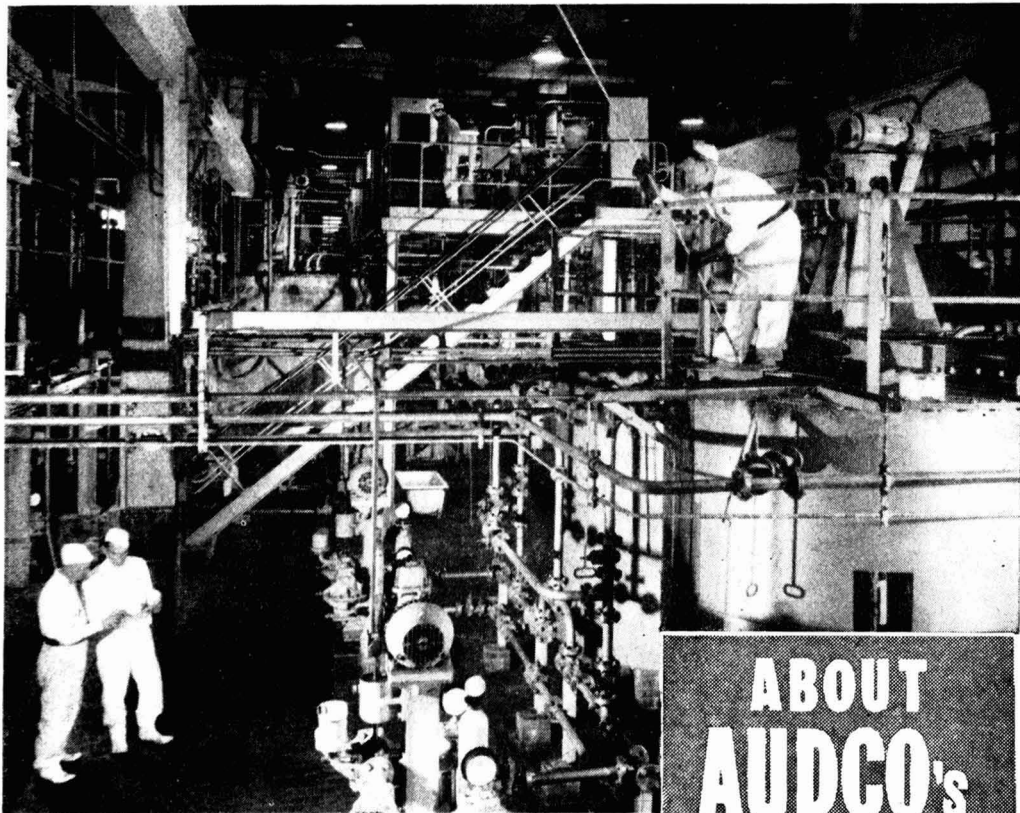


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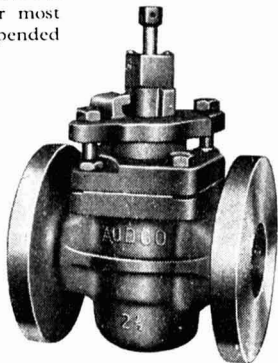
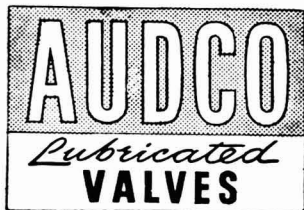


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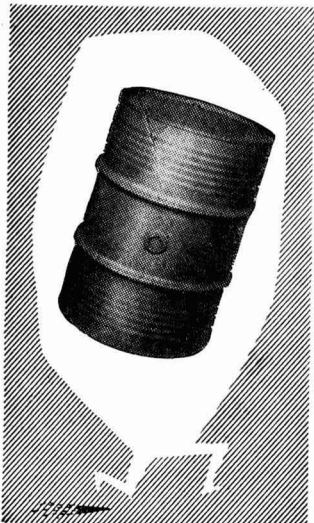
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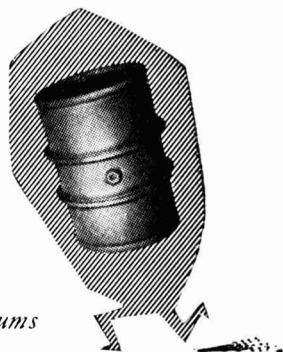
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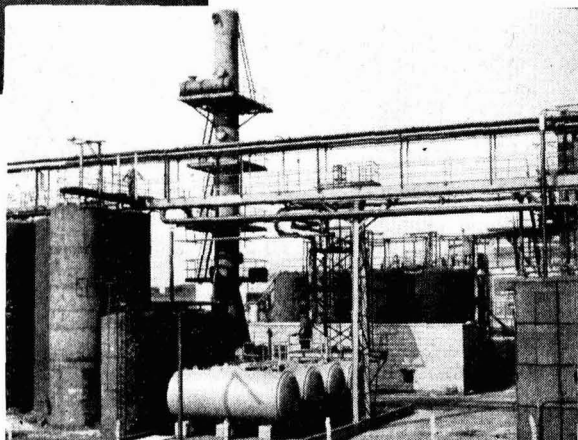
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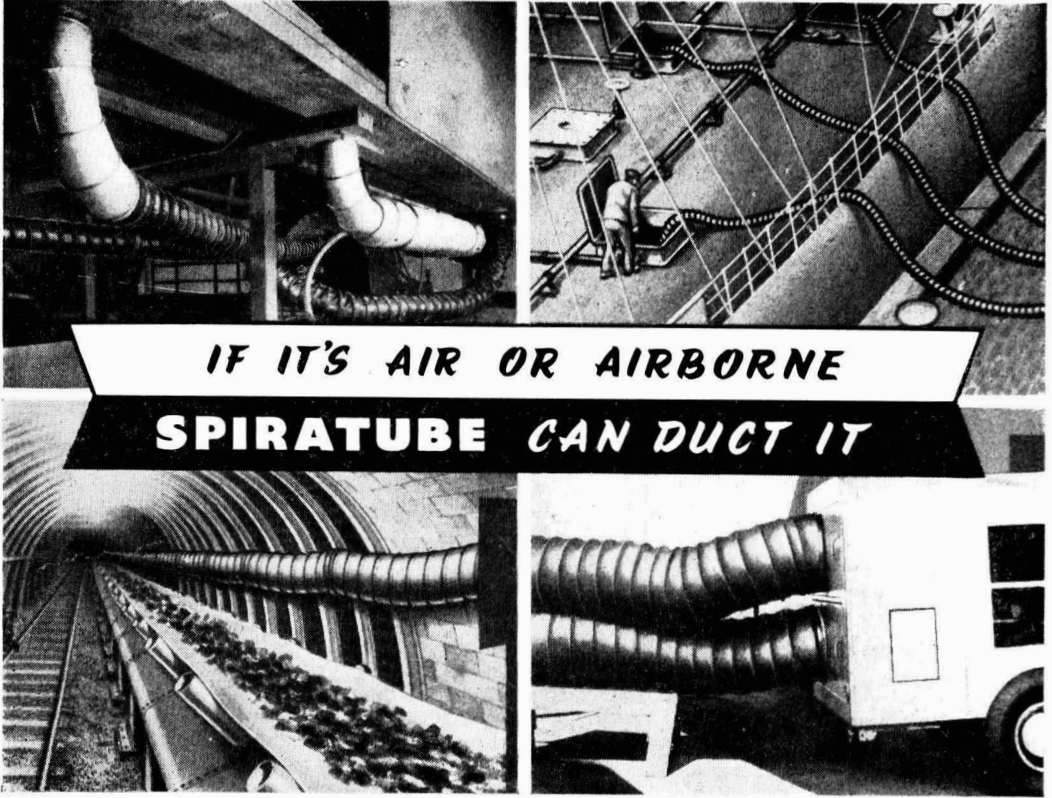
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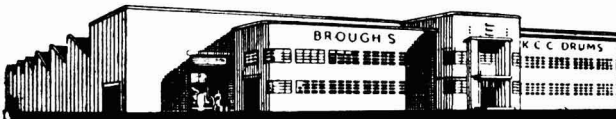
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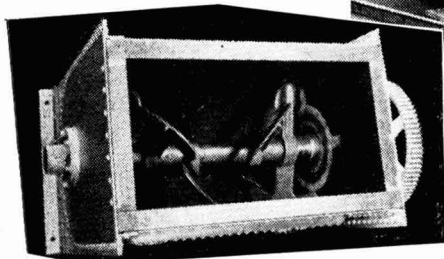
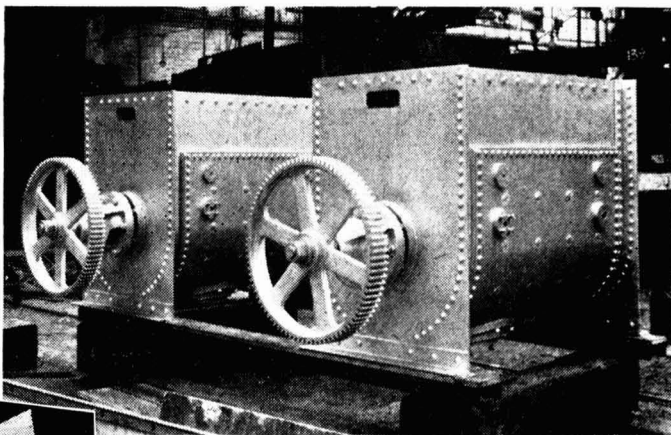
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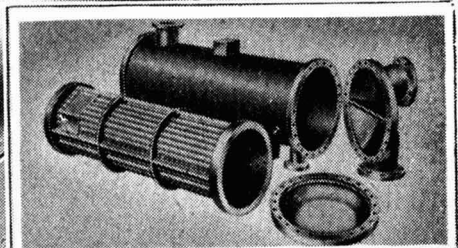
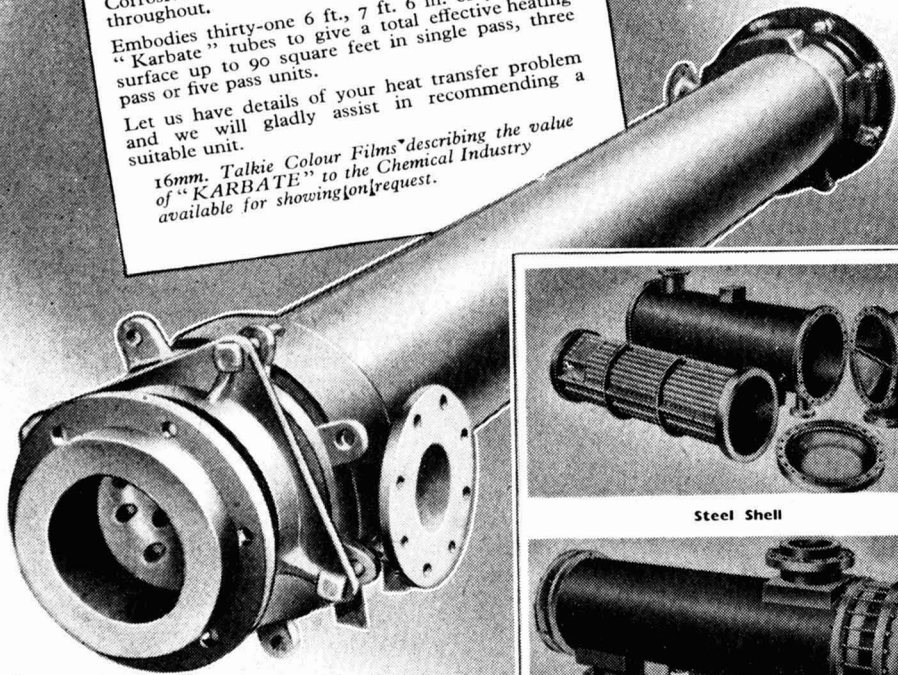
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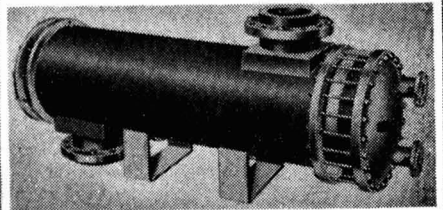
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Volume LXXIII
Number 1901

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Established 1919

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CONTENTS . 17 DECEMBER 1955

| | |
|---------------------------------|------|
| Problems of UK Glass Industry | 1317 |
| John Cass Lecture Courses | 1318 |
| Ring-Oven Technique | 1319 |
| Distillation Developments | 1321 |
| New Industrial Fibre | 1322 |
| Polymerization Techniques | 1323 |
| British Gas Industry Production | 1327 |
| The Chemist's Bookshelf | 1329 |
| Home News Items | 1333 |
| Overseas News Items | 1334 |
| Personal | 1335 |
| Synthetic Rubber, Use of Scrap | 1336 |
| Publications & Announcements | 1337 |
| Law & Company News | 1339 |
| Next Week's Events | 1340 |
| Market Reports | 1340 |

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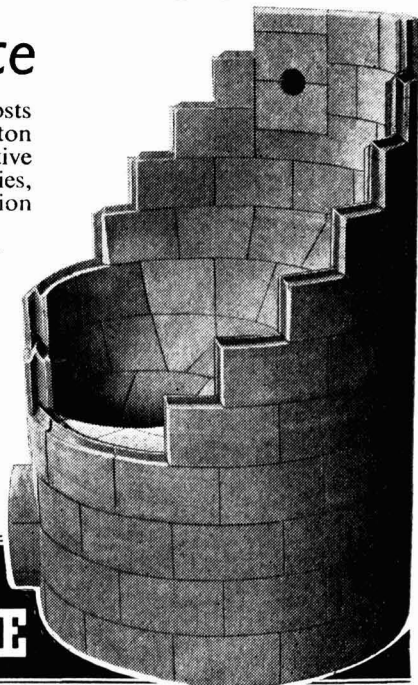
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Uniformity on the March ?

IT is quite likely that future generations—and not the distant future at that—will regard the commercial dictum that ‘the customer is always right’ as an item of old-world courtesy, charming and gallant, but as dead as the dodo. Trend upon trend in the contemporary industrial scene increases the pressure for standardization, regimentation, rationalization and all the rest. Customers still have options, but the range of options narrows in most markets. The production flowlines rule. Their pace cannot be fast and their costs cannot be low unless the goods that flow are distinguished by lack of variety. To be different is to be expensive.

These comments could have been made 20 or more years ago when assembly belt mass production methods were making their first major impact upon British industry. But their meaning is much wider today. It is not the assembly belt philosophy alone that tells the designer of goods to think in terms of production simplicities. Nor is it certain that the extent of rationalization brought about by assembly belt mass-production methods has been a bad thing. Mass markets have been satisfied at prices within average economic reach, and for most types of goods ample trading room has been left for the ‘tailor-made’ product in a higher priced and more limited market. Consumer demand for something less standardized has generally been able to find sufficient satisfaction if it has also had sufficient expression.

It is the new and further drive towards uniformity of product and industrial outlook that may well carry more powerful seeds of danger. Demands for higher productivity and lower costs are virtually

demands for further product design ‘stream-lining’, venturing beyond the assembly belt’s requirements in simplicity and standardization. ‘Automation’ is the next station on this one-track journey.

Here is a brief extract from a recent paper on ‘Some Technical Aspects and Implications of Automation’ (C. L. Boltz): ‘Automation calls for a flexible mind in management, so that, for instance, a product itself can be designed or modified to suit an automatic production line. . . . It may be simpler to modify a product than to redesign a system.’ Also, ‘Automation involves the manufacture of components so that they shall be suitable for the new processes’. These modern conceptions may be laudable enough, but is it certain that a product designed primarily to suit its own flowline can approach in quality the product designed to suit experience of consumers’ needs ?

Take a purely theoretical case of some interest to one branch of the chemical industry. On many assembled engineering industry articles, a paint finish is required both for rust-resistance and appearance. Paint becomes a component that must be suitable for new processes of automation. For efficient automatic spraying or dipping it may have to possess certain properties of fluidity not wholly compatible with maximum rust-protective properties. There is at least a theoretical danger that the best paint for automation and not the best paint for the purpose of painting would be chosen. Similarly, the most suitable means of applying a durable paint surface may not be chosen—unless it also happened to be suitable for ‘automation’.

Readers who have bought modern cars may not all regard this argument as wholly theoretical. A far simpler case can be quoted from practice. A pair of wrought iron gates with a black paint finish bought in 1953 were heavily rusted within 12 months. It was necessary for them to be derusted and brush painted with both an undercoat and topcoat some 15 months after purchase; and the cost of this was nearly 20 per cent of the initial cost of the gates.

The reason for it was that the simple process of dipping had been used for giving the gates their manufactured black paint finish. No doubt in the home market these irritations for buyers must be endured, but what effect do they have upon the reputation of British quality and workmanship in overseas markets?

In a recent paper on electronic computing machines (*Journal of Scientific Instruments*, 1955, **32**, 409) it is made fairly clear that the use of computers in technical industry depends upon a 'rationalization of requirements'. For lens design calculations the wide variations in current practice and requirements would have to be simplified. A rationalization of requirements has already been made by the aircraft industry which makes greater use of electronic computers than the rest of industry together. In itself and at this stage this may not be a dangerous development, yet it could be insidious. As the use of computing machines extends, is there not a risk that eventually only those calculations that can be fed into the machines will be carried out, that there will be less and less reliance upon the slower but far more flexible 'human' method? Mechanizing high-grade human skills is the first step in destroying them. That is not to say that computers are undesirable. Where they can be designed to fit cumbersome and frequent tasks of calculation they should obviously be introduced. But it is not the same thing to fit the tasks to the machines and their limitations.

Last month a paper on the formulation of agricultural compound fertilizers was read to the Fertiliser Society (see *THE CHEMICAL AGE*, 1955, **73**, 1105). A heterogeneous compilation of crop responses to different nutrients, drawn

from many research test records and similar sources, was used as a basic sample survey for proving statistically that compounds formulated to a small range of plant nutrient ratios would be able to meet the full diversity of crop and soil needs. Yet by this method of argument many variations that affect crop responses were 'averaged' and only an 'averaged' conclusion could have been reached. Skill and ingenuity in formulating compounds to meet farming needs in areas with particular soil conditions or particular climate patterns would be eliminated were this argument to become the basis of some national scheme for design—all the influence of official recommendation would be expressed in terms of a short list of approved plant food ratios.

However true it may be that the application of statistical science can show that many supposedly important differences are in fact insignificant in effect, the acceptance of statistical arguments of this kind presupposes the taking of correct samples, adequate in the number of 'cases' and properly distributed.

Product standardization is urgently desirable in many fields, not only within one country's trade but on an international scale. The importance of standardized patterns and sizes for small engineering parts from screws to electrical fittings is indisputable. But how far should standardization be pressed for totally different purposes—how far should the consumer be told that the production line is always right?

Many small businesses in this country have weathered depressions and war and large scale competition by maintaining a reputation for quality and individuality of product. They have sold brains and service and durability. It is unhappily too easy to dismiss the small business set-up by generalizing the argument that many such businesses are technically backward. In world markets today, and far more in those of tomorrow, British goods are the products of a small industrial country. How far should we risk these tempting ventures down the streamlines and flowlines of uniformity and regimented design?

Notes & Comments

A Gypsum Boom

DURING the sulphur shortage the raw material spotlight shone with particular brightness on gypsum, and the ICI processes for using it to make sulphate of ammonia from synthetic ammonia and to make sulphuric acid and cement (both of which processes had in any case stood on their own feet during times of cheap and plentiful sulphur) acquired new glamour. However, the sulphur situation is no longer regarded with as much foreboding in many importing countries, and we hear rather less about gypsum. But in India, according to a recent article in the *Fertiliser Journal* (1955, 43, 537), it is officially regarded 'next to coal and iron as a mineral of great importance in the industry of the country.' Although much of the vast gypsum resources of the former India now lie within Pakistan boundaries, Indian reserves are still huge—in 1950/51 they were assessed at 67,100,000 tons. An annual mining rate of 60,000-65,000 tons during 1939/48 has been raised to a figure of about 800,000 tons. The three main uses are for cement, fertilizer and sulphuric acid.

Sulphur Providing Fertilizer

OF these the use as fertilizer predominates and accounts for some 80/85 per cent. Gypsum is used as a straight fertilizer providing sulphur, and it is considered both cheaper and more effective than sulphur or sodium sulphate, both of which enjoyed use before. This is an interesting deviation from the customary fertilizer pattern of most countries, though the real need for sulphur in European cropping may well be masked by its sizeable and incidental supply in such materials as superphosphate and sulphate of ammonia. The importance of sulphur has been stressed in recent Australian soil research; Indian soils, like so many Australian soils, are arid soils. In India the use of other sulphur-containing fertilizers is far from highly developed—and gypsum as a local and low-cost material is a very cheap

fertilizer. At present rather less than 14,000 tons of gypsum are being used for sulphuric acid manufacture; but all India's sulphur needs (as sulphur) have to be imported. How far gypsum will be developed in acid-making may depend upon the extent to which India's iron pyrites is similarly utilized. Despite this boom, gypsum mining is still a spade-and-shovel operation; mechanization of these quarrying methods is obviously a primary step for forthright expansion.

Statistics and Plastics

THE Board of Trade tonnage returns for plastics have been altered in presentation, a change made at the suggestion of OEEC. Output is classified now by initial nature rather than by end-use. The result is that a clear division into the two main types, thermoplastics and thermosetting, is given; and it becomes clear (if there was any doubt) that during 1955 the thermoplastics have started to take the lead. In commenting upon this change, *The Economist* (1955, 3 December) has criticized the grouping of the two largest and fastest-growing plastics in the 'miscellaneous' sector. Ton-nages for pvc and polythene could and should be separately given. However, this would break the general rule that figures of output are not published in this way when the materials concerned are manufactured by only a few firms. It is quite true that pvc and polythene output data are fairly well known, and more detailed BOT statistics would not amount in practice to a significant breach of secrecy. However, an official policy or principle can hardly be varied to suit circumstances. The co-operation of companies might be much reduced if a principle of this kind could be varied at official discretion.

Position Changing

WITH polythene the circumstances that would at present favour separate presentation of statistics for output could well be very different in a few years' time. ICI's patent expires in

April, and the new low-pressure processes may bring far-reaching changes. Yet once a change in principle had been commenced, returning to the former method of presentation would become difficultly controversial. We have frequently enough criticized the chemical industry's predilection for needless secrecy, but in this matter we cannot share *The Economist's* desire to make official statistics more revealing. In any case people who need to know the separate figures for these materials can arrive at a fairly close estimate without great effort in research.

Abstract Affairs Again

WHEN *British Abstracts* fell by the financial wayside as a comprehensive effort, we suggested that the comparative comfort of *Chemical Abstracts* might not be lasting, and earlier this year (see THE CHEMICAL AGE, 1955, 72, 1133) that warning became much more than a speculation. Fresh comment in *Chemical & Engineering News* (1955, 33, 5068) on the formally official page compiled by the ACS 'Secretary's Office' can be taken to reveal considerable background strain for the last remaining English-language abstract 'journal'. There is now marked anxiety to persuade readers that *Chemical Abstracts* should be regarded as a service and that the new and complicated system of graded payments is equitable for a

service if unusual as a system of fixing subscriptions for a regular publication. It is a reasonable assumption that the new proposals are not being too happily accepted even in the US. Balancing the deficit on CA costs and revenue by drawing on ACS funds and by obtaining grants from firms is presented as an undesirable and non-durable solution. This had provided 40 to 50 per cent of CA operating costs and the time had been in sight when the 'subsidy' proportion would become as much as 75 per cent. The fate of *British Abstracts* is referred to, and it is said that '*Chemical Abstracts* was nearer to the same situation than many will let themselves believe'.

Proved Correct

AT the time when our own abstracts were struggling to survive, numbers of chemists here took the view that their disappearance would not matter greatly as *Chemical Abstracts* fulfilled much the same purpose. We received and published correspondence on that theme, though it was our own hope that industry here would provide enough monetary help to *BA* to ensure continuance. If the dual existence of *BA* and *CA* was to have any influence we felt that a co-operative, cost-sharing venture might have been given a 'last chance' consideration. It has not taken very long to show that this was a not inaccurate assessment of the general situation.

Nuclear Education

ENGINEERS of the future who will harness atomic energy for peaceful uses will need a strong background in mathematics and physics in addition to a sound basic engineering education. Some graduate level study in nuclear physics will also be necessary for this work.

Chemical engineers attending the 48th annual meeting of the American Institute of Chemical Engineers in Detroit were told on 27 November that solving nuclear engineering problems requires primarily the application of basic principles of engineering with due regard for the presence of these unusual forms of energy. Professor J. O. Maloney of the University of Kansas said:

'Problems related to nuclear engineering are being worked into regular undergraduate chemical engineering courses. Emphasis is on basic chemical engineering principles and not on nuclear engineering'.

Of special interest was Prof. J. J. Martin's description of the University of Michigan facilities. The most outstanding of these is the Phoenix Memorial Building, which houses the nuclear reactor, a powerful cobalt-60 source, two heavily shielded caves with complex remote handling equipment, an accelerator, and all the necessary instrumentation for safe radiation work. Among the programmes under way are cancer research, food preservation studies, chemical process studies, and others.

Problems of UK Glass Industry

Tariffs Discussed at Annual Lunch

IMPORT and export problems of the British glass industry were discussed in two speeches delivered at the annual luncheon of the Glass Manufacturers' Federation held at the Hyde Park Hotel, London, on 6 December. The president of the federation, Mr. E. A. S. Alexander, proposing the health of the guests, said that the Government would have to consider carefully the acute foreign competition that the industry was suffering if it was to preserve the home market as a sure foundation for the export trade. The object of tariff negotiation was to secure greater facilities for exports generally, but by the very action of facilitating imports, branches of the export trade might be jeopardized by undermining the home market.

Referring to the 'not unimportant' part the industry played by supplying glass containers and components to other industries for their export trade, Mr. Alexander said, 'Our progress in this direction has been made with Governmental encouragement and you may rest assured that it is a path we shall continue to follow, but the more readily can we (and will we) do so by the extent to which we are relieved of the anxieties created by the intrusion into the home market of subsidized imports produced by labour working in conditions in no way comparable to our own, nor considered desirable in this country. Likewise, would we be considerably assisted by the introduction of more efficient methods at the ports and a measure of closer co-operation from the dockers'.

Minister Pays Tribute

The Rt. Hon. A. R. W. Low, C.B.E., D.S.O., M.P., Minister of State, Board of Trade, replying to the toast, paid tribute to the industry which, he said, in 20 years had changed from being a small exporter—£1,500,000 in 1935—to being a large exporter—£19,250,000 in 1955. At the same time the UK had changed from importing about 20 per cent of its home consumption of glass manufactures to importing only six per cent of home consumption. In seven years since 1948 the industry had more than doubled its exports.

Turning to the wider picture of Britain's export trade, Mr. Low said, 'Exports this year are running at an annual rate, which is the highest in our history. But encouraging as this is, it does not tell the whole story. While our exports have been expanding, our imports have been expanding at a faster rate. And the exports of our competitors have been increasing faster than ours. We have not only to pay for the increased imports which our expanding economy needs and to meet all our current commitments overseas; we have also to earn a surplus large enough to support a high level of investment in the developing Commonwealth, and in other places too. And on top of all this we want to build up our reserves. The only way to get the surplus needed is to export considerably more.'

Renewed Drive Needed

'This sets industry quite a problem, as you will appreciate. That problem can only be solved by each manufacturer undertaking a renewed drive in old markets and a new drive in markets never tried by him before. Opportunities for expansion of trade abound, in the Middle East, in the Latin American countries, in Europe, and in North America as well as in the Commonwealth.'

Commenting that he had detected in Mr. Alexander's speech some anxiety about import duties in the context of forthcoming tariff negotiations, Mr. Low went on to make three points.

'Firstly', he said, 'the import duties on glass manufactures range from 15 per cent to 50 per cent. We have been in touch with your industry, as with other industries, to find out from you what reductions in other countries' tariffs would help you. And we have also been in touch with certain sections of your industry to learn from them what would be the effect of any reduction in our duties.'

'Secondly, unfair trade practices, subsidies and dumping which cause material injury to your industry, will be covered by the new legislation we are to introduce shortly.'

'Thirdly, the argument about the inequity of imports from countries with low labour

costs cannot be pushed very far. If you do push it far, how do you expect British industry's exports to be treated in the US or Canada where wages are much higher than ours?'

The Minister concluded by saying that the establishment of the industry's new research association was a great step forward and he trusted that it would receive the same wholehearted support of all firms in the industry as it got from the DSIR.

Chemistry Lecture Courses

Sir John Cass College

THE following courses will be held at Sir John Cass College, Jewry Street, Aldgate, London EC3, during the second term of the 1955-56 session. A course of lecture-demonstrations on microchemical analysis suitable for analysts and advanced students of chemistry, will be given by A. G. Lidstone, M.A., B.Sc., and D. W. Wilson, M.Sc., F.R.I.C., on Thursday evenings at 6 p.m., beginning on 12 January, 1956.

A course of eight lectures on the principles and practice of distillation, intended for industrial chemists and chemical engineers, will be given by G. A. Dummett, M.A., A.M.I.Chem.E., on Friday evenings at 6 p.m. beginning on 20 January, 1956.

A course of lectures on chemicals from petroleum, intended for advanced and post-graduate students, will be held on Thursday evenings at 6 p.m., beginning on 9 February, 1956. The chair will be taken at the first lecture by M. A. Matthews, D.Sc., and the lecturers will be Sir Robert Robinson, Dr. R. F. Goldstein, Dr. R. G. Aickin, and Dr. R. J. W. Reynolds.

A course of eight lectures on patents and industrial design protection, intended primarily for those in senior technical positions in industry, will be given by T. A. Blanco White, of Lincoln's Inn, Barrister-at-Law, on Thursday evenings at 6 p.m., beginning on 19 January, 1956.

A course of eight lectures on the mass spectrometer and its applications, suitable for advanced students of chemistry and physics, will be given by G. P. Barnard, D.Sc., Ph.D., A.M.I.E.E., F.Inst.P., on Tuesdays from 6 to 7 p.m., beginning on 17 January, 1956.

Applications for enrolment should be made to the secretary of the college prior to the opening date of the courses.

New Aintree Laboratory

A NEW £250,000 laboratory and administrative building was opened on 25 November by Lord Woolton at the British Enka Aintree works, Liverpool. Up to now, research and processing laboratories and offices have been scattered throughout the 30 acres of factory buildings that make up the plant. Now they have been concentrated in the 80-odd rooms and laboratories of the new building. Over 150 people will work there eventually and already about 120 have moved in. Others are waiting until their specialized equipment has been installed.

From small beginnings, the Aintree factory has grown to the present 30 acre plant employing 2,500 people on a 65-acre site. Executives of the company are already planning further ahead for plant extensions, and designs are ready for a future extension to the laboratory itself. The original British Enka plant at Aintree was established in 1925 to manufacture rayon by the viscose process.

The Enka Group has factories in Holland, America and Spain as well as technical links with rayon firms in Germany and Italy. Vast quantities of research information from the laboratories of these factories are being sifted in the new Aintree laboratory which is acting as the British clearing house for information. Research workers there are also in close touch with the central laboratory of the British Rayon Research Association.

Raw Lead Glazes

The Minister of Education was asked in the House of Commons on 8 December why he proposed in his memorandum to local education authorities dated 9 November that the use of raw lead glazes should be permitted in advanced courses in ceramic design when the use of these glazes had been forbidden in the pottery industry for some years. Mr. Vosper, replying on behalf of the Minister, said that raw lead glazes might occasionally be needed to demonstrate the development of pottery making and the results produced by different types of glaze. He added that the Minister had advised that their use should be very rare and limited to advanced courses in institutions of further education. He was sure that the responsible authorities would exercise due care.

Ring-Oven Technique

Dr. H. Weisz Addresses Midlands Analysts

THE first meeting of the Midlands Section of the Society for Analytical Chemistry to be held at Nottingham took place on 25 October in the demonstration theatre of the showrooms of the East Midlands Gas Board. A lecture-demonstration was given on 'Ring-Oven Technique' (1) by Dr. H. Weisz, Chemistry Department, University of Birmingham, winner of the Feigl Prize for 1955.

The ring-oven technique is a simple method for the separation of ions, or groups of ions in a single drop. An apparatus, called the ring-oven (2), is designed to wash the soluble materials from a spot on a filter paper and to concentrate them in a sharply bounded, circular ring or ring-zone, where they can be detected. Some other pieces of equipment have been developed for this purpose.

With the aid of this technique, an analytical scheme (3) has been worked out for the separation of the following 14 cations: Pb, Bi, Cu, Cd, Sn, Sb, Fe, Co, Ni, Mn, Cr, Zn, Al and Ti. A drop of about 15 μ l is sufficient for the analysis provided the amounts of the cations present still permit the identification reactions. The cations are separated into four groups, designated as Ring I, II, III and fleck. The detection reactions are conducted on the paper with the aid of familiar reactions, which, however, have been modified for this particular purpose. The analysis requires only about one hour.

Analysis Filmed

In order to illustrate the various operations involved in his analytical scheme, Dr. Weisz showed a short film depicting the complete analysis of one drop (15 μ l) of solution containing Cu (0.1 μ g.), Pb (0.5 μ g.), Sb (0.5 μ g.), Fe (0.2 μ g.), and Ni (0.2 μ g.), i.e. not more than 1.5 μ g. solid altogether.

Attention was next turned to applications of the ring-oven technique in other fields of analytical chemistry, such as the testing of organic substances and as a means of extracting very minute quantities of material.

The method has been employed for ring colorimetric analyses (4,5). Several rings with different numbers of sample drops are prepared and compared with standard rings.

An exact estimate is unnecessary. An approximate co-ordination of the test rings to the standard rings is adequate for obtaining usable results. Examples described included determination of iron with potassium ferrocyanide, nickel with dimethylglyoxime, cobalt with α -nitroso- β -naphthol, copper with hydrogen sulphide water and conversion of the copper sulphide into its equivalent of silver sulphide. In most cases, the removal of interfering ions can be accomplished on the paper itself.

Ring Electrography

As a further example of the usefulness of the ring-oven technique, there has recently been developed by Dr. W. I. Stephen, the process known as 'ring electrography' (6), which is a combination of the electrographic principles with those of the ring testing procedures already outlined. This method has proved most useful for the rapid qualitative analysis of many ferrous and non-ferrous alloys.

The development of ring colorimetry as a semi-quantitative procedure has led also to the first really adaptable procedure for semi-quantitative electrographic analysis (6), if only on a limited scale at present. Indications are, however, that electro-ring-colorimetry is a useful procedure for the analysis of quite a few alloys of simple composition.

The combination of the ring-oven technique with other analytical principles, such as polarography and chromatography, has been worked out, but at present Dr. Weisz had received only a little information (7) on these aspects of the method.

Numerous other separations of inorganic ions were in the process of being developed, and the quantitative aspects of determining more ions than described in the publications were being examined at present. Dr. Weisz hoped that details would soon become available.

The meeting was opened for discussion and several questions were put to the lecturer. Inquiries were made concerning the contamination of the filter papers by the aluminium of the ring-oven, and interferences of metal impurities contained in the reagents, notably hydrochloric acid, employed in the

various separations. Dr. Weisz said that tests had shown the liquid spreading across the filter paper on the oven to stop just before reaching the surface of the aluminium metal. Although no trouble had arisen on this account so far, a gold-plated copper oven had been constructed in readiness for cases of emergency. Any metal impurities present in the reagents would naturally also be concentrated into the ring-zone on the filter paper, but ANALAR-pure chemicals were used, and in any case the reagent solutions were so dilute that the effect of impurities could be neglected.

No Progress

In response to the question of further work on the reagents employed for identifying chromium and manganese which tended to fade somewhat on standing, and so be of little use qualitatively, Dr. Weisz replied that unfortunately there had been no progress made in this direction. Neither had there been any progress towards the solution of the problem of extending the ring-oven technique to the alkaline earth metals. The difficulty here lay in the need for a really good means of micro-separation of these metals.

The lecturer was asked if it was not possible to incorporate arsenic into the analytical scheme. It appeared that it was possible to precipitate the arsenic as its sulphide along with stannous and antimonous sulphides, to dissolve out the two latter with 1:1 hydrochloric acid, and then to identify the arsenic by means of a silver nitrate bath. These findings were unpublished as yet.

Concerning the application of the ring-oven technique for the detection of very small amounts of lead (of the order of 10 ppm) in organic matter, Dr. Weisz thought that this should be possible. The limiting factor of the technique was imposed by the spot tests for one drop of solution and not by the separations themselves. Besides concentrating the lead in the ring-zone, the organic matter would become concentrated there too. Thus, some solvent might be chosen in which the lead was soluble and the organic matter insoluble. Then in the separation the organic matter would remain in the fleck at the centre of the filter paper on the oven, and could be punched out.

One member of the audience wondered whether the ring-oven methods had sounded the death-knell of spectrographic analysis.

They were certainly better in certain cases than spectrography said Dr. Weisz, but the reverse was equally applicable. The time factor was in favour of the ring-oven methods.

An inquiry about the use of neutron activation to yield an increased sensitivity revealed that this approach had been contemplated but no work had actually been carried out at present. The question of increasing sensitivity by employing a rectangular strip instead of circular filter paper for the techniques led to both advantages and disadvantages. Thus, the narrower zones produced on a rectangular strip of filter paper would have a higher concentration of material in them, but this concentration would not be uniform over the whole of the zones. Furthermore, the number of sectors of reasonable size into which the zones could be sub-divided for identification reactions would be less than for the case of the circular filter paper.

The final question concerned the extension of ring-oven techniques to anions. Dr. Weisz said that this had been tried, but not yet systematically. As there were many excellent spot tests (8) available for the detection of anions, however, it was hoped to make progress on such a scheme in the future.

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- (4) Weisz, H., *Mikrochimica Acta*, 1954, 460.
- (5) Weisz, H., *Mikrochimica Acta*, 1954, 785.
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- (7) Private communications.
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Erinoid Ltd.

Trading profit of Erinoid Ltd., manufacturers of plastics materials, for the year just ended totalled £120,974, of which £61,623 has been provided for taxation. During the year the company increased its sales of cellulose acetate moulding powder and polystyrene, although the profits from styrene products fell below those of the previous year. Supplies of all materials was satisfactory with the exception of casein, and at the end of the financial year stocks were below normal. Increased costs of raw materials for manufacturing casein may restrict development in this field during the current year. The directors recommended a dividend of 7½ per cent on the ordinary stock.

Distillation Developments

Papers Presented at A.I.Ch.E. Meeting

RECENT developments in the science of distillation were reported at the American Institute of Chemical Engineers Annual Convention in Detroit, 28-30 November. The investigations were a continuation of a recent trend towards a more fundamental approach to studies of distillation operations. Result of this and future studies will be a better knowledge of what happens in distillation columns, which will permit improved design and operation of present and future distillation plants. Knowledge of the fundamental properties of bubbles and orifices in actual operation will benefit the recent modifications of the age-old bubblecap tray such as sieve, perforated metal, expanded metal, and mesh-type trays.

Bubble Studies

A. I. Johnson, D. G. Robinson and C. P. Michellepis of the University of Toronto, delivered a paper entitled 'Bubble Studies for Single Holed Perforated Plates'.

Motion pictures were taken at 1,000 frames per second of bubbles issuing from various sized orifices. The rate of bubble growth, bubble shape, chain reaction of bubbles, and leakage were studied for air in water and various organic compounds. Bubble growth was found to be regular and bubble velocities agreed with single bubbles. Appreciable bubble pressure drops were observed at higher air rates. Leakage from the orifice was observed to occur between bubbles and was found to pass through a maximum with increase of air velocity.

In a paper on measurement of mass transfer inside drops in liquid-liquid extraction F. P. Pike, W. T. Withers, Jr. and K. O. Beatty, Jr., of North Carolina State College reported that the area of drop collapse caused most of the mass transfer. The fall velocities of the drops were large and depend on formation. The mass transfer during the fall did not seem to depend on experimental conditions.

J. C. Bryan and H. J. Garber of the University of Tennessee delivered a paper on some of the basic concepts of bubble formation from small submerged orifices. Air was bubbled into each of four liquids: water, methanol, cottonseed oil and an ethyl acetate-cottonseed oil solution. The average size of the bubbles formed was

correlated with liquid density, liquid viscosity, liquid surface tension, bubble frequency, and gas volumetric flow.

A paper on a new technique for multi-component distillation calculations was presented by J. B. Bachelor of San Gabriel, California. Calculations were based on an analytical method which does not require the usual limiting assumptions. It also gave feed zone flows and compositions at the minimum conditions.

Sieji Uno and R. C. Kintner of the Illinois Institute of Technology, Chicago, presented a paper on 'The Effect of Wall Proximity on the Rate of Rise of Single Air Bubbles in a Quiescent Liquid'. The validity of previous experiments which used relatively narrow tubes for experimentation and the minimum size tube relative to bubble size for negligible wall effect were determined.

Geothermal Project

TOWARDS the end of 1954 an agreement was signed between the New Zealand Government and the UK Atomic Energy Authority whereby a joint company, Geothermal Development Ltd., was set up with the object of building a plant at Wairakei on the North Island. The purpose of the plant will be to produce both heavy water and electric power from geothermal steam.

The Authority undertakes to purchase from the company the whole of the heavy water and the New Zealand State Hydro-Electric Department the whole of the net electric power available.

The New Zealand Government and the Authority are the sole shareholders. The company is to have a nominal and paid up capital of £30,000, one third of which is to be provided by the Authority and the rest by the New Zealand Government. The remainder of the capital requirements of the company will be provided by loans. Those for the heavy water plant are to come from the Authority and those for the electric power equipment from the New Zealand Government.

Revised estimates have been received concerning the cost of the heavy water scheme. These estimates need examination in consultation with the New Zealand Government, and it will not be possible to make a statement for some time.

New Industrial Fibre

Celanese Corporation Starts Production

CELANESE Corporation of America began commercial production of Fortisan-36, a new super-strong industrial fibre, at its Rome, Georgia, plant on 30 November. The new fibre has been evaluated by potential customers in several different industries, and their trial reports have shown, according to the president of the company, that Fortisan-36 has properties of great strength, low elongation and dimensional stability which indicate its possibilities in such fields as V-belts, power transmission belting, high pressure hose, conveyor belts, truck tyres, plastics laminates, fibres, paper reinforcement, oil hose and tarpaulins.

Fortisan-36 is claimed to be the first synthetic fibre ever to be evaluated and produced specifically for the use of heavy industry rather than the apparel trades. It is said to be important wherever high strength and the maintenance of dimension is essential, where strength without bulk or weight is a consideration, and where its melting property is of interest. It also provides a good bond with both natural and synthetic rubber, and requires no further processing to remove stretch.

Developed especially for industrial applications where heavy deniers are required, Fortisan-36 will be available initially in 800 and 1,600 denier continuous filament. Other sizes in the heavy denier ranges will be offered later. Although chemically akin to Fortisan, the regenerated cellulose yarn introduced by Celanese in 1940, Fortisan-36 is made by entirely new and different equipment.

Covering 60,000 sq. ft. of floor space, the Fortisan-36 equipment is installed on three different floor levels to take advantage of gravity flow. The installation is so designed that raw materials can be charged into the system on the third floor and, after mixing, filtration, spinning and saponification, emerge on the first floor as a finished product. Maximum use is made of automation and instrumentation, all instruments and controls being located on a graphic panel which shows, at a glance, how every part of the process is functioning.

The entire production area at the Rome plant is air conditioned, with refrigeration supplied by a 550-ton absorption system which operates on low pressure by-product

steam. Stainless steel and copper have been used for all process piping, all tanks, pumps and valves are fabricated of stainless steel. The spin bath and saponification solutions are continuously filtered. Demineralized water, equal in purity to distilled water, is used for washing the yarn.

New Sintered Filter

A SINTERED filter of unique design and remarkable versatility was introduced by Purolator Products Inc., Rahway, N.J., at the 25th Exposition of Chemical Industries in Philadelphia on 5 December.

Capable of handling fluids ranging up to 1,000°F. the new filter can take flow rates comparable to any high temperature filter in existence with lower differential pressures and a better degree of filtration, claim Purolator engineers.

Made of sintered metal, the new filter can remove particles as small as one micron in size from a wide range of fluids, including nitric acid, hydrochloric acid, sulphuric acid, phosphoric acid and strong alkalis.

The one-piece sintered element can be made in a variety of diameters and lengths and its radial fin construction can be supplied in specified depths and numbers of convolutions to give extended area within a confined space. Varying flow rates are also available. Filters of stainless steel, monel and other metals can be made as required.

The makers say that it has a higher degree of porosity per square inch than is available in any other high temperature, metallic filter element. It can handle differential pressures of up to 500 psi.

Mobile Plastics Exhibition

To stimulate the sales of its plastics products to engineering firms, Creators Ltd., of Woking, Surrey, have recently introduced a mobile exhibition. Besides displaying the range of the firm's products, the exhibition incorporates a photographic display showing the processes and techniques in the different divisions of the firm. The idea was originated by Mr. A. C. Anselm, managing director of Creators Ltd. and the plan of operation for the exhibition is for it to visit factories which have been contacted and have expressed a desire to see it.

Polymerization

A Survey of Recent Techniques

POLYMERIZATION recipes and techniques are continually changing in order to facilitate the production of superior articles of manufacture. Techniques which reduce the polymerization times are again important because of their economic contributions. Variations in a polymerization technique may often modify the properties of a polymer, which in turn may initiate new applications in the industrial market. Polymers and copolymers prepared from unsaturated monomers to-day portray a gamut of applications, which range from uses in the tannery to their role in the production of synthetic arteries. Although in the latter field the inclusion of polythene arteries *in vivo* has not proved a success, owing to the development of thrombosis, other polymers may yet be devised where the occurrence of embolic changes in the living organism may not be stimulated.

The alkali salts of the methacrylic acid, amide, nitrile or ester copolymers have found useful applications in the sizing of textile materials and in the tanning of hides. Such copolymers are furthermore efficient dispersing agents, especially for pigments; they have also been used as 'anti-halation' layers in photography. The water sensitivity of such copolymers and therefore their swelling index is related to the number of carboxyls in the chain. Polymers having high percentages of acid monomer in the polymer chain (>90 per cent) indicate properties similar to those of the polymethacrylates, while the lower percentages of monomer (<40 per cent) in the chain, yield polymers of low solubility. The ideal polymers are obtained utilizing between 65 to 85 per cent methacrylic acid (1).

Four Principal Methods

Polymerization techniques to-day may be broadly divided into emulsion, bulk, solution and graft methods of polymerization. Emulsion polymerization, although popular, often affords products which are contaminated by the additives of the polymerization. In solution polymerization, the simplicity of the system is conducive to the production of purer products. The liquid media employed are non-solvents for the growing polymer

and only dissolve the monomer to a limited extent. Products afforded by this method, being of a high standard of purity, find applications in electrical work. Copolymers of vinyl chloride and acrylonitrile or vinylidene monomers with ethyl- α -chloroacrylate or dimethyl maleate have been produced in this way (2).

Grafting Technique

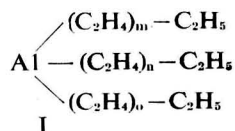
Graft methods of polymerization are useful in systems involving an active monomer and a static polymer. Such methods are therefore useful when attaching a synthetic rubber moiety to a natural rubber as *Hevea*. In the pure synthetic rubber field, the technique is applied to the production of polyacrylonitrile fibres, possessing enhanced dye receptivity. The static polymer in such a system is the water soluble polyvinyl alcohol, the reacting monomer being acrylonitrile. The polymerization is effected using reduction-oxidation catalysts. The resulting polymer may then be spun from the conventional solvents used for the spinning of polyacrylonitrile (3).

Bulk polymerization is of use in the production of sheet-like materials, which can then be used in compression, ejection or extrusion moulding techniques. The linear alkane thiols are important ingredients in bulk polymerization, because their inclusion in a recipe appears to eliminate possible 'setting up' which may occur in the polymer on heating, when it is desired to remove unreacted monomer. The heating of the polymer which follows to assure satisfactory moulding often culminates in an undesirable reduction of the fusion point of the polymer. Other polymerizations are accomplished on moving belts and subjected to photopolymerization. Recipes containing solutions of vinyl or vinylidene monomers, plasticizers, accelerators and chain transfer agents can be polymerized by light rays, the process being facilitated by the inclusion of photopolymerization catalysts.

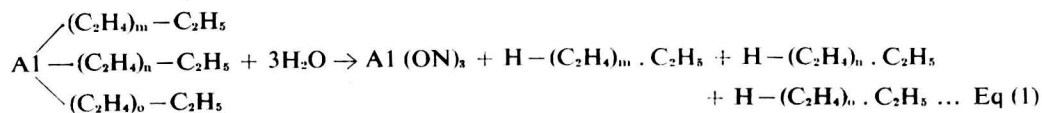
Organometallic compounds have been successfully used in the polymerization of ethylene. Beryllium diphenyl and diethyl, and aluminium diethyl hydride have been utilized in such polymerizations (4). The property

of the accruing polymer appears to depend upon (1) the physical conditions under which the polymerization is carried out and (2) the nature of the activator used. Such factors influence the orientation of the olefinic linkage in the molecule; the degree of unsaturation may also be affected. Thus mixtures of olefines have resulted when the operation was carried out between 160° and 220°C, and controlling the reaction below 200°C to about 60 per cent conversion, gave the simpler α olefines. The polymerization prolonged above 200°C shifts the olefinic linkage to the centre of the chain.

Predominantly saturated polymers are obtained using beryllium or aluminium alkyl halides in molar ratios of 1:20. In this technique, the pressures ranges from 10 to 2,000 atmospheres and the temperature between 60° and 160°C. The aluminium trialkyls react with ethylene to yield complex aluminium trialkanes. The integers in I are governed by the quantities of reacting ethylene. Hydrolysis of (I)



can give a mixture of complex hydrocarbons represented by eq. (1). At temperatures above 200°C, the aluminium polyalkanes tend to disproportionate to olefines



and metallic hydride. Reaction of the hydride with ethylenes present reforms an aluminium alkyl hydride and so renders the reacting system cyclic.

Other important developments in polymerization technique are those involving the Alfin catalysts, the latter being regarded as essentially, complexes comprising the sodium alcoholates, sodium chloride and sodio-olefinic derivatives. Using pentane as solvent, butadiene can be polymerized to high molecular polybutadienes. Previously diolefines had been polymerized using sodio-alkane derivatives as amyl sodium, the reaction being one of metalation (5), initially involving allylic isomerization in the anion. A predominance of 1,2-polymer was afforded

by this method, suggesting a displacement in the equilibrium of the resonating ion.

Morton polymerized butadiene employing such a catalyst: it involved for example the addition of amyl sodium to butadiene, the resulting adduct being then added to a further molecule of diene. The Alfin polymerized products showed a predominance of 1,4-linking. The Alfin catalyst being polar in nature and acting in a non-polar medium was regarded as an ion aggregate (6), the required electromeric changes in the diolefine taking place on the surface of the catalyst. In this way the initial ion was formed. The polybutadienes resulting from this polymerization were found, owing to their high molecular weight, to be too hard for mastication on the mill, a serious disadvantage in their application. Solvation of these polymers by aromatic and naphthenic type oils have, however, yielded very satisfactory oil modified rubbers, which have found important applications in the US.

The production of these oil modified rubbers was further facilitated when oil was added to the liquid phase of the polymerization mixture. The high degree of solvation of these polymers by mineral oils further rendered their application an economical process; thus 100 parts of the rubber have taken as much as 200 parts of oil extender and the dynamic characteristics of the modified product has compared favourably with the characteristics of *Hevea* and cold rubber

stocks. The discovery of the Alfin catalyst, in consonance with the history of other discoveries in science, was one of accident, and took place as a result of experiments carried out for the preparation of the co-ordinating agents for sodium ions. Alfin catalysts have been successfully prepared by the partial decomposition of amyl sodium by isopropyl alcohol, propylene being then passed through the mixture.

Co-ordinating complexes, particularly those embracing the heavy metals with organic acids as oxalic and its homologues, their amino and hydroxy substituted analogues as malic and tartaric acid, together with citric acid, have been utilized as activators in emulsion polymerization process.

The introduction of such chelates in such techniques has served not only to reduce the reaction times, but also to yield products having improved tensile and elongation characteristics, despite the speed of the polymerization. These activators may function *per se* or in the presence of initiators as hydrogen peroxide. Although copper and manganese salts may inhibit polymerization, the opposite effect is observed when these salts are chelated with suitable organic acids or salts. In practice the nitrates, sulphates etc., have been used in conjunction with the soluble salts of organic acids: the activator may of course be formed *in situ*. When formed *in situ* 0.1 to 1 per cent of catalyst is employed, the quantities tending to be smaller when the activator is introduced as a prepared mixture, the amounts then ranging from 0.01 to 1 per cent (7).

Later techniques have incorporated more complex structures as ethylene dinitrilotetraacetic acid. This activator facilitates a low temperature polymerization, which favours the formation of 1,4-polymers or copolymers. Other chelating compounds have found application in such polymerization systems. In this category have been included *o*-phenanthroline and $\alpha\alpha'$ -bispyridyl. Table I illustrates the various efficiencies of organic chelating agents in association with $\text{FeSO}_4 \cdot 7 \text{H}_2\text{O}$ (0.14 parts).

TABLE I

| Chelating Agent | Parts Used | pH | Per cent Conversion |
|-------------------------------------|------------|------|---------------------|
| Pot. dinitrilo tetra-acetic acid .. | 0.45 | 12.0 | 73.0 |
| <i>o</i> -Phenanthroline .. | 0.2 | 2.7 | 44.0 |
| $\alpha\alpha'$ -bis Pyridyl .. | 0.16 | 3.9 | 34.0 |
| Lactic acid .. | 0.42 | 7.0 | 34.5 |
| Pot. citrate .. | 0.34 | 10.0 | 69.0 |

The phenyl and butyl lithiums have been used as a source of free radicals in the photopolymerization of the N-alkenoxy methyl polyamides. Acyloins as photocatalysts were utilized in the recipes. Yarns, fibres and interliners for fabrics have been made from the resulting polymers (8). Finally the inclusion of dibutyl tin diacetate in the polymerization of α -chloracrylates has resulted in the production of plastics with superior optical properties. The *O*-alkyl xanthates have been included as photoinitiators in polymerizing systems. They are claimed to be superior to benzoin (9). An example of this class of initiator is afforded by carbethoxymethylene bis-ethylxanthate.

The use of actinic rays have found applications in polymerizations. Esters of methacrylic acid may be polymerized by light. Since 1941 photopolymerization methods have improved considerably: developments in irradiation technique and methods of polymerization no doubt have contributed to such improvements. The introduction of the α -carbonyl alcohol compounds as photoinitiators has displaced eosin and benzanthrone included by the Germans in earlier experiments (10). Acyloin ethers as benzoin ethyl ether have also been utilized in photopolymerization technique (11). The oxidation products of the acyloins, the $\alpha\alpha'$ -diketones also function as initiators. Thus diacetyl and pentane-1:2-dione have been used in such applications. The photopolymerization activators presumably owe their mechanism to their ability to generate free radicals under the influence of light. In this way they assist in a chain mechanism. Azo and organo-metallic substances often decompose photolytically below 200°C. Examples are azomethane and diazomethane (12). Azodi-isobutyronitrile affords a further example.

Photopolymerization

Photopolymerization has been carried out as an emulsion, solution or as a granular process. In emulsion polymerization processes for example, the monomer surface active agent and activator etc., are exposed to light rays, the latter penetrating the sides of the reaction vessel, which may be made of quartz or pyrex glass. After removal of the monomer, the resulting polymer may be precipitated by the application of electrolytes or the process of freezing.

In solution polymerization, monomer, catalyst and a liquid vehicle are employed. The granulating process introduces protective colloids as the granulating agents. Westinghouse H-3 mercury vapour lamps and General Electric Mazda lamps, P5-52, 1500 watt-100 volt have been used as sources of light energy. The amount of photo-initiator although not critical, is important. Low concentrations of photoinitiator do not always appreciably affect the velocity of the polymerization, while large amounts, on the other hand, can give undesirable discolorations. The relative efficiencies of α -carbonyl alcohols are shown in table II; they indicate the time required for the conversion of 30 per cent polymer

in recipes containing any of the below initiators.

TABLE II

| <i>α</i> -Carbonyl Alcohol | Time (hrs.) |
|--------------------------------------|----------------|
| Control (none) | 8.0 |
| 3-Hydroxy 4-methyl pentanone | 2.2 |
| tert. Butyl benzoin | 2.5 |
| Benzoin | 1.7 |
| Toluoin | 2.5 |
| Acetoin | 4.0 |
| Butyoin | 4.0 |

Ionizing radiations as X-rays, γ -rays and neutron emissions have been applied in polymerizations. In the case of ethylene, ionizing radiations reduce the danger hazards of the polymerization and at the same time afford polymers of high purity. Liquid ethylene has been polymerized by exposing the monomer to γ -rays, X-rays or neutron emissions. The polymerization is carried out at maximum pressures compatible with a minimum temperature which permits a reasonable rate of reaction. Conditions where the operating temperatures lie between 120° and 250°C and the corresponding pressures between 500 and 1500 atm. yield tough polymers which are also flexible. Sensitizers have been used to advantage in these polymerizations; they include the α -chlorohydrocarbons and alcohols.

These compounds readily decompose to active fragments under suitable radiations. In this way chain reactions are facilitated. Ethylene interpolymers have been prepared using vinyl acetate, styrene, carbon monoxide and formaldehyde. Convenient sources of radiation may include the use of cobalt 60 and radium, such emissions being penetrative and controllable. Neutron emissions adaptable for radiation practice, may be obtained by mixing a radioactive element with beryllium. In this way radiations of long life are assured.

Vinyl compounds have been polymerized by irradiation using neutrons from a cyclotron, and have given two to five per cent conversion after a month. The rate of polymerization is increased using a sensitizer. The low yields suggested, imply that the techniques are still in the pioneer stage (13).

When chloroprene or methyl methacrylate vapour is illuminated, polymerization continues after the source of light is removed. If methyl methacrylate is so polymerized to give the active polymethacrylate, and chloroprene vapour then introduced, polychloroprene will form on the active polymer. If the chloroprene monomer is then

replaced by methacrylate monomer, polymethacrylate will then form on the polychloroprene polymer chain, and give a sandwich polymer (14). In this way copolymers having homopolymeric moieties are formed. The properties of the resulting copolymer therefore tends to be an arithmetical function of the homopolymers in the chain. In emulsion polymerization the live polymer will initiate the polymerization of the entering monomer. Monomers yielding flexible homopolymers as methyl methacrylate are polymerized first, whence after the latter has been completely polymerized, the monomer contributing to the brittle polymer is then added. Temperature ranges vary from 50° to 75° C. and light rays between 1800 to 5000 Å find application.

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- (9) USP 2,716,633.
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Shell Venezuelan Project

TWO major projects involving a total expenditure of nearly £15,000,000 have recently been put in hand by the Cia. Shell de Venezuela. The first is for the construction of a gas pipeline running between La Paz oilfield in the state of Zulia and the Cardon refinery on the Paraguana Peninsula at a cost of £7,500,000, the second, for a fourth distillation unit at the Cardon refinery at a cost of about £7,250,000.

Delivery of the pipe for the 20 in. diameter gas pipeline will begin early next year. When completed the pipeline will measure 177 miles in length and will be able to carry 106,000,000 cubic feet of gas daily.

The new distiller to be built at the Cardon refinery, which will be in addition to the catalytic cracking and alkylation units now being constructed, will have an intake capacity of about 4,000,000 tons a year and, when completed, will raise Cardon's annual capacity to 12,750,000 tons.

British Gas Industry

Increased Production & Sales

BBRITISH gas sales in the first quarter, April to June, of the financial year 1955/56, were over five per cent more than in the corresponding period of the previous year, but in the second quarter, July to September, this increase was not maintained due partly to the high temperatures in these months. Total sales in the six months were over two per cent up on the previous year. In this period industrial sales increased by five per cent.

The production of coal gas in the six months ended September 1955 increased by two per cent and the quantity of coal used rose similarly. Water gas production fell by 24 per cent and the use of oil in water gas fell by 26 per cent. In the six months 2,100,000 gallons of heavy oil were used in oil gasification plants and in water gas plants.

The quantity of surplus gas purchased from coke ovens and oil refineries increased by nearly nine per cent.

In the six months ended September 1955, the production of coke increased over three per cent above the corresponding period of the previous year. Coke used in water gas production was reduced by 22 per cent but sales of coke were nearly four per cent up on the previous year. Stocks of coke which had fallen to very low levels at the end of the last financial year have increased substantially and are now over 1,000,000 tons. Crude tar production increased by four per cent but crude benzole production fell by four per cent in the six months ended September 1955.

New gas making capacity to a total of 32,000,000 cu. ft. per day was completed and brought into operation during the six months ended September 1955; this was a smaller figure than in the corresponding period of the previous year.

North British Rayon Ltd.

At the 27th ordinary general meeting of North British Rayon Ltd, in London on 8 December, Mr. G. A. Samuel, the chairman and managing director, said that he had to report a further consolidated trading loss of £34,486 against £58,031 in the previous year. With depreciation, debenture and loan interest and other charges, the total loss for the

year amounted to £97,619 and, after the deduction of the profit and loss account brought in, there was a debit balance of £70,777 to be carried forward. No appropriations had been made to or from reserves, which remained as at 30 June 1954. During the year under review drastic cuts had been made in overheads by economies in various directions and the rate of loss had been greatly reduced in the last quarter of the trading year. In view of the unpromising outlook for the small rayon producer with only one product, the company was investigating alternative possibilities of development.

Women Executives

TO MARK the second year of its existence, the British Association of Women Executives held a reception on Tuesday, 6 December, in London, when the aims and activities of the association were explained to the Press. Among the members present were several with interests in the chemical industry, including Miss E. Eades, governing director of Rentokil Ltd., and Mrs. Helen Dunn, a director and secretary of Metalock (Britain) Ltd.

The association was formed in 1954 as it was felt that the increasing numbers of women who either own or manage their own businesses or are directors of limited companies made it essential for an organization to represent their interests. Although, according to the last Census there are over 72,000 women employers of labour in the UK, it was felt that women were still not fully represented on such bodies as Chambers of Commerce and trade associations.

The BWE holds monthly dinners and members are thus able to exchange views and to hold discussions on topics of mutual interest. Its aims are to assist women in executive positions in industry and business to develop their growing interests and to bring to light and help abolish anomalies in legal and financial matters where women receive less favourable treatment than men. At present a sub-committee is examining taxation problems, especially the assessment of tax on joint incomes of husband and wife. The BWE claims that it is feminine but not feminist.

The president is Mrs. Orr-Ewing, The Grove, Seal, Sevenoaks, Kent.

Hydraulic Ram & Pump

British Filters' Development

MANUALLY operated thrust screws have been used for many years on all types of filter presses. The need to reduce labour costs and at the same time to increase the efficiency of the closing operation, has led British Filters Ltd. of Maidenhead, to develop a hydraulic unit for this purpose.

The latest version of this unit incorporates a double acting hydraulic ram, operated by a hand pump through a three-way control valve.

A standard Staffa 30-ton high-pressure ram was fitted into the machine, together with a two-stage Duo pump and control valve. The ram has a piston diameter of $4\frac{1}{4}$ in., and when working at a maximum pressure of 6,000 psi will develop a thrust of 38 tons. The ram is of robust construction, the cylinder being of cold drawn seamless tube, which is honed to very close limits. The piston rod is of high tensile steel, and the piston is fitted with heavy duty hydraulic packings. The trunnion end fitting and neck ring cap are bored from a solid billet and are screwed to the cylinder tube. Suitable 'O' rings are used to form the necessary seals.

The hand pump, which is also of robust construction, is arranged to work at two separate pressures. It has an output of 4.5 in.³ when working at a pressure of 500 psi, and of 0.33 in.³ when working at a pressure of 5,000 psi. Set to work at the lower pressure the ram can be rapidly extended

until it begins to take up the load. At this point a collar is disengaged on the handle and this has the effect of putting the pump into 'low gear' operating the ram at the higher pressure and correspondingly lower speed.

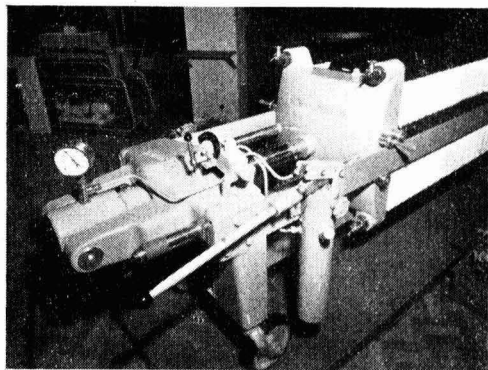
Staffa hydraulic rams are manufactured by Chamberlain Industries Ltd., Staffa Works, Staffa Road, Leyton, London E10.

Radiochemistry Symposium

A SYMPOSIUM on radiochemistry and an exhibition of radiochemical and chemical apparatus will be held on Friday and Saturday, 17 and 18 February at the Technical College, Bradford. Sponsored by the Bradford Chemical Society in conjunction with the Department of Chemistry & Dyeing of the Technical College, Bradford, there will be no fee for attendance at either the symposium or the exhibition.

Four lectures will be given at the symposium, and these will be followed by demonstrations of some of the apparatus and techniques described in the lectures. The symposium begins at 7 p.m. on the Friday, and at 9.30 a.m. on the Saturday. The lectures to be given are: 'Basic Principles of Radiochemistry' on the Friday; 'Measurement of *Beta* & *Gamma* Radiation'; 'Estimation of Isotopic Concentrations'; and 'Applications to Chemical Problems' on the Saturday.

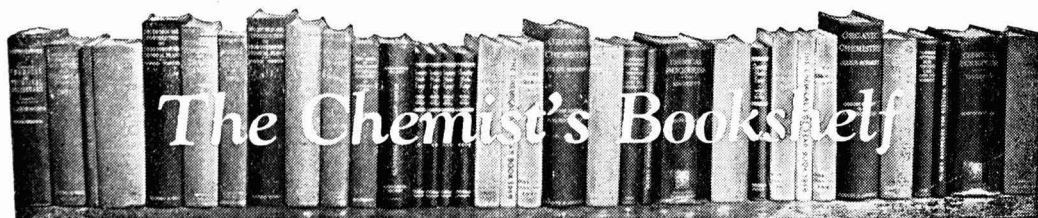
The exhibition will be held in the college hall from 10 a.m. to 6 p.m. each day, and exhibits will emphasize apparatus, physical and chemical, which is used in radiochemistry. Those wishing to attend should contact: Dr. W. R. Moore, B.Sc., Ph.D., Department of Chemistry & Dyeing, Technical College, Bradford, Yorks.



A filter press equipped with the new hydraulic ram developed by British Filters, Ltd., of Maidenhead

Electrical Engineers Exhibition

Owing to the growth in the size of the Electrical Engineers' Exhibition it has been necessary to obtain larger premises to house the exhibition company. The registered address will still remain at 23 Bloomsbury Square, London WC1, but all correspondence and interviews will be carried out at 6 Museum House, 25 Museum Street, London WC1. The telephone number, MUSEum 3450, remains unchanged.



ELECTRIC DIPOLE MOMENTS. By J. W. Smith. Butterworths Scientific Publications, London. 1955. Pp. vii + 370. 42s.

This book gives a comprehensive survey of the subject including the experimental methods and the interpretation of the results. The chapters on experimental methods are well illustrated and sufficient detail is given to render the book very valuable to those faced with the problem of making measurements on dipole moments.

There have been important developments in our understanding of the origin and causes of electrical asymmetry in molecules achieved by the application of wave mechanics in recent years. These developments are clearly described and used extensively in the second part of the volume which deals with the interpretation of experimental results.

The author has obviously taken considerable trouble to present the new concepts in simple language and has avoided the pit-fall of encumbering the text with too many complex mathematical equations. In this connection he has included a short appendix on wave mechanical principles summarizing the major topics of relevance to the treatment of his subject. In the concluding chapters, a discussion is given of the use of dipole moment measurements in achieving a fuller understanding of a number of problems such as internal rotation and molecular association.

The volume contains a number of useful tables of recent values of dipole moments. The references are given at the end of each chapter and an author index is included at the end of the volume as well as the usual subject index.

The author has succeeded in producing a book which can be read with profit by a wide range of readers as well as by specialists in the field.—C. KEMBALL.

THE CHEMISTRY OF PETROLEUM HYDROCARBONS. Edited by B. T. Brooks, C. E. Boord, S. S. Kurtz and L. Schmerling. Reinhold Publishing Corp., New York; Chapman & Hall, London. 1955. Vol. II, pp. 448, 108s. Vol. III, pp. 690, 144s.

The present volumes complete the series of three volumes originally planned by the editors and present a detailed survey of the present state of knowledge concerning the chemistry of petroleum hydrocarbons. Volume II deals essentially with the mechanism and conditions of thermal and catalytic cracking, pyrolysis, isomerization, dehydrogenation and oxidation of hydrocarbons and contains 16 chapters each by an acknowledged expert in the particular field. Volume III deals with the chemical reactions of hydrocarbons, the isomerization, halogenations, nitration of alkanes, the polymerization, condensation reactions and hydrogenation of alkenes, the alkylation, sulphonation, nitration and general substitution reactions of aromatic hydrocarbons and contains 22 chapters by distinguished authors.

From such a remarkable collection of articles it is difficult to single out any one chapter for particular mention, since each chapter is complete within itself and presents a balanced appraisal of the present state of our knowledge. It is of interest to note, however, that the editors have achieved a balance between the highly theoretical chapters, such as the chapter by Steacie and Bywater on 'Mechanisms for the Thermal Decomposition of Hydrocarbons', or that of Lewis and Von Elbe on 'General Theory of Hydrocarbon Oxidation' and those with a particular practical aspect such as those of Haensel (on Aromatization and Plat-forming) and Schaad (on Polymer Gasoline).

In the review of Part I it was noted that much of the subject matter had appeared in

other recent publications, but volumes II and III—which deal more extensively with the chemistry (rather than the physical chemistry) of hydrocarbons—contain much that has not appeared previously in collected form. As a complete work the three volumes cover the whole field of the chemistry of petroleum hydrocarbons in greater detail and perhaps with greater authority than any previous work of this type. As a reference text the work will be invaluable to research and laboratory workers in the petroleum industry and to all research workers in fields related to hydrocarbon chemistry. Obviously the work will be a necessary addition to a chemical library but it is a matter of regret that the extent of the work and the price of publication may prevent its wider use as a text book for students.

As with all Reinhold books the work is extensively indexed, excellently produced and a delight to read. It is remarkable that in a text written by so many authors the work retains a continuity of presentation which reflects the greatest credit upon the work of the editors and is a monument to the degree of co-operation they have achieved between authors and the editorial group.—F. MORTEN.

DETERMINATION OF ORGANIC STRUCTURES BY PHYSICAL METHODS. Editors: E. A. Braude and F. C. Nachod. Academic Press Inc., New York; Academic Books Ltd., London. 1955. Pp. xiii + 810. \$15.

As the editors point out in the preface, one of the most characteristic features in the development of organic chemistry during the past 30 years is the extent to which the ideas and techniques of physics and physical chemistry have been absorbed into every branch of the subject. This is true not only of the experimental study and theory of organic reactions and reactivity, but also of the elucidation and 'explanation' of organic structures. Whereas, however, the former topics have been expounded and reviewed in an impressive range of textbooks, there has not been available any comprehensive up-to-date account of the latter. The present volume has been written and compiled to remove this deficiency in the literature. It deals with the more important physical methods of determining the structure of organic compounds from the functional

point of view: each method is treated as a research tool of specific value to the organic chemist.

To accomplish their aim, the editors have secured the services of an international panel of authors, each of whom is an expert in the field he surveys. This, along with the scope of the book, is well illustrated by the table of contents which is as follows:—

Part I. The Determination of Molecular Size.

Chapter 1, Phase Properties of Small Molecules by A. F. Herbrandson and F. C. Nachol; Chapter 2, Equilibrium and Dynamic Properties of Large Molecules by P. Johnson.

Part II. The Determination of Molecular Pattern.

Chapter 3, Optical Rotation by W. Klyne; Chapter 4, Ultra-violet and Visible Light Absorption by E. A. Braude; Chapter 5, Infra-red Light Absorption by R. C. Gore; Chapter 6, Raman Spectra by F. C. Cleveland; Chapter 7, Magnetic Susceptibilities by C. A. Hutchinson.

Part III. The Determination of Molecular Fine Structure.

Chapter 8, Surface Films by E. Stenhagen; Chapter 9, Dipole Moments by L. E. Sutton; Chapter 10, Electron Diffraction by J. and I. Karle; Chapter 11, X-ray Diffraction by J. M. Robertson; Chapter 12, Microwave Spectroscopy by E. B. Wilson and D. R. Lide; Chapter 13, Thermodynamic Properties by J. G. Aston; Chapter 14, Dissociation Constants by H. C. Brown, D. H. McDaniel and O. Hafliger; Chapter 15, Reaction Kinetics by E. A. Braude and L. M. Jackman; Chapter 16, Wave-Mechanical Theory by C. A. Coulson.

The book is excellently produced and has no serious misprints. It possesses very complete author and subject indexes, and up-to-date reference lists of the original literature. Although it has been primarily addressed to organic chemists the treatment is always thorough and quite advanced, and physical chemists can learn much from it about fields which are not actually their own.—H. MACKLE.

REAGENT CHEMICALS AND STANDARDS. Joseph Rosin. D. Van Nostrand Co. Inc., New York; Macmillan & Co. Ltd., London. 3rd edition. 1955. Pp. x + 561. 70s.

This book, well known from its earlier

editions, needs no introduction, and little need be said about the present edition other than that it is substantially enlarged by the addition of some 45 new reagents (and solvents) bringing the total of substances included to something of the order of 600.

Typical materials which are now included for the first time are ethylenediaminetetraacetic acid and its sodium salt, Eriochrome Black T, cyclohexane, *iso*-octane, tetramethyl-ammonium hydroxide, and diethylformamide.

The reagents are presented in the standard form already familiar to the chemist, and in particular to the analytical chemist, from earlier editions. This edition continues to provide an essential and invaluable handbook for the chemist who is concerned with the purity of his reagents and with the preparation of standard solutions over the whole range from buffers and indicators through Karl Fischer reagent to the familiar acids, alkalis and oxidation-reduction titrants. The quality of production maintains the usual high standard that we expect from the publishers.—CECIL L. WILSON.

AN INTRODUCTION TO PROCESS CONTROL SYSTEM DESIGN. By A. J. Young. Longmans Green & Co., London. 1st edition. 1955. Pp. xvii + 379. 42s.

To the average chemical engineer, automatic control is what driving a motor car is to the average man—however modest he is about his other achievements, to impugn his knowledge of, or skill in, this field is to offend if not insult him. How often have we seen the flowsheet liberally sprinkled with controllers and heard the argument about where they should be placed and what their effect will be? Or the chemical engineer whose first action on taking over his shift on the start-up of a new unit is to reset the controller increasing the proportional band and reducing the re-set time? This essentially unscientific attitude is a measure of the gap in our knowledge between an understanding of the characteristics of a control instrument in response to a given impulse and the operation of a continuous unit under 'steady state' conditions. What we lack is an understanding of the behaviour of the process plant with changes in external conditions.

Mr. Young's book goes far towards putting the subject of process control design on

a scientific basis and takes a major step in filling the gap referred to above. With the advent of frequency response analysis, lucidly described and explained in this book, the dynamic characteristics of a plant may be determined while the unit is in operation. However, as Mr. Young points out, this experimental analysis must go on side by side with theoretical analysis of behaviour of a unit in response to disturbances entering it. No matter that the mathematics of such analysis are very complex this aspect of process control cannot be neglected. Mr. Young provides an excellent introduction to this subject both from practical and theoretical viewpoints and does so with a minimum of mathematics. In fact there is no part of this book which cannot be understood and used by the practising engineer or student who has taken mathematics up to first year university level with the exception perhaps of a small part of one of the appendices.

This is essentially a book for the chemical or process engineer rather than the specialist in instrumentation and a book to be read and used, rather than left to decorate one's bookshelf. Incidentally it accomplishes this last object with an attractively designed dust cover and binding. The book is well produced and printed and the price of two guineas remarkably modest.—D.C.F.

CHEMICAL PROPERTIES OF ORGANIC COMPOUNDS. By E. N. Marvell & A. V. Logan. John Wiley & Sons, New York; Chapman & Hall Ltd., London. 1955. Pp. vii + 326. 38s.

This American introduction to organic chemistry does not fit into our usual college or university educational schemes. It is not a direct entry to the subject but it draws on quite a limited scientific background. The object is apparently to cover rapidly rather more than a first year course in such a way that the organic chemist's contribution to the modern way of life can be more readily appreciated. There is a preoccupation with industrial applications, plastics, synthetic fibres, syndets (synthetic detergents), disinfectants, drugs etc.

To cover the ground in the compass of some 300 small pages the authors make no historical approach and omit all consideration of alternative theories, proofs of structures or reaction mechanism. They confine themselves throughout to factual statements

of present views. They claim thereby to reduce memory burden. For example, aromatic substitution occupies a dozen lines of general explanation without mention of terms such as 'electrophilic' or 'cationoid'. Halogenation and nitration each are dismissed in six lines and sulphonation in three. The result has the dimensions of the summary of a student's notes but superbly and copiously illustrated with photographs, diagrams of industrial processes, molecular models and reaction sequences. In one diagram a monomer is represented by a number of separate male figures, a polymer by the figures holding hands and a copolymer by a chain of alternate male and female figures holding hands.

The authors admit that the material selected is merely basic in nature on which the instructor can build. In other words it is designed to meet the particular needs of American students. It is difficult therefore to be sure to whom to recommend this admittedly attractive book. Those who desire an understanding of the chemistry of plastics, petroleum products, detergents and so on and who do not already possess an adequate, theoretical background might find in this book a rapid but not necessarily com-

plete guide. There are six short chapters on biological compounds.—M.C.

HUMIDITY. By H. L. Penman. The Institute of Physics, Monographs for Students, London, 1955. Pp. 71. 5s.

In his preface the author says that he hopes this book will meet the needs of students, particularly those taking courses for the Higher National Certificate in Applied Physics and in the first two years of degree courses.

The treatment throughout appears to be straightforward but a certain amount of mathematical knowledge is assumed including an understanding of calculus notation. This should be well within the capabilities of the average first year undergraduate.

The final chapter consists of a brief account of industrial hygrometry. Short descriptions are given of various air conditioners and automatic control apparatus and the chapter concludes with a mention of the theory of automatic humidity control.

Nearly all the material for this book has been taken from standard sources which are mentioned in the bibliography. Several of the diagrams have however been redrawn and modified.—J.P.S.J.

Well Logging Advance

Claims for Smallest Atom Smasher

POSITIVE identification and location of oil bearing formations by radio-activity well logging is said to be a greater possibility as the result of the first successful test of the world's smallest 'atom smasher' by Well Surveys Inc., Tulsa, Oklahoma, US.

The neutron generator is only 3 in. in diameter by 47 in. long and provides an intensive beam of electrons. It is a miniature version of the Van de Graaff particle accelerator which generates voltages up to 200,000 which are used to produce a stream of deuterons. These deuterons are fired into a target of tritium, producing an intense yield of neutrons.

These neutrons, travelling at extremely high speeds, penetrate the earth formations surrounding a bore hole and cause various nuclear reactions in the material encountered. These reactions, in turn, yield atomic particles and rays which can be identified and measured by sensitive radiation detec-

tion equipment which accompanies the accelerator down the hole.

The resulting information, transmitted to the surface and recorded, when correlated with the results of neutron radiation research performed with the large 500,000-volt accelerator in Well Surveys' laboratories, will, it is claimed, be useful in identification and evaluation of formation constituents.

The design of a suitable generator was made more difficult because of the extremely strenuous conditions it would have to stand up to; temperatures up to 300°F and external pressures up to 20,000 lb. per sq. in. It also had to draw very little electrical power. It was decided to utilize the technical experience of the High Voltage Engineering Corp., and to aim directly at the ultimate perfection of equipment small enough and reliable enough to meet the demands of the oil industry.

This procedure, in the company's opinion, is better than step by step development although it would take longer in the earlier stages.

• HOME •

Lithographed Steel Drums

Rheem Lysaght Ltd., of Bristol, is to spend £150,000 on expanding plant and machinery for the production of fully-lithographed steel drums.

Sterling Chemicals Price List

Albright & Wilson Ltd. have just issued the first amendments to their Sterling chemicals price list which they published in September. The list contains the names of 108 chemicals which the company have decided to delete from their range of chemical products. The amended list can be obtained from 49 Park Lane, London W1.

Organic Chelating Agents

A lecture on 'Organic Chelating Agents as Aids to Industry' will be delivered by Mr. A. Taylor, B.Sc., F.R.I.C., of F. W. Berk & Co. Ltd., at a meeting of the Yorkshire Section of the Society of Chemical Industry to be held in the Large Lecture Hall at the Technical College, Huddersfield, on Monday, 19 December, at 6.30 p.m.

Chromium Chemicals Plant

British Chrome & Chemicals Ltd. announces that after two years' preliminary work, plans are now complete for the erection of a large-scale plant for the production of sodium bichromate and other chromium chemicals on a site in the North of England. The plant will be completely mechanized and largely automatically controlled, and is intended to be the most advanced of its kind in the world.

Plight of Public Analyst Service

Unless a complete reorganization of Britain's public analyst service is undertaken in the near future it will eventually die of anaemia, says Mr. Howard Bagnall, Birmingham city analyst, in his annual report. 'Its laboratory facilities, its staffing and the manner in which the all-important sampling is carried out are all out-of-date and quite unable to cope with modern conditions,' Mr. Bagnall states. He suggests the establishment of a small number of regional laboratories, with modern equipment and a staff of specialists.

THE CHEMICAL AGE Subscriptions

With effect from 7 January 1956, the annual subscription rate (home and overseas) for THE CHEMICAL AGE will be increased to 52s 6d. The price of single copies will be increased to 1s 3d, by post 1s 6d.

Chemical Society Library

The Library of the Chemical Society will close at 1 p.m. on Friday 23 December and will reopen at 10 a.m. on Thursday 29 December, 1955.

Hormone Drugs From Wool Wax

Speaking at a Bradford Rotary Club luncheon, Dr. F. P. Woodford of the International Wool Secretariat Research Bureau at Leeds University; said there was a possibility that wool wax might be converted in hormone drugs, such as cortisone and progesterone.

Textile Institute's Royal Charter

Her Majesty The Queen has granted a supplemental Royal Charter to the Textile Institute extending the powers granted by the original Charter of 1925. The supplemental charter authorizes Fellows and Associates of the Textile Institute to practise and to describe themselves as chartered textile technologists.

ICI Sulphuric Acid

The output of sulphuric acid at ICI Billingham Division has doubled since 1946 with little change in the number of men employed. Announcing this recently Mr. E. A. Blench, Billingham Division production director, said that in 1954 the number of man-hours per ton of acid produced was 4.02 and in the third quarter of this year was 3.37.

Turks & Caicos Salt

The Secretary of State for the Colonies, Mr. Lennox-Boyd, replying in the House of Commons on 7 December to Lady Tweedsmuir, who asked whether he would approve a grant-in-aid for the restoration of the salt industry in the Turks and Caicos Islands, said that the Commissioner of the Turks and Caicos Islands had just attended full discussions in the Colonial Office about the future of this industry, and the question of assistance was being considered.

OVERSEAS

US Concession in Yemen

The first oil and mineral concession ever granted by the Kingdom of Yemen has been secured by a US group known as the Yemen Development Corp. The corporation states that it has signed a 30-year agreement for exclusive rights of exploration and exploitation in an area of 40,000 square miles forming the northern two-thirds of Yemen.

Karachi Oil Discovery

Petroleum deposits have been discovered in the residential suburbs of Karachi town. Pakistan Petroleum Co., a subsidiary of the Burmah Oil Co., will start drilling a test well early next year. The Government is understood to have ordered the suspension of building operations in the area for six months to enable the company to carry out tests.

New Guinea Project

The Australian Government is planning to develop a hydro-electric smelting plant in New Guinea. The Aluminium Resources Development Co., formed by Great Britain and Australia, is now undertaking preliminary investigations of two river systems. It is planned to process bauxite from Northern Australia to produce raw material for the Australian aluminium industry.

Exhaust Fumes Fertilize

An amazing new farm machine is in production in the US. It is called the Wonsover, is 24 ft. long, and combines equipment to plough, harrow, seed and fertilize the soil in one operation. The final device on the back of the machine is a sprayer designed to kill weeds that might blow on to the newly planted soil. The exhaust fumes of the machine are fed back to the two bins in front where their sulphur and nitrogen content are mixed with the fertilizer and insecticides.

Derelict Copper Mine to Re-open

The Kansanshi copper mine, six miles south of the Northern Rhodesia-Congo border, is to resume production after having been derelict for 13 years. About £1,000,000 is being spent on plant and equipment. The Anglo-American Corp. will be one of the companies participating in the operation of the mine which is scheduled to start production in 1957.

Sulphuric Acid Bounty

The total amount of bounty paid by the Australian Government during 1954-55 under the Sulphuric Acid Bounty Act 1954 was £A306,305, the rate varying between £2 7s and £2 12s 3d per ton of sulphuric acid. The bounty is payable on acid produced during the five years commencing 1 July 1954 from prescribed materials of Australian origin, and on acid sold by the producer for delivery in Australia or used by the producer in the production in Australia of fertilizers.

Colombian Import Duties

Duties on sodium hydroxide in the Colombian import tariff have been amended as follows. Sodium hydroxide (caustic soda) for the manufacture of rayon-viscose yarn is now 0.04 plus six per cent *ad valorem* compared with 0.15 plus 15 per cent *ad valorem*, in pesos per kilo. Other sodium hydroxide remains at 0.15 plus 15 per cent *ad valorem*. The import into Colombia of unwrought silver (under tariff item 684) other than for working by local silversmiths or by the Bank of the Republic for minting coins will now come under Group 2. Imports of silver for the two specific purposes mentioned will continue under Group 1.

US Sulphur Production

The US sulphur industry produced 498,591 long tons of native sulphur in September 1955 compared with 500,710 long tons in August 1955 and 439,244 long tons in September 1954. Production of recovered sulphur (of a purity of 97 per cent or greater) amounted to 30,800 tons in September 1955 as against 34,500 in the previous month and 27,300 tons in September 1954. Producers' stocks of native sulphur increased slightly over the previous month, totalling 3,000,346 at the end of September compared with 2,943,466 at the end of August.

Swedish Uranium Discovery

One of the richest uranium deposits in the world has been found in the Billingen Mountain in the Vaestergoetland Province of South-West Sweden, claims Mr. Josef Eklund, Chief State Geologist. The find, estimated at 1,000,000 tons, was made by State geologists commissioned by the Swedish Atomic Energy Co.

PERSONAL

At the recent annual general meeting of the Physical Methods Group of the Society for Analytical Chemistry in London, the following officers were elected for the forthcoming year:—*chairman*, DR. J. E. PAGE, F.R.I.C.; *vice-chairman*, MR. R. A. C. ISBELL, A.Inst.P.; *hon. secretary and treasurer*, MR. L. BREALEY, B.Sc.

MR. F. RICHARD KING has left ICI after 35 years' service to join the Aspro group of companies as purchasing manager. This is a new post created by the Aspro group. Mr. King was in ICI's purchasing department in London.

MR. D. R. B. MYNORS has been appointed a director of Courtaulds. He has been a member of the company's staff for some years.

It is announced that MR. R. M. WYNNE-EDWARDS has retired from the board of Richard Costain and will devote the whole of his time to the managing directorship of Costain-John Brown in view of the company's expansion and pending capital increase. MR. R. B. MINTO has elected to retire from the Costain board but will continue in an advisory capacity.

MR. H. E. CHARLTON has resigned from the board of directors of Petrocarbon Developments Ltd. in order to devote all his time and energy to his own company, H. E. Charlton Engineers Ltd.

The Appleby-Frodingham Steel Co. (branch of the United Steel Companies Ltd.), of Scunthorpe, Lincs, have announced the following appointments to take effect from 1 January:—MR. W. GEARY, works manager (services), to take over special duties for the general works manager in connection with management studies and statistics; MR. T. P. LLOYD, works manager (steel), to take over the duties of works manager (services); and MR. W. JACKSON, melting shops manager, to be works manager (steel).

The Distington Engineering Co. Ltd. (branch of The United Steel Cos. Ltd.) announces that MR. T. S. KILPATRICK will relinquish his duties as commercial manager of the company on his appointment as

deputy general manager of the Workington Iron and Steel Co. on 1 January 1956. He will remain a director of the Distington Company. On the same date MR. A. E. BELL, sales manager (engineering), is appointed general sales manager and MR. T. WINTRUP, contracts manager, will become sales manager (engineering).

DR. E. J. BOURNE, Ph.D., D.Sc., B.Sc., reader in organic chemistry at Birmingham University, has been appointed to the London University chair of chemistry, tenable at Royal Holloway College, where he will take up his duties at the beginning of the summer term next year. Dr. Bourne, who is only 33, is believed to be one of the youngest professors ever appointed by London University.

MR. RALPH S. ROBINSON, technical director of the Bate Chemical Corporation Ltd., of Toronto, Canada, has been appointed vice-president of that company. Before leaving Britain to join the Bate Chemical Corporation in 1953, Mr. Robinson was chief chemist and works manager of Styrene Copolymers Ltd., Manchester.

Sheepbridge Alloy Castings Ltd., a subsidiary of Sheepbridge Engineering Ltd., announce that MR. G. BREWER has been appointed cast iron and bronze foundry manager. Mr. Brewer has for some years past been employed in various technical capacities at Sintered Products Ltd., another member of the Sheepbridge Engineering Group. MR. S. MARTON, B.Met., metallurgist of Sintered Products Ltd., has been appointed to a new research post at Sheepbridge Alloy Castings. He will be in charge of the development of a process for the continuous casting of bronze tubes.

MR. A. G. PEACOCK, B.Sc., A.R.I.C., A.Inst.P., has been elected chairman of the electrical and electronics section of the Scientific Instrument Manufacturers' Association in succession to MR. P. GOUDIME, M.A., managing director of Electronic Instruments Ltd. Mr. Peacock, a director of Mervyn Instruments of Woking, Surrey, is the honorary exhibition secretary of the Physical Society. MR. R. Y. PARRY of Ekco

Electronics Ltd., and MR. L. A. WOODHEAD of Cossor Instruments Ltd., have been appointed vice-chairmen. The electronics section of SIMA now has over 40 members, nearly one-third of the total association membership. The section is now organizing an exhibition entitled *Atoms, Electrons & Industry*, to be held in Bristol from 6 to 8 June next year.

DR. J. T. STOCK, B.Sc., M.Sc., Ph.D., F.R.I.C., vice-principal of Norwood Technical College, Knight's Hill, West Norwood, London SE27, has been appointed associate professor of chemistry at the University of Connecticut, and will be leaving the college for the US on 24 January. Dr. Stock was a student at Norwood Technical College from 1928 to 1936. He then went to Sir John Cass College, and joined Fullers Ltd. in early 1940. Later that year he joined the Chemical Defence Research Establishment at Porton, returning to Fullers as acting chief chemist in 1944. While at Porton Dr. Stock obtained his M.Sc. by studying at Southampton University on Sundays. Dr. Stock joined the staff of

Norwood Technical College in 1946, becoming vice-principal in 1952. In the last ten years he and Mr. M. A. Fill, the senior lecturer at the college, have published 100 notes and papers on microchemical and similar topics, mainly in their own time. Several of these have been published in *THE CHEMICAL AGE*. Although somewhat reluctant to leave Britain, the lack of opportunities and research facilities for analytical chemists have compelled Dr. Stock to seek further advancement abroad. Dr. Stock was awarded the Robert Blair Fellowship in Applied Science and Technology for 1953 by the London County Council and spent a year in the Division of Analytical Chemistry at the Institute of Technology, University of Minnesota, working with Professor I. M. Kolthoff. He returned to this country earlier this year. At an informal gathering of colleagues and friends at the college on Friday, 20 January, at 5.30 p.m., it is hoped to present Dr. Stock with a farewell gift. Contributions (limited to 10s) should be forwarded to the college secretary (cheques and postal orders payable to LCC Norwood Technical College).

Synthetic Rubber

Use of Scrap Material

ADURABLE, oil-resistant, low cost synthetic rubber has been produced by a chemical process starting with rubber scrap. The American Chemical Society's Division of Rubber Chemistry was told at the closing session of its autumn meeting at Philadelphia on 4 November.

Four classes of the useful new rubber had been produced, depending on the type of scraps used as raw material and the particular chemicals mixed with them, according to Joseph Green and E. F. Sverdrup of the US Rubber Reclaiming Company Inc., Buffalo, NY.

The new materials were especially suitable for making such practical products as gaskets, oil and chemical resistant rubber parts, rubber sheeting and rubber coated fabrics, shoe soles and heels, shock absorbers, matting, sponge, wire insulation and structural hard rubber, it was stated.

Scraps of vulcanized rubber products containing both natural rubber and GR-S type synthetic had now been modified chemically

to produce a different rubber, with properties not normally associated with the initial materials.

It was found that when vulcanized material and GR-S type synthetic rubber scraps were reclaimed in a reclaimator (a specially designed extruder similar to an over sized meat grinder) in the presence of a certain concentration of activated chemical compounds, a definite reaction occurred between the compounds and the rubber.

The process entailed mixing the ground scrap rubber, reclaiming ingredients and a solid acid, such as citric acid, in the reclaimator at about 400°F. The time required was the same as that used for the reclamation of rubber—about three minutes. The product was cooled immediately to prevent excessive attack by the air, rolled into sheets on mechanical rolls, and allowed to set at least 24 hours before use.

In the laboratory experiments, as the concentration of the active chemicals was increased more and more, the rubbery product became tougher and tougher, and finally a point was reached where the product became hard, brittle resin.

Publications & Announcements

BRITISH Drug Houses Ltd., Poole, Dorset, have published a booklet by A. H. Beckett and E. H. Tinley entitled 'Titration in Non-Aqueous Solvents'. The first few pages are devoted to basic theories and to the definition of terms and a short discussion is included on the scope and limitations of these methods. The booklet continues with an account of some of the practical methods used, describing apparatus, indicators and solvents. A wide variety of applications are suggested and brief but comprehensive experimental details are given. Acetous perchloric acid and perchloric acid in dioxan are recommended as titrants for a wide range of basic substances. For acid materials potassium methoxide in benzene/methanol, sodium triphenylmethane and lithium aluminium amides are suggested as possible titrants. There are 35 pages in this booklet which contains 62 references in the text together with a further 12 general references. It is published without charge and BDH say that they will welcome requests for it.

* * *

TIN alloy coatings as alternatives to nickel-chromium are discussed in the latest issue of 'Tin and its Uses', the quarterly journal of the Tin Research Institute, Fraser Road, Greenford, Middlesex. In this article Mr. S. C. Britton, M.A., reviews some comparative tests that have been carried out with steel which has had a final coating of either tin-nickel or chromium. Conclusions which were drawn from this work were that the substitution of part of the nickel layer in nickel-chromium coatings by a layer of tin-bronze holds promise of reducing pore corrosion, but it appears that substitution must stay short of 100 per cent. Tin-nickel is fully as resistant to tarnish and corrosion in the atmosphere as chromium. In positions sheltered from rain, tin-nickel coatings retain brilliance better than nickel-chromium. Other articles include 'A Simple Coulometer Method for Tin Coating Determination' and 'Purity of Tin for Coatings'.

* * *

THE new Segas plant which is to be built at Ponders End in Middlesex was described by Mr. E. O. Rose, B.Sc., M.I.C.E., to the London and southern section of the Institution of Gas Engineers at its spring meeting 1955. The portions of Mr. Rose's

address referring to the Segas catalytic oil-gas process have been published by the Power-Gas Corp. Ltd. of Stockton-on-Tees. It was aimed at Ponders End to develop a complete gas manufacturing plant of the oil-gas type which would be entirely independent of any other plant in the works. A plant was envisaged which was to be supplied only with oil, fresh water and electric power and was to produce only gas, effluent and sulphur from the purifiers. The plant should be in operation in about a year's time and it is hoped that it will give a clear indication of the cost of operating the process on a fully commercial basis.

* * *

TENTH in the 'Vacuum Technical Series' has now been published by the Mobil Oil Co. Ltd., formerly the Vacuum Oil Co. Ltd., Caxton House, Westminster, London SW1. This latest publication, 'Refrigerator Lubrication', opens with a discussion about general principles of refrigeration, the means adopted to achieve it and the fluids which are used as refrigerants. The booklet then goes on to deal with general aspects of the construction and operation of refrigerating circuits, the lubrication of compressors in refrigerating systems and the compatibility of various refrigerants with lubricating oils. The final chapter sums up all lubrication requirements and makes recommendations covering most of the different systems in use. There are 72 pages of text and 54 illustrations, many of which are in three colours, red for oil, green for water and blue for refrigerant.

* * *

DIFFICULTIES arise in chromium plating because of the large volume of gases evolved at the anode and cathode. These gases form a multitude of small bubbles which produce a fine spray of acid particles which may be carried a considerable distance to neighbouring buildings and their contents. An adequate exhaust ventilation system would require the use of a large quantity of air, necessitating expensive pumping equipment. A new surface active fluorinated hydrocarbon called Zeromist has been produced by the Electro-Chemical Engineering Co. Ltd. of Weybridge, Surrey. This material creates a thin safe foam blanket during operation which it is claimed completely

stops the evolution of chromium spray. It is also claimed that the use of this material saves up to 70 per cent of the chromic acid and greatly reduces the carry forward of chromium solution on the racks as well as almost completely eliminating the toxic and harmful chromium spray. The initial quantity used varies between 1½ and 3 lb. per 100 gal. of chromium solution and the rate of consumption is low, because of its stability and the fact that loss is due entirely to drag out. It is claimed that considerable savings can be made on ventilation plant, heating (the loss of heated air is very much reduced) and scrubbing apparatus.

* * *

ISSUE No. 1, 1955 of the Sulzer Technical Review, published by Sulzer Bros. (London) Ltd., 31 Bedford Square WC1, is devoted mainly to the subject of hydraulic power storage. An introduction to this branch of engineering is provided in a short review of past developments and future prospects. A short note is also given on a heat recovery plant ordered in 1947 by the Perlen paper mill in Switzerland from Sulzer. This plant utilized the waste heat from the mill's three paper machines for heating the fresh air supply to the building. A short time ago the mill installed a fourth machine which was also provided with heat recovery plant by Sulzer. The total saving of fuel is estimated as the equivalent of £14,000 per year.

* * *

QUALITY production of new refractories is being carried out by Morgan Refractories Ltd., Neston, Wirral, Cheshire. These materials—the Morgan low heat-storage insulating refractories MI 28, MI 26 and MI 23—are produced in a modern plant which was built specifically for the purpose. As is suggested by the grade name, MI 28 can be used up to 2,800°F, MI 26 up to 2,600°F and MI 23 up to 2,300°F. Technical Sales Bulletin 52, published by the company, describes some of the properties of these materials and gives some facts and figures about the economies claimed for them. In one example quoted, the original walls of a furnace, which consisted of 13½ in. of firebrick, were replaced by 4½ in. of MI 28 backed by 9 in. of MI 23 for the walls and 9 in. MI 28 for the roof. The operating temperature of the furnace was 2,400°F and the annual saving in fuel was of the order of £200 per 100 sq. ft. of wall.

'CHEMICAL Plant from Design to Operation' is the title of a booklet published by the Power-Gas Corp. and Ashmore, Benson, Pease & Co. of Parkfield Works, Stockton-on-Tees. This describes some of the work done by these companies and the world wide services that are available. From Stockton, or in association with overseas associates, complete schemes are organized from foundations to readiness for operation says the booklet. This service is available for projects using the flow sheets or technical designs of the client. The Power-Gas corporation are the licensees for the Krystall process of crystallization which was designed to overcome some of the difficulties and inefficiencies met with in the more common types of crystallizers, and chiefly to keep the solution at all times within the metastable field where the process can be controlled. The largest section of this booklet is that devoted to the production and purification of industrial gases. These companies manufacture and supply a catalyst for the catalytic oxidation of carbon monoxide. This catalyst has found a market with the manufacturers of synthetic ammonia, and in the edible oil industry for the purification of hydrogen used in the hardening of animal and vegetable oils.

Actibon Carbon Sales

SALES of Actibon decolorizing carbon, hitherto conducted by Perry & Hope (Carbons) Ltd. were taken over by the manufacturers, The Clydesdale Chemical Co. Ltd., 105/147 Millerston Street, Glasgow E1, on 1 December 1955.

As from that date, therefore, all communications normally sent to Perry & Hope (Carbons) Ltd. should be addressed to: The Clydesdale Chemical Co. Ltd., Sales Office, 142 Queen Street, Glasgow C1 (telephone: Central 5247/8; telegrams: Cactus, Glasgow).

Remittances for all sales effected up to and including 30 November 1955, as rendered on Perry & Hope (Carbons) Ltd. form of statement, should, however, be made payable to them at their address. All sales contracts in force at 1 December 1955 have automatically been transferred to The Clydesdale Chemical Co. Ltd., and the change will in no way curtail the facilities which have been available to customers in the past.

Law & Company News

Commercial Intelligence

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

Mortgages & Charges

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

PLEXICRAFT LTD., London SW., plastic engravers and fabricators.—1 November, charge to Midland Bank Ltd., securing all moneys due or to become due to the bank; charged on 132 Crystal Palace Road, Camberwell. *Nil. 31 December, 1954.

POLYMER (UNITED KINGDOM) LTD., London EC, synthetic rubbers.—28 October, third deed supplemental to a debenture dated 4 April, 1952, to Bank of Nova Scotia, further increasing the limit of the amount secured thereby from £150,000 to £500,000; general charge. *£400,585. 19 April, 1955.

Satisfaction

MAGNESIUM ELEKTRON LTD., Manchester. Satisfaction, 4 November, of charge registered 20 November, 1952.

Change of Name

ELECTROZONE LTD., manufacturers of ozones, ozonators, disinfectants etc., offices of Mawsley Bleachers Ltd., Cross St. Mills, Cross Street, Wigan, changed to Wood Arts Ltd., on 3 November, 1955.

Receiverships

EMMET DISTRIBUTING CO. LTD., manufacturers of and dealers in chemicals, gases, disinfectants etc., 143 Upper Street, London N1. John B. Rubens, 18 Maddox Street, London W1, ceased to act as receiver and manager on 28 October, 1955.

WALTON CHEMICAL CO. LTD., chemical manufacturers etc., 24 Wilton Street, Liverpool 3. Brian M. Frazer, 265-275 Martins Bank Building, Water Street, Liverpool 2, was appointed receiver and manager on 17

November, 1955, under powers contained in mortgage and charge dated 27 January, 1948.

Increases of Capital

GAMMA & X-RAYS LTD., Power Road, Chiswick, London W4, increased by £3,000, in £1 preference shares, beyond the registered capital of £3,000.

DISINFESTATION LTD., vermin destruction preparation manufacturers etc., 125 Pall Mall, London SW1, increased by £97,500, in £1 ordinary shares, beyond the registered capital of £2,500.

R. CRUICKSHANK LTD., chemical manufacturers, electrical engineers and general mill furnishers etc., Camden Works, Camden Street, Birmingham, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £200,000.

MAY & BAKER LTD., Dagenham, Essex, increased by £1,000,000, in £1 ordinary shares, beyond the registered capital of £2,037,500.

Company News

Anglo-Ecuadorian Oilfields Ltd.

Crude oil production of the Anglo-Ecuadorian Oilfields Ltd. during the year ended 31 March 1955, amounted to 328,661 tons compared with 313,081 tons for the previous year. Sales of refined products, with the exception of Diesel oil, rose above those of the previous year. The total sales figures were: gasoline, 42,772,758 (35,342,412) gallons; kerosine, 6,846,168 (5,855,808) gallons; Diesel oil, 11,483,220 (13,328,154) gallons; residue, 27,656,244 (22,716,750) gallons. The figure for gasoline includes imports, which in the year ended 31 March 1955, totalled 9,819,600 gallons as against 7,728,000 gallons in the previous year. The net operating income of £1,134,392 just failed to reach the £1,140,120 achieved last year. Net profit for the year, after the payment of tax, was £342,159 to which has been added £153,443 brought forward from last year, making a total of £447,602 for allocation. The directors recommended a distribution out of the profit of 14 per cent, less tax.

Celanese Corp. of America

The directors of Celanese Corp. of America have declared a dividend of 12½

cents a share on the common stock, payable 22 December 1955, to holders of record 2 December 1955. The board also voted regular quarterly dividends of \$1.12½ on the preferred stock, series A, and \$1.75 on the seven per cent second preferred stock. Both preferred stock dividends are payable 1 January 1956 to holders of record 2 December 1955.

Doulton & Co. Ltd.

From 1 January four main production branches of Doulton & Co. Ltd. will be given separate identities and will operate as wholly-owned subsidiaries. Overall control of the business, however, will continue to be exercised by the parent company from Doulton House, London. Two of the three new subsidiary companies will be: Doulton Industrial Porcelains Ltd., managing director Mr. R. F. Lindop, to operate from Tamworth, and Doulton Vitrified Pipes Ltd., managing director Mr. J. P. Medd, to operate from Erith.

Distillers Co. Ltd.

On 8 December the board of the Distillers Co. Ltd. declared an interim dividend on the ordinary capital for the year ending 31 March 1956, of 4.4/5d per share of 6s 8d (equivalent to six per cent), less tax, at the rate of 8s 6d in the £, payable on 28 February 1956 to shareholders on the register at 8 December 1955. The board reported that during the current financial year the volume of business was expanding despite rising costs and increasing competition.

Market Reports

LONDON.—Buying interest in industrial chemicals has been well maintained during the past week with more emphasis on contract renewal business. Export trade continues at a good level with a steady flow of new enquiry from Commonwealth markets. The potash and soda products are being taken up in good quantities whilst acetone, formaldehyde, borax and the barium compounds are all reported to be in steady request. Prices for the most part are unchanged but the non-ferrous metal compounds are firmer. Quotations for zinc oxide are £6 per ton dearer and white lead at £145 15s per ton, and red lead at £140 10s per ton both show an advance as from 9 December. A moderate flow of new

business has been reported for the fertilizer materials. Activity in the coal tar products' market is mainly concerned with forward bookings, and for most items there is a ready outlet. It has already been reported that higher prices for the tar acids are to come into operation at the end of the year.

MANCHESTER.—Fresh bookings on the Manchester chemical market during the past week have tapered off in some instances, but this is in accordance with the usual year-end experience. The call for contract deliveries, however, has been fairly well maintained, though these, too, may be expected to slacken off temporarily during the next few days. The general trend of prices remains firm. There is a steady call for most of the light and heavy tar products, with a moderate trade reported in the fertilizer market, basic slag still being the most active section.

GLASGOW.—The past week has shown an improvement in the Scottish heavy chemical market, with business very brisk and covering quite a varied range of chemicals. The bulk of orders received are again pertaining to current requirements although with the year coming to a close enquiries for next year's contracts are now being received. Continued activity is still being shown on the agricultural side. With a few exceptions, prices on the whole have been steady. Export still continues satisfactory with a good volume of inquiries being received.

Next Week's Events

MONDAY 19 DECEMBER

SCI (Yorkshire Section)

Huddersfield: The Technical College, 6.30 p.m. 'Organic Chelating Agents as Aids to Industry' by A. Taylor, B.Sc., A.R.I.C.

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street EC1, 6.15 p.m. 'Tin-Cadmium Alloy Plating' by A. E. Davies, B.Sc., Ph.D., A.R.C.S., D.I.C.

TUESDAY 20 DECEMBER

Incorporated Plant Engineers

Cardiff: South Wales Engineers' Institute, Park Place, 7.15 p.m. 'Steam & Utilization'. Film show presented by Babcock & Wilcox Ltd.

PHENOL

A high-quality synthetic product meeting the most stringent industrial requirements.

XYLENOLS

A grade of refined cresylic acid of distillation range approximately 215—230°C. Total tar acid content 99.5 to 100%.

Availability

Ample supplies for prompt delivery in road tank-wagons and in 40/45 gallon drums.

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For further information, consult :



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.

GRADUATES in **MECHANICAL** and **CHEMICAL ENGINEERING** required for progressive positions in the Research, Design and Production Divisions of **THE POWER-GAS CORPORATION LIMITED**. Training given to men without previous industrial experience. Apply to:—**STAFF PERSONNEL MANAGER, PARK-FIELD WORKS, STOCKTON-ON-TEES.**

CHEMIST
(Main Grade)
required by the

ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKS

to take charge of a Group providing General Chemical Services to the Establishment.

Duties will include the responsibility for the safe movement, storage, treatment and disposal of all radio-active liquid and solid wastes and other trade wastes of a toxic nature; the decontamination of radio-active buildings, plant and equipment; the operation of chemical plants for the treatment of radio-active and trade effluents; and the control of laboratories engaged in general chemical analysis. Applicants should possess the A.R.I.C., A.M.I.C.E. or equivalent qualifications. They should have wide experience in the Industrial Chemistry field and in the handling, treatment and disposal of radio-active wastes. Experience in the control of analytical laboratories and process plant operation is desirable.

Salary: £1,130-£1,435 per annum. Contributory Superannuation Scheme. Married officers now living outside the Establishment's transport area will be eligible for housing on one of the Authority's estates or alternatively assistance towards legal expenses incurred in house purchase will be payable.

Requests for application forms by **POSTCARD** to **THE SENIOR RECRUITMENT OFFICER,** at the above address. Quote Reference 841/38.

CHEMIST

required for Analytical and Preparative Research on Inorganic Chemicals and Magnesium Alloys.

Applicants should have B.Sc. or A.R.I.C. with some practical experience and would be expected to work under the Chief Analyst in a modern and well-equipped Laboratory.

Salary depending on qualification and experience. Pension and Life Assurance.

Please apply, stating Reference CA. D7, age, details of qualifications and experience, to:

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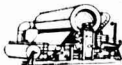
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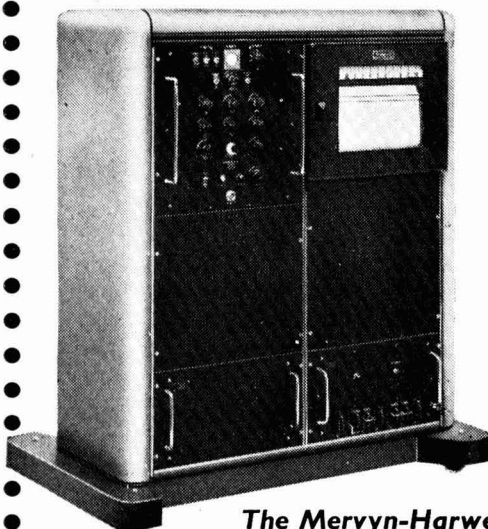
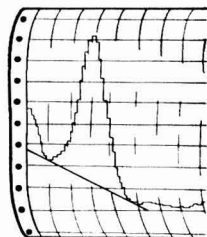
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INDEX to advertisers in this issue

| | Page | | Page |
|---|------------------|---|-----------|
| Accrington Brick & Tile Co., Ltd. | 1312 | Kleen-e-Ze Brush Co., Ltd. | Cover ii |
| Alumina Co., Ltd. (The) | 1345 | Laporte Chemicals, Ltd. | 1302 |
| Audley Engineering Co., Ltd. | 1301 | Lennox Foundry Co., Ltd. | Cover iii |
| Braby, Fredk., & Co., Ltd. | 1302 | MacLellan, George, & Co., Ltd. | 1312 |
| Borax Consolidated, Ltd. | Front Cover | Mervyn Instruments | 1345 |
| British Acheson Electrodes, Ltd. | 1309 | Mirvale Chemicals Co., Ltd. | 1344 |
| British Carbo Norit Union, Ltd. | 1304 | National Enamels, Ltd. | 1345 |
| British Ceca Co., Ltd. (The) | 1344 | Pott, Cassels & Williamson | 1308 |
| British Electrical Development Association | 1305 | Spencer Chapman & Messel, Ltd. | 1346 |
| Brotherhood, Peter, Ltd. | 1299 | Thorium, Ltd. | 1300 |
| Brough, E. A., & Co., Ltd. | 1307 | United Coke & Chemicals Co., Ltd. | 1308 |
| Callow Rock Lime Co., Ltd. | Cover iii | Widnes Foundry & Engineering Co., Ltd. | 1303 |
| Clark, T. & C., & Co., Ltd. | 1300 | Whitaker, B., & Sons, Ltd. | Cover ii |
| Classified Advertisements | 1342, 1343, 1344 | Worcester Royal Porcelain Co., Ltd. (The) | Cover iii |
| Cruickshank, R., Ltd. | Cover ii | Yorkshire Tar Distillers, Ltd. | 1304 |
| Flexible Ducting, Ltd. | 1306 | | |
| Geigy Pharmaceutical Co., Ltd. | 1310 | | |
| I.C.I. Ltd. (Billingham-Organic Chemicals) | 1341 | | |
| Imperial Smelting Corporation (Sales), Ltd. | Cover iv | | |

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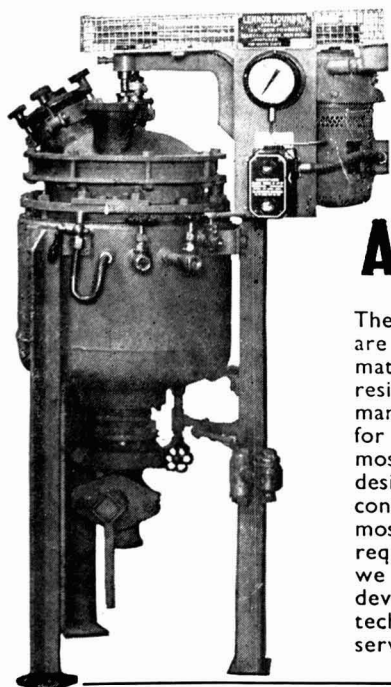
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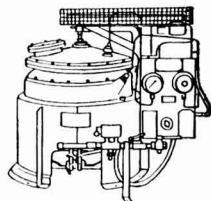


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