14 Nov.

The Chemical Age

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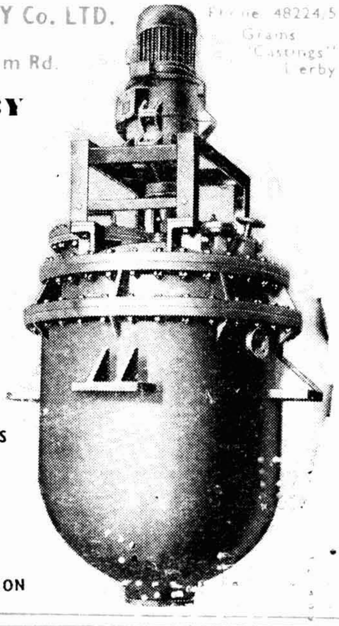

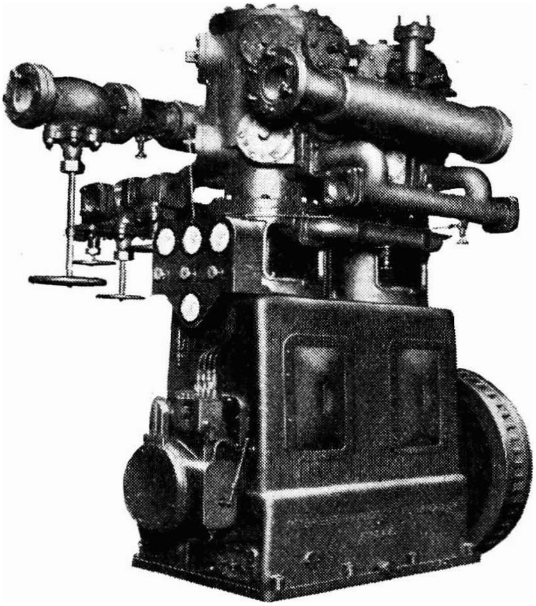

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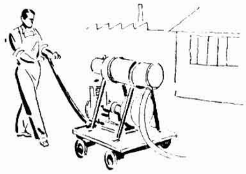

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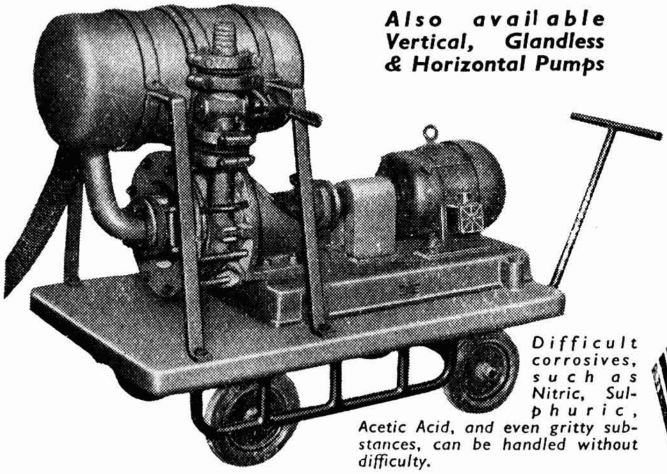

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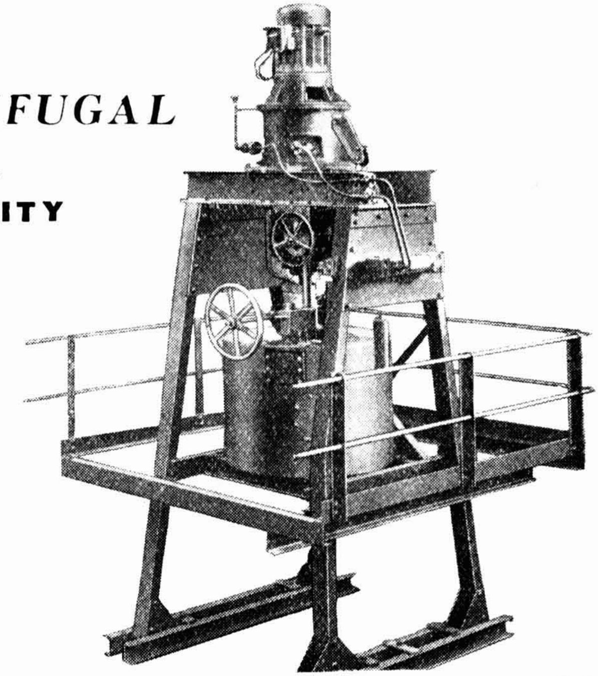

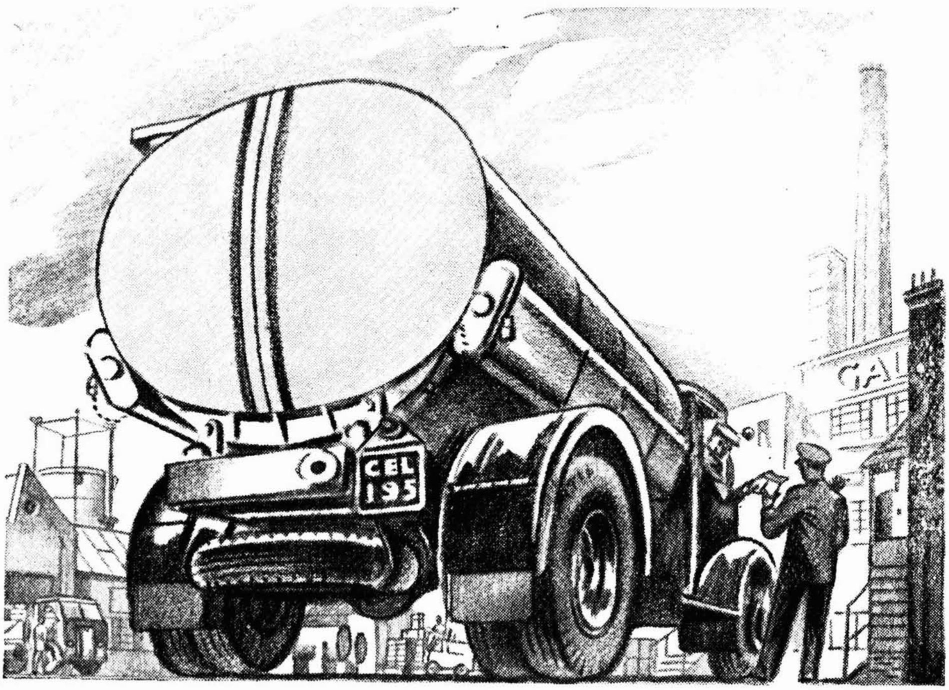

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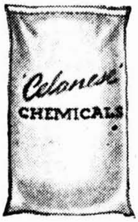

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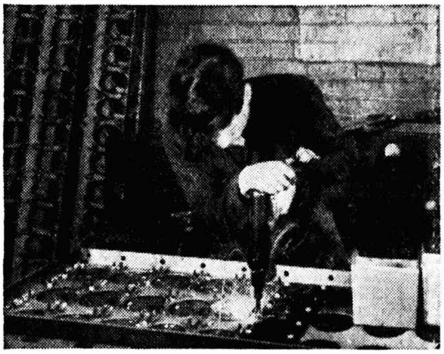
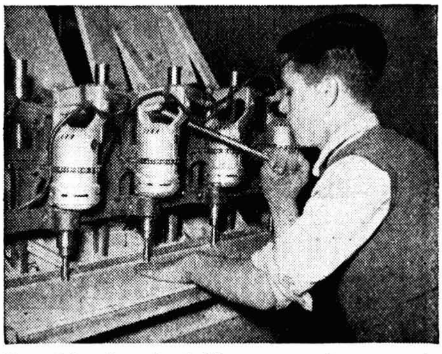
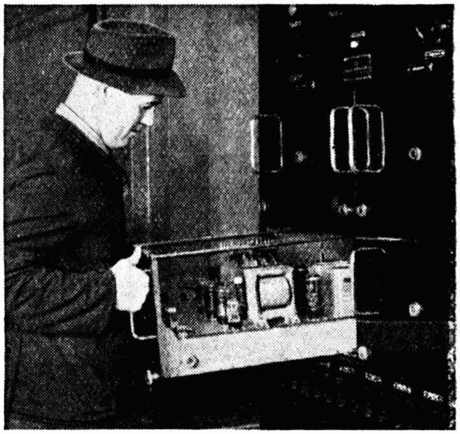


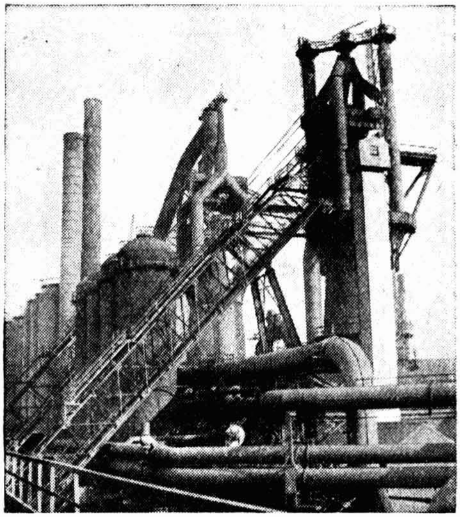
An electric stud-welding gun in operation on a dust collector component.



Portable electric drills mounted on stands and ganged for simultaneous operation in a Midlands joinery shop.



An electronic control cubicle with one unit withdrawn.



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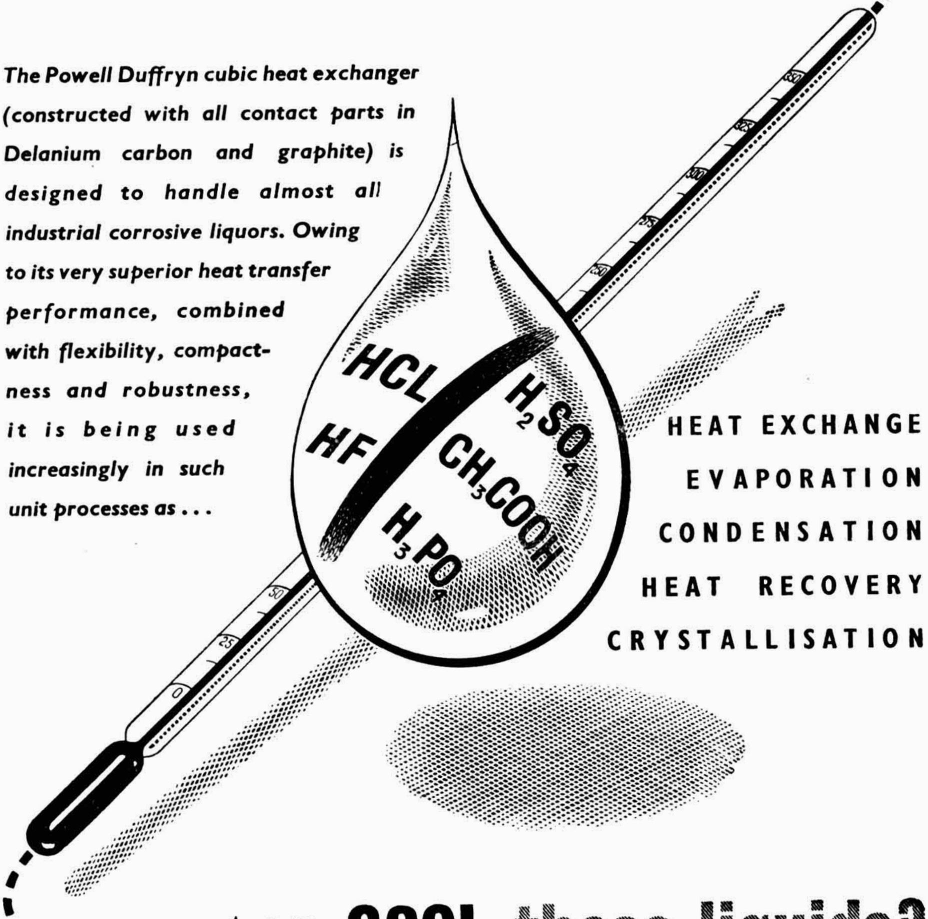

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Foam & Froth

FOAMING and frothing is well enough known in laboratories and works processes, but it is only recently that rivers and town sewage plants have begun to demonstrate similar surface agitations. The vertical unrest of a rising sea of bubbles is not merely a public curiosity. As is now widely realised, this new kind of water pollution problem has arrived with the widening use of synthetic detergents. One of the most notable cases occurred in a small American town of 5,000 population. One day in 1947 a detergent manufacturer door-to-door canvassed the district offering trial one ounce samples of a household detergent. The next day large volumes of froth began to build up on the sewage plant separators; within fifty hours foam from 2 to 5 feet deep had engulfed almost all the sewage treatment plant. For a month the foaming continued although its intensity began to decline after the first two weeks, obviously because the inhabitants were coming to the end of their free samples of detergent. An experience then unusual has since become quite common. In this country foaming has been persistent in the River Lea; in the sewage system of Bradford severe problems have been encountered because the increased presence of detergents in water effluents interferes with the removal of wool greases during sewage treatment.

There are two separate causes of water pollution by detergent substances, separate in a practical sense if not in principle. Where a factory is using detergent chemicals in processing, a concentrated emission of surface-active material is likely. Here the public problem caused has its remedy in discussions between sewage authorities or river boards and the factory's management. There are no similar controls at source for detergent pollution from households. Every kitchen sink, washtub, and washing machine in the country can add its mite of surface-active chemical to the stream of sewage. Set against the huge volume of water that enters town sewage systems, these small additions may seem insignificant, but it must be remembered that only small amounts of these substances are required to bring about sharp changes in surface tension. Today it is said that at least 40 per cent of all domestic washing products is synthetic. In America the proportion is much higher than 40 per cent and there it is still rising. Two years ago an ACS conference on detergent pollution problems reached the conclusion that whatever sewage treatment difficulties had already been caused could not be regarded as temporary but must be expected to persist and increase.

From the pollution standpoint most synthetic detergents unfortunately possess high chemical stability. Their ability to lower surface tension is still exercised despite extreme changes in dilution and *p*H or actual associations with oxygen and micro-organic organisms. In sewage treatment processes involving aeration, the surface-activity of detergents can produce much more film and bubble formation than in the washtub. Also, some detergent producers have added foaming agents to their products in order to overcome the housewife's prejudice against a washing agent that lathers less than soap; this is certainly true of some American formulations though the practice may not be so common here. There are, of course, chemical answers to foaming troubles. Some of the silicones, certain octyl alcohols, glyceride oils, and fatty acids can be used as anti-foaming agents in sewage or water treatment plants. At the present time it is understood that foaming in the Lea is being countered with a surface-active agent! The cause of this foaming is pollution by anionic detergents and neutralisation by a cationic surface-active chemical is giving good results. Fortunately from the economic aspect only about a third of the theoretical amount needed for neutralisation appears sufficient to prevent foaming. In general, however, the regular use of other chemicals to counter the effects of detergents is regarded as too costly. Series of water sprays installed at points where foam tends to accumulate in sewage treatment have achieved some success; on occasions when this mainly mechanical attack upon foam formation is inadequate, anti-foaming agents are added.

The calcium and magnesium soap precipitates have long aided sedimentation in sewage treatment but many synthetic detergents inhibit sedimentation, coagulation, and settling. Most of them exert adverse influences upon the growth of micro-organisms, and high concentrations—perhaps unusually high at present in sewage water treatment—can disturb purification processes that depend upon digesting bacteria. Longer periods of time are required for completion of processes; when foaming tends also to occur, larger tanks or vessels may be required. Many detergent products are based upon complex phosphates and the final effluent of treated water that emerges from sewage plants will contain most of the detergent phosphate waste; in rivers this may lead to steadily rising problems of algal and aquatic weed growth.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 42s. Single copies, 1s.; post paid, 1s. 3d. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784/5). LEEDS OFFICE: Martins Bank Chambers, Park Row, Leeds, 1 (Leeds 22601). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited.

Notes & Comments

Conscription & Education

ONE of the sharpest clashes of our times is that caused by the rising demands of both military service and higher scientific education. Youth cannot pass precious years in two places at once, and if we are to produce good scientists and technologists, all the best years of intellectual malleability must be spent in education and training. Two years for military service make a major inroad into the time-table of production. Attempts to ease the dilemma by utilising scientifically trained conscripts in scientific branches of the forces are welcome enough, but at best they give a limited solution to the real problem, that of man-power wastage. The scientific needs of the forces are better satisfied by volunteers with a long-term and vocational outlook. To some extent this problem is determined by public opinion for deferment is the logical answer, yet total deferment for students of certain subjects brings with it a feeling of injustice. In the United States the clash between conscription and scientific training has been sharper than in this country. Although no country realises more vividly the dependence of future growth and strength upon scientists, America—or at any rate her politicians—have feared that public opinion would be outraged by large-scale student deferment. The cry of differential treatment for the sons of rich men has been too great a risk for many politicians to swallow.

American Public Opinion

AS *Chemical & Engineering News* (**31**, 10, 985) has revealed, however, Gallup polls have indicated that the problem is understood by the public with considerable objectivity. Deferment of students (subject to reasonable progress as undergraduates) was supported by 55 per cent on the grounds that the nation's real needs would be better satisfied in this way; deferment was opposed by 37 per cent. Analysis of the poll showed that deferment was as strongly supported by people who themselves had not had a college education as by those who had. At times of tension American public opinion often displays a more emotional subjectivity than public opinion here. America, too, has been closer to the Korean war than we have. If that is the present balance of U.S. opinion on this difficult subject, we can assume that at least as enlightened a balance of opinion is held here. Indeed, our legislation has wisely allowed for student deferment since peacetime conscription was introduced; however, if current hopes of some easing in East-West tension do not fade again, the case for total deferment of science students might be reviewed. The mere postponement of military service does not reduce the problem of skill wastage.

Coal Treatments

OUR recent leader on fuel policy and smoke pollution (CHEMICAL AGE, **68**, 407-8) called for steadily increasing pre-treatment of coal, involving product-extraction and a residual smokeless fuel. A paper by H. D. Greenwood, Assistant Director of Carbonisation, N.C.B., shows that there are formidable technical obstacles and new methods of coal treatment may first have to be evolved (*Jour. Inst. Fuel,* **25**, 148, 379). There is a shortage of high-class coking coals. These coals are becoming worked out and progressively more costly to mine. Some priority of supply must be given to the producers of metallurgical coke. The economic future of gas and coke manufacture would seem to depend appreciably upon the introduction of coal blending, thus making partial use of less suitable types of coal. If large-scale carbonisation processes are to aim at producing 'a fuel for the domestic grate which is more reactive and more uniform in quality than coke, and at a price which will be an inducement to the public to use such fuels in the place of raw coal,' they must be designed to utilise a wider range of coals than formerly used in carbonisation for coke and gas. The carbonised briquette type of process, as exemplified by Phurnacite, may have an easier future than raw coal carbonisation methods such as the Coalite process. But if coals must be given special pre-treatments to fit them for carbonisation, the costs of the resultant fuel must be increased. Perhaps the domestic consumer is less interested in price per ton than fuel technologists assume? With raw coal today there is an incalculable proportion of waste and ineffectiveness that is quite unrelated to price. A manufactured fuel with consistent performance and reliable freedom from wastage can command an appreciably higher price and still prove cheaper than raw coal.

Economic Embarrassment

ONE side-light from Mr. Greenwood's paper is not without chemical point. The cost of raw coal for coke-making has risen to four times the 1937 cost; but the revenue obtainable from by-products has not risen to a comparable extent. An economic embarrassment for all coal treatment processes that involve by-product extraction would seem, therefore, to have been created by the general efficiency of the chemical industry, whose market prices have been held at lower upward levels than those of the solid fuel industry. Nevertheless, we shall no doubt continue to hear periodic murmurings about nationalisation of chemicals from our wilderness politicians.

'Terylene' for Canada

I.C.I. to Erect $20,000,000 Plant

A PLANT in Canada for the manufacture of the new synthetic polyester fibre, 'Terylene' is to be erected by the Imperial Chemical Industries, Limited. The expenditure on this project will be a sum in excess of $20,000,000. It is the company's intention that the necessary finance shall be found in Canada in accordance with proposals which have been approved by the Bank of England.

Plans call for the erection of a large plant able to meet the full demands of the Canadian market. The proposed site is at Millhaven, near Kingston, Ontario. This location has been chosen, after a careful survey of many areas in various parts of Canada, because it offers distinct advantages in meeting exacting technical requirements of the project. Options on suitable land have already been secured, and building and engineering teams will begin field work at an early date.

Construction of the plant will be initiated by a new wholly owned Canadian subsidiary of I.C.I. After the proposed segregation of the I.C.I. and du Pont interests in Canadian Industries, Ltd., it is intended to offer this project to that successor company of C.I.L. in which I.C.I. will be the principal shareholder, and in which Canadians will participate as shareholders. This procedure is in accordance with I.C.I.'s policy of regarding the successor company as the normal medium for developing manufacturing projects in Canada.

A product of British research, this polyester fibre was discovered in the laboratories of the Calico Printers' Association, Limited. I.C.I. acquired the world rights, apart from the U.S.A. (where the fibre is being manufactured and sold under the name of 'Dacron'). The basic Canadian patent was granted in February of this year. I.C.I. has invested substantial sums in research and development on the fibre, and production in the United Kingdom on a pilot plant scale started some years ago. The construction in the U.K. of a full-scale plant involving a large capital expenditure is well advanced.

'Terylene' fibre is sold in two forms—filament yarns, which look and process rather like silk or nylon, and staple fibre, which looks and processes very much like wool. The filament yarns are very strong, stretch very little, resist abrasion, and absorb very little water. Clothes made from them are extremely strong and long-wearing, wash easily, dry rapidly, and need little ironing. In its staple form, 'Terylene' fibre is very resilient, and therefore makes possible the production of socks, knitted wear and suitings which are not only attractive and comfortable, but are washable, completely shrink-proof, quick-drying and almost uncreasable.

U.S.A. Rubber Strike

A strike involving 35,000 rubber workers was reported from New York on 3 April. Eighteen of the 19 rubber plants from New England to California were affected during the strike which lasted two days.

OCCA Technical Trade Exhibition

New Materials & Equipment on Show

THE fifth annual technical trade exhibition, which is sponsored by the London Section of the Oil & Colour Chemists' Association, was opened on Monday, 30 March, at the Borough Polytechnic, London, by Mr. Lawrence Turner, M.P. for Oxford, himself a paint manufacturer. The exhibition provides an opportunity for the young technical men in the paint and allied industries to meet the technical men of the raw materials and machinery suppliers and is intended to be largely educational.

Prior to the official opening, members of OCCA entertained to luncheon at the Criterion Restaurant, Piccadilly Circus, W.1, a number of distinguished guests, representative of the trade associations and research organisations of the paint and printing ink industries. The principal guest was Mr. Lawrence Turner. Mr. L. O. Kekwick (the president of OCCA) was present, and Dr. F. W. Stoyle (chairman of the London Section) presided.

The chairman, welcoming the guests, said the exhibition was organised by some of the stalwarts of the London Section, its hon. secretary (Mr. H. C. Worsdall) and others —the 'underground movement' which was generally responsible for the groundwork in any organisation. It was a grand idea. In the paint, printing ink and allied industries the buying was rightly done, not by reference to box files, but by deciding what materials were best for the work in hand; thus intimate contact was provided between the technical side and the buying and selling side. He thanked all who were responsible for arranging the exhibition and the exhibitors who had prepared the stands.

Proposing the health of the guests, Dr. Stoyle paid tribute first to Mr. Turner, and remarked jocularly that the letters 'M.P.' after his name stood for 'Member of Parliament' and 'manufacturer of paint.' It was important that manufacturers of paint should belong to that august assembly at Westminster, and he had no doubt that Mr. Turner added colour to its proceedings. The Association was encouraged by his attendance and was grateful to him for opening the exhibition.

Other distinguished guests to whom the chairman referred especially were Mr. F. W. Burmann (vice-president of the Society of British Paint Manufacturers); Mr. W. H. Wilson (vice-president, the Paint Manufacturers' and Allied Trades Association); Mr. N. J. Campbell (director of the National Paint Federation); Mr. K. L. Thornbery (vice-chairman of the London Colour, Paint and Varnish Manufacturers' Association); Mr. F. Bowes (president, Federation of

Mr. Lawrence Turner opening the exhibition. On his left is Mr. L. O. Kekwick and on his right Dr. E. C. Pickering, head of the chemistry department of the Borough Polytechnic

British Printing Ink Manufacturers); Mr. John Coates (president, British Printing Ink Manufacturers' Association); Dr. E. C. Pickering (head of the Chemistry Department, Borough Polytechnic), the work of whose department had such a tremendous impact on the industry; and Dr. L. A. Jordan (director of the Paint Research Station and a past-president of OCCA). He regretted that Dr. G. L. Riddell (director of the Printing, Packaging and Allied Trades Research Association) was unable to be present.

Dr. Jordan and Dr. Riddell were directing organisations whose work was of fundamental importance to the industry, and it was worth while remembering that the emphasis which OCCA tried to apply in organising the exhibition was on the development of products for the industry—in other words, research and development. The Association needed all the support and assistance that the industry could give it, and he hoped that other organisations in the industry would be able to join in its work in order that all should reap the benefits which derived from the spread of knowledge. There were organisations concerned with research in gelatin, whiting, roads and buildings and perhaps half a dozen others, each of which contributed to the development of the industry.

M.P. Responded

Mr. Turner, M.P., responded on behalf of the guests. He indulged in some hopeful references to relief which might come from the budget in April, bearing in mind recent utterances by the Chancellor, particularly that our dollar reserves had increased to $2,000,000,000. Looking back over the last 18 months, that was a very remarkable state of affairs which he hoped would benefit industry. Whether or not there would be concessions in purchase tax or in direct taxation on limited liability companies or even public companies he would not care to guess, but he felt that we might look forward to some relief.

Adding his tribute to Dr. Pickering, Mr. Turner said he had studied under his direction many years ago in the Borough Polytechnic, and it was a very great pleasure to meet him again.

Finally, he said that if there were any technical and trade matters which the industry wanted aired or on which it wanted answers from Government Departments, matters such as importation from Germany, for example, he hoped the industry would not fail to use him in trying to obtain satisfaction. If he could help by raising such matters he would be only too happy and privileged to be allowed to do so. He added that he would very much welcome during this Coronation summer a visit by members of the London Section of OCCA to Westminster; he would be only too happy to show them around the new chamber and other features.

The Exhibition

MANY new products and interesting developments in instruments and apparatus were on view at the Exhibition which was held on 30 and 31 March and 1 April.

This year, the exhibition, which filled three large halls of the Polytechnic, was officially opened on the afternoon of 30 March by Mr. Lawrence Turner, M.P. for Oxford, in the presence of a number of distinguished members of the paint and allied industries, and a large gathering of visitors.

In a short but amusing speech, Mr. Turner paid a warm tribute to Mr. H. C. Worsdall, honorary secretary of the London Section of the OCCA, Mr. N. S. Campbell, director of the National Paint Federation, Mr. W. H. Wilson, vice-president of the Paint Manufacturers' and Allied Trades' Association, and the many others whose enthusiasm and hard work had ensured the success of the exhibition. He also made a special reference to Dr. E. C. Pickering, head of the chemistry department, of the Borough Polytechnic, which had done much valuable work for colour chemistry. He himself had had the privilege of studying under Dr. Pickering in this same building in 1926 and 1927.

How much the exhibition was appreciated by the industries concerned was made amply clear by the fact that since 1949 when it first opened with 14 stands in one room it had now grown into a display occupying three halls with 45 stands.

There was a great deal of talk today about how vital research was to the prosperity of the nation, but the knowledge thus gained must be disseminated as widely as possible. It was in helping the spread of information on new materials and techniques and their application that the exhibition played such a valuable rôle.

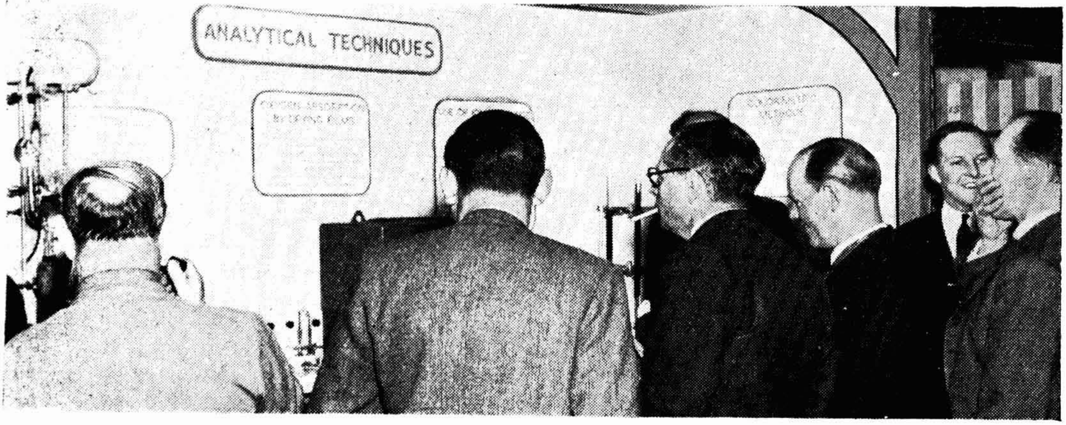
Despite the difficulty of making chemicals into an attractive display, considerable ingenuity was shown and the general standard of exhibits was high. Those stands which were fortunate enough to be able to display actual apparatus or working models were seldom without a group of interested or inquiring visitors.

A new class of synthetic resin, 'Araldite' surface coating resin 985E, an ethoxyline resin for the protection of metal surfaces, was the main feature on the stand of Aero Research, Limited, of Duxford, Cambridge. 'Araldite' 985E gives an excellent 'key' to metals—particularly to light alloys—for subsequent coats of paint. It is highly resistant to chemical attack, solvents and abrasion, and thus has important applications in chemical plant, chemical drying trays, food manufacturing equipment, textile machinery, containers for pharmaceuticals and the protection of magnesium and aluminium castings. Further exhibits showed other ethoxyline resins developed in Switzerland by the parent company, Ciba Limited, Basle, now in full-scale production at Duxford and marketed under the trade name of 'Araldite.'

Advances made in the past two years, both in determining the mechanism of protection and in improving the paint and rust inhibiting properties of zinc dust were illustrated by Amalgamated Oxides (1939), Ltd., of Dartford, Kent. Highly metallic zinc dust coatings for marine immersion have progressed steadily and a greater understanding of the mechanism of protection and the causes of blistering has been obtained. The build up of alkalinity round a highly metallic zinc dust coating in sea water was illustrated, and the resulting essential requirements of a non-saponifiable sealing coat shown. Results of a wide series of tests combining the properties of zinc oxide with the high hiding power of rutile titanium dioxide were also demonstrated.

The 'Abrac' display (A. Boake, Roberts & Co., Ltd., of Stratford, London, E.15), was this year divided into three sections. The main section endeavoured to show the effect of the presence of relatively small proportions of polar substances on the rheological properties of metallic soap dispersions. Examples given were: barium stearate in white mineral oil; aluminium stearate gels in white spirit; and lithium stearate gels in white mineral oil.

Two new types of stearates were shown in the second section. Firstly, a range of water dispersible stearates suggested for use in emulsion paints, plastics, polishes and rubber. Secondly, 'D' grade stearates produced by a new process and having a high degree of purity. Their specific volume is lower than the company's S.Q. grade stearates, but their freedom from water soluble salts is advantageous in many applications. The third section was devoted to samples of



Examining the display of analytical techniques which formed part of the Paint Research Station exhibit. Mr. Lawrence Turner, M.P. (with glasses), during his tour of the exhibition

various ester type plasticisers and synthetic lubricants.

Properties of Geon polyvinyl materials of interest to the paint and allied industries were emphasised in the British Geon, Limited, London, exhibit. Materials shown included the Geon 200 and 400 series of soluble vinyl resins; Geon 121 PVC resin (applied as a resin/plasticiser paste); and various Geon latices (vinyl resin dispersions in water).

New Linseed Oil

Two new products 'Ilinol' and 'Synthawax' were the main attraction on the stand of The British Oil & Cake Mills, Limited, of Edith, Kent. 'Ilinol' is a modified linseed oil in which conjugation has been induced by the action of a specially prepared catalyst. The display demonstrated the laboratory scale isomerisation of highly alkali-refined linseed oil, together with the special properties conferred on the oil as the result of the isomerisation. 'Synthawax' is a hydrogenated castor oil having many of the properties of the natural waxes. Samples were shown of the product in bulk and powder form, with its various applications. 'Synthawax' can serve as a raw material for the manufacturer of hydroxystearic acid, which was also exhibited.

'Rutiox HD,' a new rutile pigment, claimed to have outstanding properties including strong resistance to chemical attack, was prominently featured among the exhibits of British Titan Products Co., Limited, of York. The ease of milling of the 'Rutiox' pigments was demonstrated and a display of comparative finishes showed their high opacity, gloss and cleanness of tone. Examples also illustrated the superior durability of the improved 'Rutiox CR' during accelerated and natural weathering.

The increasing number of oils and fatty acids available today has given rise to a good deal of speculation on the technical or financial benefits to be derived from using such materials in the manufacture of varnishes or oil modified alkyd resins. A comprehensive survey of these materials has been made by the technical service division of Cray Valley Products, Limited, of St. Mary Cray, Orpington, Kent, and its display was devoted to showing the performance characteristics of a range of alkyds of equal oil length, based on a series of such oils employed in a standard formulation and exposed to similar conditions in service.

A sedimentation balance which measures the particle size distribution of powders dispersed in suitable media by actually weighing particles arriving at a sampling point without disturbing the systems in any way, was demonstrated by A. Gallenkamp & Co., Ltd., London. Other exhibits included a paint corrosion oven with watertight tinned copper lining and asbestolite exterior panels approved by the Ministry of Supply; a surface finish inflammability apparatus; and a torsion viscometer which can be used with Newtonian or thixotropic liquids.

A new advance in the manipulation of rosin, involving the active double bands, to produce a new resinous derivative, 'Dymerex,' was featured on the stand of the Hercules Powder Co., Limited, London. Specimens of the product and examples of compositions in which it can be used were also on view.

The two hexahydric alcohols—'Sorbitol' and 'Mannitol'—are now freely available in Britain and increasing interest is being shown in their use in the manufacture of alkyds, ester gums and tall oil esters for surface coatings. Various stages in the production of these raw materials were demonstrated by Honeywill & Stein, Limited, of London, who also displayed a large flow diagram for production of 'Sorbitol' (Humectant grade), 'Sorbitol'/'Mannitol' mixtures, and 'Mannitol' (Reagent grade).

'Finding the Solution' was the theme of this year's display by Howards & Sons, Limited, of Ilford. It showed how the company plays its part in industry by dissolving materials, such as DDT, Dispersol acetate dyestuffs, Geon 101, and so on, which are difficult or unusual. Plasticisers for special purposes such as petrol and oil-insoluble Plassitil, and light-fast Sextol Adipate were also on view.

I.C.I.'s Stand

Imperial Chemical Industries, Limited, was represented by its Billingham and Nobel Divisions, which shared a stand. Billingham's exhibits were composed of a wide range of solvents and chemical intermediates for the paint and varnish industry, including: Acetone, *n*- and *iso*-butanols, urea, formaldehyde, phenol cresylic acid, glycol, octyl phenol, diethylene glycol, 'Alphanol' 79 and 'Nonanol.' The Nobel Division showed its dense and linters types of nitrocellulose, including alcohol soluble grades. Illustrations were also given of applications of pentaerythritol in resins of various kinds and in pentaerythritol drying oils. The suppression of bloom on alkyds by means of calcium naphthenate was demonstrated with panels and electron photomicrographs.

A range of cadmium sulphide and cadmium sulphoselenide pigments in colours from primrose-yellow through red to deep maroon was displayed by Johnson, Matthey & Co., Limited, of London. These pigments have outstanding resistance to the action of heat, light and chemicals and are insoluble in all media.

The exploitation of mica in a number of paint products was the theme of the stand of Micafine, Limited, of Derby. Examples included its use in anti-corrosive and aluminium paints, where it is used as a diluent to reduce costs without materially affecting other properties, in matt finishes where products of good mattness and texture are possible, and in synthetic water paints where it confers good adhesion and washability.

Advantages and exclusive features of a Sparkler Horizontal Plate Filter were demonstrated by a model on the stand of L. A. Mitchell, Limited, of Manchester. The filter, designed and developed by the Sparkler Filter Company of America, and manufactured in Holland, is fitted with a steam jacket. This type of filter is suitable for the clarification of all types of resins. The main advantages are speed of filtration, ease of cleaning and economies in the use of filter media. The scavenger plate eliminates wastage of liquid left in the filter and lines after filtration of a batch. Among the laboratory equipment also shown was fluid agitating and mixing equipment and a roller mill for grinding and mixing.

'Lustrex Latex'

Monsanto Chemicals, Limited, London, introduced 'Lustrex Latex' (an aqueous dispersion of polystyrene), the newest addition to its range of chemicals for the paint industry. Also on view were samples of the 'Aroclors' group of synthetic oils and resins, some of which are recommended as plasticisers in conjunction with 'Lustrex' latices, together with benzoic acid B.P. as an antithixotropic agent and sodium benzoate B.P., as a corrosion inhibitor for paints and varnishes.

A laboratory roller mill on the stand of L. A. Mitchell, Ltd., consulting chemical and industrial drying engineers

The main products of interest to the oil and colour trades depicted in the exhibit of the National Coal Board were aromatic distillates, such as benzoles, toluoles, xyloles, and naphthas. The crude materials of these derivatives are produced at the 51 coke oven plants operated by the Board throughout Britain, and are treated by their benzole refineries. An interesting display (glassware by A. Gallenkamp & Co., Limited), showed the method of extraction of these benzole derivatives against a background model of the plant, so that the various stages in actual production could be easily followed.

Some laboratory methods of measuring certain mechanical properties of paint films on substrates were featured on the stand of The Research Association of British Paint, Colour and Varnish Manufacturers, the Paint Research Station, Teddington, Middlesex. Instruments displayed were for the determination of elastic modulus by a method based on the speed of sound through the specimen, viscous properties by using a painted strip of metallic foil as a torsional pendulum, and the extent of elongation at break by a direct extension method.

Chemical and physical apparatus used at the station for the assessment of the properties and compositions of various paints and paint materials were exemplified by an automatic fractionating column for the examination of solvents, equipment for the automatic recording of oxygen absorption by drying oils and paints, and demonstrations of some of the newer analytical reactions.

An interesting addition to its range of products was the propylene derivatives shown by Petrochemicals, Limited, London. The emphasis of the company's display was on the technical advantages to be gained by using the products, and samples together with finishes incorporating them were on view.

Results of the work of its technical service department during the past year in the use of 'Plastoprene' isomerised rubber in various finishes was shown by Plastonol, Limited, of Belvedere, Kent. A number of applications were illustrated including anti-corrosive primers, floor paints and heat-resisting enamels. Examples were also given of the resistance to chemical attack, of paints based on 'Plastoprene' not only from the common corrosive acids and alkalis, but also from some unusual corrosive agents such as wine, beer and fruit juices.

New apparatus shown by Sheen Instruments, Limited, East Sheen, London, included the I.C.I. Automatic Hardness Rocker, with electronic counter; the Sheen Conical Bend Test apparatus; a Rotating Paddle Viscometer for quickly determining 'Krebs Units'; and a gloss determination apparatus to DTD.585. Visitors were invited to bring their own panels and materials for tests on the varied equipment.

'Epikote' Resins

The exhibit of Shell Chemicals, Limited, was mainly devoted to the more interesting specific applications of the 'Epikote' resins, developed in the past year. Two new solvents I.P.S./1 and I.P.S./2 used in the surface coatings industry were also introduced. Other chemical products featured the primary alcohols 'Alphanol 79' and 'Nonanol.'

A new standard of precision is claimed for the Drage viscometer demonstrated by Towson & Mercer, Limited, of Croydon. It will differentiate between tap and distilled water or, alternatively, give a reproducible result on thick paste or heavy bitumen. The variable speed model is intended for use with thizotropic and rheoplexic pastes. Other exhibits included: the S.427 Thermostat Bath for use with U-tube viscometers which it is said will give accuracy better than IP requirements even at 210°F.; and B.S. Flow Cups intended to standardise the erratic results obtained with Ford Cups in the past.

A new range of styrene copolymer emulsions, specifically developed for emulsion paints, was shown for the first time by Vinyl Products, Limited, of Carshalton, Surrey. These new products are not intended to replace the company's existing 'Vinamul' polyvinyl acetate emulsions, but are offered as an alternative paint medium to allow the formulation of special emulsion finishes.

Revised Alcohol Prices

CHANGES in its price list for Plain British Spirit to operate from 1 April, 1953, are announced by The Distillers Co., Limited (industrial alcohol department), London. Prices are based on the number of proof gallons taken during the year ended 31 December, 1952.

Ethyl alcohol (95 per cent Gay-Lussac 66.0 p.p.) prices range from 2s. 11d. per proof gallon for over 300,000 proof gallons rising by increments of ½d. per proof gallon to 3s. 1½d. over 2,500 proof gallons. These prices refer to quantities delivered in seller's road and rail tank wagons. When deliveries are made in drums of 40-gallon capacity or more there will be an additional 1d. per proof gallon, when in 10-gallon containers 3d. per proof gallon.

When the number of proof gallons taken over the year ended 31 December, 1952, is less than 2,500 prices for deliveries will be: 40 gallons or more in containers of 40-gallon capacity or larger—3s. 8½d.; 40 gallons or more in 10-gallon containers—3s. 11½d.; 10 gallons or more (but less than 40 gallons) —4s. 8½d.

The following special grades of ethyl alcohol are subject to premiums on the above prices as follows:—absolute alcohol, 99.5 per cent, 74.5 op., 2d.; absolute alcohol, special high strength, 99.9 per cent, 75.2 o.p., 4d.; doubly rectified alcohol (SVR), 95.8 per cent, 680 o.p., 3d.; P.I. rectified alcohol, 96.1 per cent, 68 o.p. 7d.; R.R. absolute alcohol—absolute alcohol re-rectified, 99.7 per cent 75 o.p., 12s. 6d. per bulk gallon (net).

These prices relate to spirit supplied Duty Free. The current rate of Duty, when payable should be sent with the order.

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Analytical Chemistry of Tin & Lead—Part 2

At a recent meeting of the Midlands Society for Analytical Chemistry held in Birmingham, Dr. J. W. Price, of the Tin Research Institute, introduced a discussion on the analytical chemistry of tin and lead. In last week's issue we published a report of Dr. Price's remarks on tin and the subsequent discussion and the following is his lecture on the analytical chemistry of lead:—

THE chemical properties of lead are in several ways very similar to those of tin. Thus it is capable of forming two series of salts in which it is divalent and tetravalent respectively, and those salts may be dissolved in sodium or potassium hydroxide to form plumbites and plumbates. Plumbites, however, do not absorb oxygen to form plumbates. In general, however, the tetravalent salts are unimportant, being readily converted to the divalent form in solution: the relative insolubility in water of the chloride and sulphate are perhaps the most important factors in the analytical chemistry of lead.

The solubility of the sulphate is very much less than that of chloride, a visible precipitate being produced by the addition of sulphuric acid to a solution of one part of lead in 25,000 parts of water. Separation of lead as chloride is useful in the determination of small amounts of other metals in the presence of excess of lead, as lead sulphate occludes other metals to a far greater extent.

Precipitation of the sulphate may be considered quantitative in the presence of dilute sulphuric acid and alcohol.

Titrimetric Methods

While the titrimetric method for tin is the most accurate, the gravimetric methods are considered the more accurate for lead. There are, however, a number of well-established titrimetric methods which are capable of yielding satisfactory results. In most cases a preliminary separation of the lead as sulphate is necessary. This precipitate is then either dissolved in ammonium acetate solution or converted to carbonate by boiling with ammonium carbonate solution and then dissolved in acetic acid.

Conversion to carbonate is necessary in the oxalate-permanganate method, as dissolving directly in acetate can leave enough sulphate in the solution to prevent complete conversion of the lead to oxalate.

In the presence of much barium, the residue from the acetate extractions may contain lead. This should be recovered by evaporating the residue to dryness with hydrochloric acid and then re-extracting with ammonium acetate.

The solution of lead acetate obtained by either method can be titrated with ferrocyanide or with molybdate, or the lead can be precipitated as oxalate and titrated with permanganate. A further method which is much used is the precipitation of lead chromate followed by determination of the chromate with either potassium iodide and thiosulphate or with ferrous sulphate and dichromate.

In the precipitation of lead chromate it is important that the solution be boiled for 10 minutes to obtain a precipitate of definite composition, the yellow colour of the lead chromate first precipitated changing to red.

Direct precipitation of lead chromate without the preliminary isolation of the sulphate is possible in some cases, e.g., solutions of copper alloys.

Gravimetric Methods

Both the sulphate and the molybdate methods give good results and the choice of method will depend on the material analysed. In a number of alloys it is possible to precipitate lead molybdate directly, thus avoiding evaporation to fumes with sulphuric acid; also the lead content of the precipitate is less than in either the sulphate or the chromate. On the other hand it is necessary to re-precipitate the molybdate, as the first precipitate will always contain a little MoO_3, as well as antimony or tin if they are present in the alloy.

In the analysis of ores, slags, etc., separation of lead as sulphate is usually a necessary first step. The lead is then dissolved from the impurities present with ammonium acetate and can then be re-precipitated as sulphate.

One advantage of separating lead as

sulphate is that other elements may be determined in the same solution after filtration of the sulphate. For example, copper and lead are often determined in the same solution in this way. In the presence of appreciable amounts of tin or antimony a preliminary separation of these elements should be carried out by evaporation with hydrobromic acid and bromine, as otherwise they will contaminate the lead sulphate.

After extraction from impure lead sulphate with ammonium acetate, the lead can be precipitated as chromate as described above, and the lead chromate filtered on a sintered crucible and weighed after drying at 110°C. An empirical factor has been suggested.

Colorimetric Methods

The determination of small amounts of lead as the brown colloidal sulphide, which was at one time extensively used, appears to have been largely displaced by methods depending on the use of dithizone (diphenylthiocarbazone). This reagent is of great general importance in the colorimetric analysis of the heavy metals and has been extensively used for the determination of traces of lead. When a solution of dithizone in an organic solvent, such as carbon tetrachloride or chloroform, is shaken with a neutral or slightly alkaline aqueous solution containing lead, an internal complex salt —dithizonate—is formed, which is soluble in the organic solvent giving a red colour; this colour can be measured visually or, more readily, photometrically. As a number of other metals react with dithizone, a prelimininary isolation of the lead is sometimes necessary. Procedures vary according to the other metals present, but generally an extraction of the lead with dithizone from an ammoniacal citrate solution containing cyanide and a reducing agent will separate it from interfering elements. On shaking the dithizonate solution with dilute nitric acid the lead passes into the acid, and may be re-extracted and measured with fresh dithizone. There are two techniques available for the actual measurement, the mixed colour method and the mono-colour method. In the former, the lead is extracted with a known excess of dithizone and the lead determined either by measuring the absorption by lead dithizonate at 500 mμ or by measuring the absorption by the excess dithizone at 610 mμ. The second method is the more sensitive as lead dithizonate shows very little absorption above 600 mμ, while dithizone absorbs appreciably at 520 mμ, the point of maximum absorption by lead dithizonate.

In the mono-colour method, the solution containing lead is treated, after suitable adjustment of *p*H, with successive small portions of dithizone until the dithizone layer shows no red colour. The small excess of dithizone in the combined extracts is removed by shaking with cyanide and the lead determined either by measuring the red lead dithizonate or by shaking with nitric acid and then measuring the green dithizone.

Two other methods for the determination of traces of lead which may be mentioned are the diphenylcarbazide determination of chromium in lead chromate and the oxidation of tetramethyldiaminodiphenylmethane to a blue diphenylmethane dye by the action of lead dioxide obtained by electrodeposition.

Dithizone, however, is without doubt the best reagent for traces of lead. There are a number of possible sources of error to be guarded against, but once a reliable procedure is established excellent results are possible. (See 'Determination of Small Amounts of Lead in Non-ferrous Alloys' by G. W. C. Milner and J. Townend. *Anal. Chim. Acta.*, 1951, **5**, 548.)

Polarographic Methods

Lead gives a well-defined wave both in acid chloride and in alkaline solutions. For measurements in acid solution preliminary chemical separations are usually necessary, while in alkaline solutions, with or without tartrate or cyanide, good lead waves are obtained without interference due to other elements. For example, in a tartrate medium serial determination of copper, bismuth, lead and cadmium is possible while traces of lead in cadmium may be determined in alkaline cyanide solution.

Amperometric Titration

The classical types of electrometric titration are the potentiometric and the conductometric methods. In the former, the potential of an indicator electrode is measured during the titration, a pronounced change of potential taking place at the endpoint. In conductometric titrations the electrical conductance of the solution is measured during the titration, and the endpoint is found graphically as the point of intersection of straight lines giving the changes of conductance before and after the equivalence point. In so-called 'amperometric titrations' the current passing through the solution between an indicator electrode and a depolarised reference electrode at a suitable applied e.m.f. is measured against the volume of a suitable titrating solution. The end-point is found as the point of intersection of two lines giving the change of current before and after the equivalence point. A dropping mercury electrode may conveniently be used as the indicator electrode while a saturated calomel electrode connected to the titration cell by a salt bridge forms a suitable reference electrode.

In order to minimise dilution effects during the titration it is usual to use a titrating solution which is ten times stronger than the solution being titrated and for this reason a microburette is best.

This method is particularly suitable for the determination of small amounts of lead by titrating with standard solutions of alkali oxalate, sulphate or dichromate. Of these three, dichromate is the most satisfactory, and titration of lead solutions as dilute as 0.001 M can be carried out quickly and accurately. In neutral solution at a potential of −10 volts, both lead and dichromate give diffusion currents, so that the titration curve has a V-shape. In acid buffer solutions and in stronger acid solutions, the titration can be carried out at an applied e.m.f. of zero. Under these conditions the lead is not reduced but the dichromate gives a diffusion current, giving a ⌋-shaped titration curve. This is of particular advantage when the solution contains substances which are reduced at potentials at which lead gives a diffusion current.

It may be mentioned that amperometric titration has been found very useful in the titration of sulphate and of fluoride with lead nitrate.

Electrodeposition

Passage of a current through a lead solution containing sufficient free nitric acid will deposit the lead on the anode as lead dioxide. Bi, Sn Sb and Mn will contaminate the deposit, while Cl, Hg, As, Fe, Se and P are stated to prevent complete deposition. The deposit is inclined to be powdery and non-adherent and retains water tenaciously up to 180-200°C. Slightly high results are usually obtained by this method, and an empirical factor is generally used. As an alternative to weighing the lead dioxide it may be determined titrimetrically by determination of the iodine liberated from potassium iodide, or by treatment with hydrogen peroxide and titration of the excess with permanganate.

Analysis of Ores

Lead ores present no particular difficulty, as they are usually amenable to acid attack. Lead is almost invariably separated as impure sulphate by fuming with sulphuric acid and then extracted and determined by one of the standard methods.

Zinc Base Alloys

Lead may be determined in a large sample (100 g.) by dissolution in nitric acid and deposition of the lead as PbO_2 from the hot solution (60-70°C.) after addition of 2 g. of copper nitrate. The dithizone method described under tin base alloys is stated to be equally satisfactory for zinc base alloys.

Iron & Steel Analysis

Lead may be isolated by dissolving the sample in dilute sulphuric acid, evaporating to fumes and filtering off impure lead sulphate, or by dissolving in hydrochloric acid and precipitating lead as sulphide. The lead is then taken into solution with ammonium acetate from the sulphate or with nitric acid from the sulphide precipitate and determined by standard methods—usually by precipitation as molybdate.

Foods & Biological Materials

The extreme toxicity of lead combined with the fact that its effects are cumulative (in that repeated doses, each of which is far too small to produce any appreciable effect on health, may cause serious poisoning) makes the determination of traces of this element of considerable importance. It is considered that a total lead intake of roughly 1 mgm. daily is the maximum permissible; indeed, some authorities consider that as much as this may eventually be harmful. Lead contents of drinking water and other beverages accepted by most authorities are 0.3 p.p.m. safe and 0.5 p.p.m. the maximum allowable. With a few special exceptions, food should not contain more than 1-2 p.p.m. of lead.

The determination of such small amounts of lead presents more difficulty than that of similar amounts of arsenic, for with arsenic both the Marsh and Gutzeit tests are highly selective, while with lead interfering metals must be dealt with. Further, it is more difficult with lead than with arsenic to obtain purity of reagents and to prevent contamination during the analysis.

Destruction of organic matter is best accomplished by wet oxidation, mixtures of sulphuric, perchloric and nitric acids being used in varying proportions. Separation of the lead is then necessary, particularly from iron and calcium phosphate; this is best done with dithizone. Moderate amounts of calcium phosphate can be kept in solution by addition of excess of ammonium citrate, and the lead extracted with dithizone from ammoniacal cyanide. In the presence of large amounts of calicum sulphate, lead sulphate will be retained by the precipitate and must be recovered by boiling with potassium carbonate to form calcium carbonate, filtering and dissolving in acetic acid. This solution is neutralised with ammonia, extracted with dithizone and combined with the main extract. Lead in the combined dithizone extracts is then determined either with dithizone or as the sulphide.

Lead

Probably the best method of separating lead from tin and antimony is to remove tin and antimony bromides by evaporation with hydrobromic acid and bromine. The residue is taken up in nitric, perchloric or sulphuric acid according to preference, and lead determined by standard methods. Amounts of lead down to 0.1 per cent can be determined in this way using a sample weight of up to 5 g.

For small amounts of lead, e.g., in tin ingots, a direct dithizone method has been described which gives good results. In it, substantially all the lead is recovered by a single extraction at high *p*H by excess of dithizone, with negligible interference from bismuth which, in the usual procedure, has first to be separated from the lead. The sample is dissolved in hydrochloric acid and peroxide, and made up to a known volume. A suitable aliquot is treated with hydroxylamine and tartrate, and made alkaline with ammonia, sulphite and cyanide being added at the same time. The solution is shaken with 20 ml. of 0.006 per cent solution of dithizone for one minute and the lead dithizonate measured with the Spekker using a mercury lamp and Ilford 603 filter. At the high *p*H used the excess dithizone passes into the aqueous layer.

The same procedure is applicable to the determination of small amounts of lead in copper- and zinc-base alloys.

Copper Base Alloys

The standard method for the separation of lead above 1 per cent is as sulphate after removal of any tin as metastannic acid. The sulphate is then re-dissolved and the lead determined either as molybdate or chromate. This method is rather slow but is useful if a complete analysis is required, as the filtrate from the lead sulphate can be used for other determinations.

If lead alone is to be determined, precipitation of lead chromate, after filtration of any metastannic acid, and subsequent titrimetric determination of the chromate is a convenient and rapid process. Amounts of chromate too small to be titrated may be measured photometrically.

Possibly the simplest and most rapid method for the determination of lead is the polarographic method described by Milner. After dissolution in nitric acid and filtration of any tin, a suitable alinuot is made alkaline with sodium hydroxide and the sulphide, cyanide and gelatin added. A polarogram is then taken in the usual way between 0 and -1 volts.

For lead below 0.1 per cent the dithizone method already mentioned under tin-base alloys is equally satisfactory for copper-base alloys.

(To be continued)

Steel Industry Expansion

Steel production in 1952 exceeded the total of 16,000,000 tons at which the industry had been aiming while the passing of the main production targets set out in the first post-war development plan (originally envisaged for completion in about the middle of 1953) was also achieved. These are two of the highlights in the annual report for 1952 of the British Iron and Steel Federation now published (2s. 6d.). Other matters covered are: the success of the home Scrap Drive; steps taken to implement the report of the Iron and Steel Productivity Team; introduction of the new Iron and Steel Bill; extension of training activities, and new work in the field of accident prevention.

New Work on Adhesives

Developments in Production of Resin-Bonded Plywood

THE rapidly growing importance of plywood as a structural material and for many other purposes—vehicles, furniture, etc.—lends equal importance to the matter of adhesives used in its manufacture. In Canada alone annual output of plywood, largely from Douglas fir, is now more than 400,000,000 sq. ft. Plywood may be of either interior or exterior grade, the latter of course being more resistant to moisture, weather and outdoor conditions generally; and at the same time costing about 50 per cent more in gluing than the interior grade. There is also an intermediate set of conditions, not quite so exacting as the exterior but yet somewhat more exposed than those pertaining to wholly interior. Owing to the lower cost there has been a tendency to use the interior grade in such cases. But the glue bonding has proved inadequate, and the resulting failures have proved prejudicial to the good name of plywood. Apart from plywood there has for some time been also a growing demand for a general all-purpose adhesive that would prove more economic, not only for the above intermediate cases but more generally in the whole adhesives industry. Another important desideratum has been a rapid pressing rate to secure maximum press output.

Inclusion of Protein

Attempts to achieve these aims have been directed partly at least to the inclusion of some form of protein material in the adhesive. For example, in a thermosetting adhesive of phenolic character of high-solids content, the combination has been proposed of a large proportion of low-reactivity and low-molecular weight resin solids with a large proportion of proteinous adhesive base having a low content of water-soluble constituents, to secure a product of relatively high solids and good spreading viscosity.

For a new method and product developed by the Monsanto Chemical Company it is claimed that the foregoing objectives have been attained, but it is a relatively low-content glue, with not more than 40 per cent total, consisting of high mol. wt. highly reactive phenol-aldehyde resins with a smaller amount of an alkali-soluble protein base, preferably of high-water absorption, capable of improving the thermo-setting speed without reducing bond durability. A resin syrup is first prepared of the phenol-aldehyde type, of *p*H 9.5 to 12, and thermal reactivity determined from the time required to gel under given conditons after reaching balance with the water-bath temperature. The syrup is adjusted to about 40 per cent solids and a small sample placed in a test-tube with reflux and immersed in a boiling water bath. If it gels within 100 minutes after temperature balance, and preferably within 50 minutes, the resin is sufficiently reactive. Sometimes the time may be as little as 12 minutes.

Despatch of Product

The syrup may be despatched as such, or in the form of a powder prepared by spray-drying, and the finished adhesive prepared at the customer's plant by addition of the protein of correct form and amount; or this latter may be incorporated before despatch.

A fairly wide range of raw materials is available according to cost: commercial phenol, 37 per cent formalin, and caustic soda or potash may be used, or *m*-cresol or mixed phenols, xylenols, resorcinol, etc., may be substituted for phenol, and acetaldehyde and/or furfural used instead of formalin. Sodium carbonate or other alkali-metal salt may be employed in place of caustic; and a wide variety of protein material is available, but preferably soya bean flour or flakes, or in some cases blood albumen, keratin, or fertiliser blood solubilised with strong alkali. Finally there are numerous fillers such as bentonite, wood flour, China clay, etc., and chemical modifiers, e.g. calcium hydroxide, sodium silicate, pine oil and others.

Patent Details

In their British Patent No. 688,222, the Monsanto Chemical Co., present several examples of the new adhesive prepared for use in the manufacture of Douglas fir ply-

Number	Construction	Assembly Time (min.)	Pressing Time (min.)	Shear Results and Percentage Wood Failure		Alternate Boil Test	Concrete Form Test
				Dry	Wet		
1	13/16 in.	10	7	201–91	145–34	94–41	Passed
2	,,	3	7	235–80	201–70	136–66	,,
3	,,	10	7.5	210–100	204–68	155–68	,,
4	,,	10	6	181–71	153–89	123–74	,,
5	,,	15	7	226–100	151–74	106–76	,,
6	,,	15	6.5	259–98	230–78	184–90	,,
7	5/16 in.	10	4	262–97	241–94	200–100	,,
8	13/16 in.	10	6	223–100	206–63	179–78	,,
9	,,	10	7.5	205–76	136–64	93–39	,,
10	,,	10	7	234–69	171–30	146–25	,,
11	,,	10	6	238–85	198–70	156–74	,,

wood, though not necessarily limited to this product. Other uses are envisaged, such as paper laminates, or hot-pressed shaped articles from powdered raw material. In such cases the plywood glue formulation may be modified in various ways, by reducing or omitting the fillers or varying the chemical modifiers.

Eleven different formulations are given in the specification, and fir plywood was made from these in the hot press with the following test results. Hydraulic pressure of 175 lb., and press temperature of about 285°F., were used with varying pressing times of 4 to 7.5 min.

In these eleven glues total percentage of theoretical adhesive solids ranged from 17.5 to 25.2, of resins from 12.7 to 18.7, and of protein from 4.2 to 7.1 per cent, *p*H range was 9.5 to 12, and viscosity 1,200 to 40,000 centipoises. With a gross spread for fir plywood of about 55 lb., wet glue per 1,000 sq. ft. of double glue line, satisfactory plywood bond strength is readily obtained. Even lower spreads may often be used, especially with thin assemblies. Using the previously known exterior grade phenolic adhesives a gross spread of about 66 lb., wet glue is required, costing at present prices (date of application of patent in U.S. was April 13, 1949) about 40s., per 1,000 sq. ft., as compared with 16s. 6d. to 22s. 6d. for the new adhesives. Another advantage of the new products, from the point of view of fire risk, is that plywood made with these burns much more slowly. The plies do not curl towards the fire and feed the flames, but slowly char away, thus considerably slowing down the rate of combustion.

Hostel's Annual Dinner

THERE will be a departure from fairly-long established custom when the John Benn Boys' Hostels Association holds its annual dinner at the May Fair Hotel, London, on 22 April. Hitherto the association—which numbers several well-known personalities in the chemical and allied trades among its supporters—has had the distinguished head of one of the great Public Schools as proposer of the toast, 'The London Boy.' At the forthcoming dinner, over which Lord Leverhulme will preside, this toast will be proposed by Vice-Admiral J. A. S. Eccles, C.B., C.B.E., and the Rev. Derek Brinn will respond to it. He is a Hostel old boy. Other speakers will include Sir Theobald Mathew, K.B.E., M.C., the Director of Public Prosecutions; Mr. Henry Longhurst; and Mr. Glanvill Benn.

Tickets for the annual dinner at the May Fair are available on application to the Appeal Secretary, John Benn Boys' Hostels Association, Bouverie House, 154 Fleet Street, London, E.C.4, price 25s.

Industrial Research Surveys

IN the House of Commons recently, Mr. A. Molson, replying on behalf of the Lord President of the Council to a question by Mr. A. Albu, announced that the Manchester Joint Research Council's survey of the technical resources of industrial firms was complete and was being prepared for publication; the Department of Engineering Production at Birmingham University was continuing its survey and was expected to publish the results in an appropriate journal. It was not proposed to publish a report of the Social Survey of the Central Office of Information, but the Department of Scientific and Industrial Research were considering the preparation of a general paper covering all three surveys.

Ion Exchange Resins as Catalysts

ION exchange resins may be considered as insoluble acids and bases. Materials containing sulphonic acid radicles are strong acids, while those with carboxylic acid groups are weak acids. In a similar fashion weakly basic ion exchange resins contain the free amino group, while the introduction of quaternary ammonium groups produces strongly basic properties. It was therefore to be expected that these materials would behave like conventional acids and bases having catalytic activity in the appropriate reactions. The advantages of heterogeneous catalysis are many. The catalyst may be removed from the reaction mixture by filtration and thus the product does not require separation. The catalyst may be used again provided there is no attack by the reaction medium and the contact time with the reactants may be made as short as desired, an advantage when labile substances are being used. Finally the process lends itself particularly to continuous operation.

It was in all probability considerations such as these which promoted the investigation by German chemists during the late war into the use of cation exchangers such as Wofatit for esterification, hydrolysis and ester interchange reactions[1,2]. Their efforts were successful enough to enable a large-scale plant for continuous esterification to be constructed. The publication of reports upon this work stimulated a great deal of interest in resin catalysed esterification and hydrolysis.

Hydrolysis of Esters

Davies and Thomas[3] studied the hydrolysis of esters with the commercial resin Amberlite I.R. 100 and found that the reaction kinetics of the hydrolysis of ethyl and methyl acetate suggested a first order reaction which is the same as that observed for homogeneous systems. With higher esters such as *n*-butyl and benzyl acetates the reaction was of zero order. Haskell and Hammett[4] studied the kinetics of acid catalysed hydrolysis in more detail and in order to obtain comparable results with homogeneous systems they selected 70 per cent acetone as the medium. Previous work using mineral acid in this medium had shown the reaction to be of the first order. When the resin catalysed reaction was compared with the hydrochloric acid catalysed hydrolysis the free energy of activation was found to increase almost linearly with the increase in chain length of the ester.

The Reverse Reaction

The reverse reaction of esterification was examined by Levesque and Craig[5] who used as their catalyst a phenol-formaldehyde-sulphonic acid resin similar in properties to the commercially available Amberlite I.R. 100. The resin was heated with a mixture of *n*-butanol and oleic acid. They found that the velocity constant of the reaction was directly proportional to the surface area of the ion exchange resin and also that the reaction was of the second order. There was, however, an unexplained induction period during which this was not obeyed.

Work carried out much earlier than this by S. Sussman was published in a rather fragmentary form[6] soon after the appearance of the German reports.

The principle ion exchanger used by Sussman was ZeoKarb H, a strongly acidic substance from sulphonated coal; but he also carried out a few experiments with the phenol-formaldehyde-sulphonic acid type of exchanger. He discovered that cation exchangers could be used to catalyse reactions with materials which would be destroyed by the normal acidic catalysts. Thus he was able to esterify furfuryl alcohol with acetic acid using ZeoKarb H as the catalyst, the water of reaction being removed azeotropically with boiling benzene. This direct esterification had not been successful previously because of the strong tendency to resinification in the presence of mineral acids exhibited by furfuryl alcohol. Although the yields were comparatively low there was no trace of resinfication.

The esterification of *n*-butanol with oleic acid was used as a standard reaction to study the effect of catalyst type, and the life of the ion exchanger, water evolution being used to determine the rate of reaction. Other esters prepared in this manner were triacetin, glycol diacetate and ethyl chloroacetate. Attempts to carry out the reverse reaction of ester hydrolysis were much less successful. In these experiments the ester or fat was boiled with water and the cation exchanger. In the only case reported ethanol was used as a mutual solvent for butyl oleate and water and in this case a 9 per cent yield of oleic acid was obtained.

The author attributed this failure to the poor contact obtainable in the three phase system ester-water-catalyst. Experiments with ester interchange were more successful and when amyl acetate was refluxed with methanol in the presence of ZeoKarb H there was a 70 per cent conversion to amyl alcohol and methyl acetate, the latter being distilled off as formed in the form of its azeotrope with methanol. The reaction was very slow, but this was ascribed to low catalyst dosage in terms of available acidity.

Progress in Germany

Much of the work upon esterification and hydrolysis had been carried to a far greater degree of completeness in Germany, but Sussman extended the principle to other reactions normally catalysed by the hydrogen ion. The preparation of acetals is often complicated by the fact that although acetal formation is promoted by small proportions of acids the resulting acetal is sensitive to acids, particularly so at elevated temperatures. Very good yields of the acetals were obtained by refluxing the aldehyde and alcohol in the presence of a cation exchanger while distilling off the water as formed. Mixed glycerol formals were prepared from paraformaldehyde and glycerol, and di-*n*-butoxy-methane was made from paraformaldehyde and *n*-butanol. In the latter case the formal was distilled directly from the reaction flask without the removal of the catalyst, but no charring or discoloration took place. This method should be of particular interest when preparing the acetals of labile alcohols or aldehydes which show a tendency to resinify, such as propargyl aldehyde. At the present time, however, this aspect has not been investigated. Alcoholysis of the acetals was also achieved by refluxing the acetal and an alcohol in the presence of the cation exchanger. Thus methylal was prepared from di-*n*-butoxy-methane by boiling with methanol in the presence of ZeoKarb H and removing the methylal as formed in the form of its azeotrope with methanol.

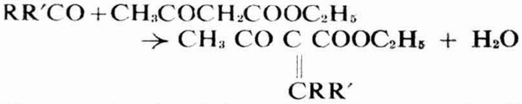
Dehydration of *tert*-butanol to isobutylene was achieved by heating with a cation exchanger in xylene, but decomposition of the catalyst occurred when it was used in an attempt to dehydrate castor oil. Finally, sucrose inversion was carried out by heating 33 per cent sucrose solution in the presence of the cation exchanger, the resulting solution being tested with Fehlings solution. The best results were obtained by heating at 90° for half an hour, lower temperatures and shorter times being much less effective.

All this work was carried out with strongly acidic cation exchange resins, there appear to be no similar uses for the weakly acidic resins. More recently, however, it has been found that both the strong and weakly basic anion exchange resins have considerable applications in the catalysis of organic reactions. The first mention of this affect appeared in a patent[7] where Spurlin claimed the use of a methylated anion exchanger and sodium chloride to replace calcium oxide in the synthesis of pentaerythritol. Sussman, however, considered that this was not a true example of the catalytic action of an ion exchange resin because by the normal process of ion exchange the salt would be converted into caustic soda, itself capable of catalysing the formation of pentaerythritol. Later on, however, Galat[8] found that Amberlite I.R. 400 was an excellent catalyst for the hydration of nicotinonitrile. The normal procedure which uses caustic alkali gives a poor yield of the amide owing to the formation of the acid as a contaminant. When the nitrile was boiled in aqueous solution in the presence of the anion exchanger a 90 per cent yield of almost pure amide was obtained. Jenny[9] studied the mutarotation of glucose in the presence of anion exchangers while Ueno[10] has described the use of anion exchange resins in the aldolisation of acetaldehyde and the addition of alcohols to propionolactone.

These examples may be described as isolated instances of the use of anion exchangers, but during the last two years there have appeared two extended investigations into the possibilities of the basic ion exchangers as catalysts for organic reactions. The first of these was read as a series of papers at the 119th meeting of the American Chemical Society in 1951 and published a year later[11].

Knoevenagel Condensation

The Knoevenagel condensation consists in its simplest form of the condensation of a carbonyl compound with a substance containing a reactive methylene group such as ethyl acetoacetate, ethyl malonate or ethyl cyanoacetate.



$$RR'CO + CH_3COCH_2COOC_2H_5 \rightarrow CH_3\ CO\ \underset{\underset{CRR'}{\|}}{C}\ COOC_2H_5 + H_2O$$

The reaction has been studied in some detail by Cope[12] and his co-workers and has been shown to be reversible and to be catalysed by amines and their salts, the most satisfactory being piperidine and its acetate salt. Astle and Zaslowsky[11] replaced the amine catalyst by basic ion exchangers and prepared a large number of the condensation products with a variety of aldehydes. Where the aldehyde did not readily undergo the aldol reaction, e.g., substituted aldehydes, long chain aliphatic aldehydes and aromatic aldehydes, the mixture of ester aldehyde and catalyst was boiled with benzene and the water of reaction removed continuously as an azeotrope. The more sensitive aldehydes were merely shaken with the ester in the presence of the anion exchanger. Where the aldol appeared as a side product it was dehydrated to the unsaturated compound by heating above 100°C. The authors discovered that the efficiency of the strongly basic exchangers, Amberlite I.R.A. 400 and Dowex 1 was less than the weakly basic resins Deacidite, Deacidite acetate, Amberlite I R. 4B, Amberlite I.R. 4B acetate and Duolite A.4, and this was attributed to the lower capacity. The efficiency of the weakly basic resins is further enhanced by the undiminished activity of the carboxylic acid neutralised materials. The weakly basic anion exchangers were not inactivated by several condensations even at the temperature of boiling benzene; the strongly basic materials on the other hand were rapidly inactivated, probably due to the formation of salts with small quantities of acids.

Aldol Condensation

The Aldol condensation of aldehydes and ketones may be defined as the addition of active hydrogen from one molecule of the carbonyl compound to the C : O bond in a second molecule followed by carbon-carbon addition of the residues. The resulting alcohol may further be dehydrated to an unsaturated compound.

$$2\ RCH_2CHO \rightarrow RCH_2CH(OH)CHR.CHO \rightarrow RCH_2.CH : CR.CHO + H_2O$$

A large number of substances have been suggested as catalysts for this reaction, some acidic, such as zinc chloride and hydrochloric acid, others basic such as sodium ethoxide and hydroxide, carbonate or acetate. The efficacy of amine salts and amino acids suggested the use of ion exchangers. The same range of resins was used as in the previous investigation and as before it was found that the strongly basic resins were rapidly inactivated. However, when butyraldehyde was passed through a column of Amberlite I.R.A. 400 there was considerable evolution of heat and resinification with the formation of α-ethyl-β-propyl acrolein. Continuous operation was possible using a column packed with a weakly basic exchanger or its acetate salt; but in this case the aldol was the primary product. The effectiveness of weakly basic resins increased after several runs and this was considered to be due to the conversion of the resin to its carboxylic acid salt by the traces of organic acids always present to a small extent in aldehydes, this contention being supported by the superior effectiveness of the acetate salts as catalysts. The yield of aldol was increased by longer contact times. The amine type anion exchangers Amberlite I.R. 4B, I.R. 45 and Deacidite were not strong enough to promote the formation of diacetone alcohol from acetone; but the aldol could be prepared by refluxing acetone in a soxhlet apparatus with a quaternary ammonium type exchanger such as Amberlite I.R. 400 in the thimble. Dehydration to mesityl oxide could be achieved by placing a quantity of strongly acidic ion exchanger in the boiler.

Cyanoethylation of Alcohols

The cyanoethylation of alcohols with acrylonitrile is catalysed by such basic materials as alkali metal hydroxides and ethoxides and tetra-alkylammonium hydroxides. Primary and secondary amines undergo the cyanoethylation reaction spontaneously without the use of a catalyst and so it was not anticipated that the amine type anion exchangers would be suitable for the catalysis of the alcohol cyanoethylation reaction. This was found to be so in practice and the reaction was only catalysed by the quaternary ammonium hydroxide type of resin. The reaction is very vigorous and with the more reactive alcohols is best carried out below 15°C., but for the alcohols of higher molecular weight such as methyl cellusolve or furfuryl alcohol the temperature could be raised to 45°C. The yields of the alkoxy propionitriles are very good and the reaction procedure is simplified by there being no need to neutralise the catalyst. *tert*-Butyl alcohol could not be made to react with acrylonitrile and could be used as a solvent for other reaction mixtures. Inactivation of the catalyst which was observed after a few runs was probably due to the presence of a film of polyacrylonitrile on the surface of the ion exchanger.

These findings were largely confirmed by another group of workers, C. Schmidle and R. Mansfield[13], but they laid stress upon the influence of the water content of the strongly basic resins upon the course of reaction pointing out that acrylonitrile reacts with water in the presence of the ion exchanger to produce *bis*-(2 cyanoethyl)-ether. They considered that the relatively high moisture content, the thermal instability and the consequent difficulty of drying the strongly basic anion exchange resins limited their usefulness. Nevertheless, by vacuum drying they were able to use the resins as catalysts for the cyanoethylation of hydrogen cyanide, methyl ethyl ketone, nitroethane and ethyl acetoacetate.

Nitro-Alcohol Formation

The condensation of aldehydes with nitro paraffins was found to be effectively catalysed by Amberite I.R. 400 and I.R.A. 410.

$$RCHO + R'CH_2NO_2 \rightarrow RCHOH.CHR'NO_2$$

The reaction could be carried out continuously by allowing the mixture to flow down a jacketed column of the exchanger.

Cyanhydrin Formation

The preparation of cyanhydrins from carbonyl compounds and hydrogen cyanide was found to be effectively catalysed by Amberlite I.R. 400 and I.R. 45. Those aldehydes susceptible to aldolisation were mixed with the acid before the resin catalyst was added.

Benzoin formation of a number of aldehydes was promoted by converting the ion exchanger to its hydrogen cyanide salt. Continuous operation could be achieved with a heated column of exchanger.

From these studies it is certain that there are many reactions in which ion exchange resins can advantageously replace the conventional acids and bases. It is even more certain that there are many more such reactions which have not yet been investigated where these materials may be useful catalysts.—J.R.M.

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Bradford Technical College

TWO new courses to be held in the summer term in the Department of Chemistry and Dyeing are announced by the Technical College, Bradford.

The first, beginning on 20 May, will consist of a series of nine lectures and demonstrations on 'The Chemistry of High Polymers' to be held on Wednesday evenings at 7 p.m. The course is of a post-graduate nature, designed to present a survey of the modern chemistry of high polymers, including industrial and textile aspects.

A knowledge of elementary classical thermodynamics will be required in later lectures, and a course on the subject is being arranged to provide students with an opportunity for revision if they require it.

Lectures will be given by Dr. R. L. Elliott, head of the department, and Dr. W. R. Moore, senior lecturer in physical chemistry, who will be assisted in demonstrations by members of the research staff of the department.

Fee for the course is 30s.

The course on 'Chemical Thermodynamics' will be of a post-graduate refresher nature, designed to present a survey of chemical thermodynamics and its applications to problems of interest to both the industrial and research chemist.

Dr. W. R. Moore, senior lecturer in physical chemistry, will be the speaker, and the series will consist of 10 lectures on Thursday evenings, at 7 p.m., beginning on 21 May. Fee for the course will be 30s.

South African Corundum

Industrial & Strategic Importance of Abrasive Mineral

NEXT to the diamond, corundum is the hardest natural mineral known, and this property makes it industrially valuable as an abrasive and as a raw material for the manufacture of abrasive tools. Corundum is actually an impure form of the ruby and the sapphire, being a composition of alumina and oxygen, with impurities such as silica, ferric oxide, and so on, and combined water. It might also be described as a pure form of emery.

As an abrasive this mineral has many uses. It makes excellent grinding wheels for finishing materials of high tensile strength. It is also used for coating abrasive cloth and, to some extent, in grain forms, for setting up polishing wheels. It is an ideal medium for grinding glass, for which purpose it is being increasingly used by the optical industry, although the manufacture of grinding wheels is still by far the largest field of usage. The coarser grain sizes are purchased by grinding wheel manufacturers and the finer-sized products by optical lens makers. The fine dust remaining after use by the optical instrument grinders is sold to retail opticians.

Corundum often crystalises direct from magma rich in alumina and poor in silica, as in the nepheline syenites of certain parts of Ontario, which were formerly among the most important producers of the mineral. Between 1921 and 1940, however, there was virtually no Canadian output. During the decade ended in 1940, practically the whole of the world's supply of corundum came from veins in the north-eastern Transvaal and their weathered outcrops.

Location of Deposits

Deposits of corundum have been noted in many localities throughout South Africa, but apart from small quantities produced in Namaqualand, mining has been confined to certain districts of the Northern Transvaal. The sizes of individual Transvaal deposits vary within wide limits. Of those known at present the vast majority have only a few hundred to a few thousand tons of corundum bearing rock with an average corundum content not exceeding 40 per cent. The average size of the crystals in the various deposits also varies widely. Some exceedingly large crystals, weighing up to 300 lb., have been found, but these are exceptional. The majority range from an eighth-of-an-inch to four inches in length.

'Crystal' Corundum

Most of the corundum produced is recovered and marketed as a crude 'crystal' corundum, consisting of loose crystals and fragments of clean corundum, which may be derived from eluvial as well as from the primary or 'reef' deposits. The known occurrences of eluvial corundum are more widely distributed than those of the primary deposits, and for many years the bulk of the production was derived from this type of deposit. The concentration of corundum in the eluvial deposits varies considerably in different deposits and in different parts of the same deposit. Corundum may be present only as a few isolated crystals scattered through the soil in insufficient quantities to repay working. On the other hand, 'pockets' containing an extraordinarily high concentration of corundum have been found.

In the eluvial deposits recovery is effected by screening and concentration, washing being carried out in rotary pans similar to those used in the alluvial diamond diggings. The working of reef deposits has been very largely confined to those deposits in which the rock has been rendered comparatively soft by weathering, or where it is naturally friable. After the rock has been broken the corundum is recovered by hand-cobbing and jigging.

Should further cleaning be necessary to remove adhering fragments of felspar or schist, this is carried out by simple devices such as revolving barrels or beater mills. The final product is clean crystal corundum of excellent abrasive quality, which is marketed in three grades based on size and total aluminium content.

A considerable quantity of boulder corundum is also exported. This material undergoes no treatment before shipment other than breaking into sizes convenient for bulk handling. The corundum content of boulder corundum exported is usually between 65 and 70 per cent.

Competition from artificial abrasives was largely responsible for a decline in South African exports of corundum from 4,851 short tons (value £39,240) in 1936 to 1,540 short tons (value £12,454) in 1938. That the industry was able to survive this competition was due to the special suitability of South African corundum for certain purposes, to the development of an efficient system of distribution in the U.S.A., and also to Government control of grading and exports. All corundum exported from the Union is subject to Government grading, and no consignment may be railed for export unless it conforms to the provisions of the regulations and unless an export certificate has been issued by an authorised Government grading officer.

U.S.A. Chief Market

The U.S.A. has consistently absorbed the bulk of the South African output. For many years producers endeavoured to develop new markets in Europe, but little success was experienced until 1936, when there was an appreciable increase in sales to Britain.

Outbreak of war in 1939 brought about a sudden transformation in the outlook for producers. The requirements of the British and American armaments programmes led to a tremendous revival of mining activities in the Union. During 1940 imports of corundum into the U.S.A. rose sharply to 5,718 tons. The following year the Union's only large producer embarked on the construction of a £20,000 plant for the treatment of the corundiferous rock and the preparation of the production for export.

So essential was corundum to war production that in 1944 plans were under consideration by the Amercan War Production Board to increase imports from Southern Africa to meet the growing demands of American industry. The foreign economic administration had already designed a programme to obtain increased corundum production. Apart from shipments of 238 tons of crystal to the United Kingdom, the entire 1945 output of 4,827 tons was purchased by the U.S.A.

In 1946, production fell to 2,047 short tons (value £31,955), but even before the outbreak of the Korean war the tide had turned again. In 1949 there was a production of 2,716 tons (value £49,733). In 1951, South Africa produced 3,162 tons of crystal, 1,749 tons of boulder, and 119 tons of concentrates. With the exception of the concentrates, which went to Britain, the whole of the year's output was purchased by the United States. In the first nine months of last year there was a production of 2,404 tons of crystal (value £60,148). 575 tons of boulder (value £4,886) and 2 tons of concentrates (value £140). Again, the entire output except for the concentrates was shipped to America.

Large deposits of corundum occur in the Marandellas and Rusape districts of Southern Rhodesia, and there is a small production from occurrences in Nyasaland. Deposits of high-grade corundum also exist in the Tete district of Mocambique, where a very large tonnage has been proved. The method of working consists simply of breaking and hand-sorting the alluvial.

Apart from South Africa, the only Commonwealth countries which produced corundum in 1951 were India (548 tons), Nyasaland (106 tons) and Malaya (25 tons). There has been no Canadian production for several years.

Corundum's industrial and strategic importance cannot be judged by the limited production and demand, because so far no alternative material has been discovered which is a wholly acceptable substitute for this natural abrasive.

First Joint Conference

THE first joint conference of the American Institute of Chemical Engineers and the Chemical Engineering Division of the Chemical Institute of Canada will be held in Toronto, 26, 27, 28 and 29 April. Six of the seven leading American universities that are presenting papers discuss recent developments in the fundamentals of distillation and extraction. The Oak Ridge National Laboratory presents two papers on radiochemical techniques including one on extraction of radio-active materials in pulse columns which should be of particular interest. Three papers are concerned with sulphite liquors, covering alcohol production. decationisation and the Sulfox process. Others papers are concerned with the Biazzi continuous process of manufacturing nitroglycerine, ion exchange mechanisms and recovery of sulphur from zinc concentrates. The increasing development of plant design in Canada is reflected by two Canadian papers on process plant design and the use of scale models in design.

Cosmetic Chemists' Meeting

Lecture on 'Dyes' given by J. K. Barraclough

THE Society of Cosmetic Chemists of Great Britain held their fourth scientific meeting of the winter session in the conference room of the British Colour Council, 13 Portman Square, London, W.1, on 3 March, when a lecture on 'Dyes' was given by Mr. J. K. Barraclough, B.Sc., A.R.I.C. The general properties of pigments were reviewed, with particular emphasis on those aspects of especial interest to cosmetic chemists.

Mr. Barraclough discussed first the naturally occurring coloured materials which form a relatively cheap source of supply of materials and, after suitable treatment, may be used as pigments. They depend for colour on the presence of oxides of iron and are known under the names of ochre, umber, sienna, etc. The disadvantages inherent in these naturally occurring compounds include variations in tinctorial power and in the nature and concentration of impurities they contain. Certain impurities can, of course, render a pigment unfit for use in a particular product, e.g., the presence of antimony, arsenic, lead, etc., would be most undesirable in cosmetic preparations.

Yellow and yellowish-brown earth-colours contain the hydrated form of ferric oxide, while the reds and reddish-browns contain the non-hydrated forms. Umber contains appreciable quantities of manganese. Most of the earth-colours can be replaced by 'synthetic' oxides of iron; the latter do not suffer from the disadvantages of the former and are generally capable of being ground to a finer degree.

Properties Vary

Oxides of iron may be obtained by precipitation from a solution of ferrous sulphate or by calcination of ferrous sulphate. The colour and general properties of the oxides may vary considerably from batch to batch unless conditions of manufacture are controlled very carefully. Mr. Barraclough pointed out that aqueous extracts from naturally occurring pigments are usually alkaline, whereas those from 'synthetic' oxides are acid; this fact may be of importance with respect to the stability of nicely balanced emulsions in which pigments are incorporated.

Reference was made by the lecturer to black oxide of iron, a by-product of the manufacture of aniline where iron is used catalytically in the reduction of nitrobenzene. He pointed out that the incorporation of a diluent in a pigment could be the means of varying the properties of the pigment and/or of the final product of which the pigment is an ingredient.

Terms Defined

The terms 'lake,' 'toner' and 'pigment dyestuff' have definite meanings to the manufacturer of these products, but as such terms are often used indiscriminately by consumers, Mr. Barraclough took pains to define them carefully. Examples of each were quoted and formulae, methods of manufacture and properties were detailed.

Discussing the manufacture of madder lakes, mention was made by the lecturer of the fact that significant amounts of Turkey red oil are used in the process. Many pigments are produced in the presence of, or are subsequently treated with, surface active agents which are adsorbed upon the surface of the particles of pigment. This point is worthy of note because of the possibility of allergic response that may be provoked from hyper-sensitive users of preparations containing such pigments. However, the general use in industry of such pigments indicates that no serious danger exists.

The field of pigment dyestuffs is expanding daily. The three main factors leading to the development of the large range of pigments available to-day are:—

(1) Certain compounds containing active hydrogen atoms can be substituted for naphthols—this discovery increased the range of colours available.

(2) In some instances diamines, e.g., benzidine or substituted benzidines, can be tetrazotised and coupled to give pigments which possess improved qualities.

(3) β-hydroxy-naphthoic acid will form an anilide and substituted anilides. Knowledge of this reaction placed more than a score of new intermediates in the hands of the chemist.

Formulæ illustrating these developments were detailed.

At the close of the lecture, questions asked by members were answered by Mr. Barraclough and his colleague, Mr. H. Webb. Stress was laid on the cosmetic industry's need of improved quality and of guaranteed freedom from certain impurities. Answering comments about alleged variations in tinctorial power of several batches of pigment, the lecturer referred to the tests recommended by the B.S.I., and pointed out the necessity for strict adherence to the standard conditions laid down.

The thanks of the meeting to Mr. Barraclough and Mr. Webb were expressed by the president, Dr. R. H. Marriott.

MIT Summer Session

SPECIAL programmes during the 1953 Summer Session have been announced by Massachusetts Institute of Technology. In July two courses in infra-red spectroscopy will be conducted by Professor R. C. Lord and Dr. F. A. Miller: from 6-10 July the course will be devoted to IR instrumentation and the technique of measurement of spectra; and from 13-17 July the course will cover molecular absorption spectra, their interpretation and their use in the analysis of such substances as hydrocarbons, high polymers and natural products. Modern instruments lent by the manufacturers and modified research equipment will be available for laboratory work.

A course in electrical methods of analysis, with emphasis on polarography, potentiometry, amperometric titration and other applications will be given from 17-21 August; and from 24-28 August there will be a course in optical methods, including spectrophotometry, fluorimetry, nephelometry, photometric titrations and flame photometry. Both courses will be conducted by Professors D. N. Hume and L. B. Rogers.

Uranium in Argentina

The National Commission of Atomic Energy has issued a decree stating that it will buy all the uranium produced in Argentina and that all holders of stocks must sell them to the commission. A sliding scale of prices has been fixed according to the content of the element in one ton of ore, and is valid for a year from 60 days after the publication of the decree.

Microchemical Apparatus

New Standards Available

FOUR further parts of B.S. 1428 for microchemical apparatus, publication of which was begun in 1950, have now been issued by the British Standards Institution. The published parts now total 11, and as many more are in active preparation.

The new parts now available are as follows:—Part A.4: 1953 'Halogens and Sulphur Combustion Train (micro-Grote)' which specifies the components required for the micro-Grote combustion train, and includes dimensioned drawings of the main components and a general assembly drawing of the whole train. The combustion tube specified is of quartz and the absorption vessel of borosilicate glass.

Part B.1: 1953 'Nitrogen Determination Apparatus (micro-Kjeldahl)' specifies components for the micro-Kjeldahl digestion apparatus and distillation apparatus, the latter being of the Parnas-Wagner type. Suitable supporting stands are also described, but are not a mandatory part of the specification. Dimensioned drawings are given for all components.

Part E.1: 1953 'Crucibles for Microchemical Analysis' specifies crucibles suitable for general use in microchemical analysis. Four sizes of platinum crucible, two sizes of nickel crucible and three sizes of porcelain crucible, having nominal capacities between 1 and 10 ml., are described, with dimensioned drawings. Appropriate requirements are also included for material, weight, constancy of weight after specified treatment, and marking.

Part I.1: 1953 'Combustion Boats, Sheath and Contact Stars for Microchemical Analysis' specifies one size of platinum boat, three sizes of porcelain boat, a sheath for the platinum boat and platinum contact stars designed to fit the micro-combustion tubes specified in other parts of B.S.1428. Dimensioned drawings are included as well as appropriate requirements for materials, weight, constancy of weight of the boats after specified treatment, and marking.

Copies of these standards may be obtained from the British Standards Institution, Sales Branch, 24 Victoria Street, London, S.W.1. (Price 2s. 6d.).

A Factory Survey

CHANGES in industrial conditions over half a century are reviewed in the annual report of the Chief Inspector of Factories (Sir George Barnett), for the year 1951, which has been presented to Parliament and was published on 26 March. (Command 8772. HMSO. 6s. 9d., post paid.)

Many improvements have taken place during the period notably in mechanisation, cleanliness and lighting. The increasing appreciation and use of mechanical handling equipment has not only led to greater productivity, but also made a definite contribution to industrial safety.

In the section dealing with industrial poisoning and diseases the report states that there was a decrease in the total number of gassing accidents which fell from 242 (25 fatal) in 1950 to 228 (17 fatal) in 1951. Carbon monoxide poisoning was responsible for the largest number of cases during the year—105, including nine deaths.

Decennial statistics since 1900 of the number of cases of industrial diseases are included in the report. Throughout the period the highest number of cases arose from lead poisoning, anthrax, epitheliomatous ulceration and chrome ulceration. The year 1951 was no exception. During the year there were 64 cases of lead poisoning, which was seven more than in 1950, but as in that year, no case was fatal.

There were 178 cases of epitheliomatous ulceration. Only one proved fatal, which was a record since 1920 when the disease first became notifiable. Notifications of chrome ulceration totalled 203 as against 143 in the previous year. The increase was attributed mainly to the greater number of cases in the manufacture of bichromates.

MSA Aid for Fertiliser Drive

A sum of £41,000 towards the cost of a series of demonstrations of the use of fertilisers on farms throughout England and Wales has been accepted by the Ministry of Agriculture and Fisheries from the American Mutual Security Agency. Four types of demonstration will be organised by the National Agricultural Advisory Service. They will be related to local conditions and their purpose will be to show farmers the value of improved fertiliser practice and better management in increasing the production of grass, fodder and cereals.

Acetic Acid Prices

REDUCTIONS in the price of acetic acid with effect from 30 March, 1953, are announced by A. Boake, Roberts & Co., Limited, London, as follows:—

	Reduced by Per Ton	New Price Per Ton 98-100 per cent	New Price Per Ton 99-100 per cent
Minimum 10 ton (spot or contract over a calendar year)	£11	£94	£97
Minimum 1 ton but less than 10 ton (spot or contract over a calendar year) ..	£10	£96	£99
Minimum 4 cwt. (1 × 40 gal. cask) but less than 1 ton ..	£8	£99	£102
Minimum 2 cwt.	£8	£104	£107
Less than 2 cwt.	£8	£109	£112

Acetic acid glacial, B.P. £3 per ton extra on the price of acetic acid 99/100 per cent.

There is a reduction of £2 per ton on acetic acid 80 per cent, the new prices per ton being as follows:—

	80 per cent Technical	80 per cent Pure
Minimum 10 ton (spot or contract over a calendar year)	£86	£92
Minimum 1 ton, but less than 10 ton (spot or contract over a calendar year)	£88	£94
Minimum 4 cwt. (1 × 40 gal. cask) but less than 1 ton	£91	£97
Minimum 2 cwt.	£96	£102
Less than 2 cwt.	£101	£107

Filling charges for demijohns and carboys remain unaltered.

Similar reductions in the prices of BISOL acetic acid are announced by British Industrial Solvents, Limited, London, which also announces a new schedule for BISOL acetic anhydride and BISOL acetates effective from 30 March, 1953.

Revised prices of BISOL acetic anhydride are:—10 ton (spot or contract) £136; one ton (spot or contract) £138; 90-gallon drum £141.

Prices of BISOL acetates under the new schedule are, per ton, as follows:—

Ten-ton (composite contract over six months): butyl acetate £171; ethyl acetate £135; isopropyl acetate £130; isobutyl acetate £160. One-ton (composite contract over six months), an extra £2 per ton; 1 × 45 gallon drum, an increase of £5 per ton.

Malayan Tin Shipments

Shipments of tin from Malaya during March totalled 6,866 tons, compared with 4,957 tons in February. This was the highest monthly total since September last. Shipments for the first quarter of the year totalled 17,500 tons, compared with 14,241 tons for the corresponding period last year.

• HOME •

Methylated Spirit & Finish

Reduced prices for industrial methylated spirits, pyridinised industrial methylated spirits, mineralised methylated spirits (coloured violet), methylated resin finish and methylated shellac finish are announced by The Methylating Company, Limited, London, as from 1 April and until further notice. Attention is drawn to the revised terms of payment. Prices in future will be on a net basis, as the $2\frac{1}{2}$ per cent discount formerly allowed has been taken into account in calculating the revised prices.

Fluorine Fumes

Replying on behalf of the Minister of Labour to questions by Dr. B. Stross and Mr. Ellis Smith in the Commons recently, Mr. Watkinson said that his department were always on the watch for inadequate ventilation arrangements in factories employing fluoride processes, and agreed to look into the matter of consultation with the Ministry of Agriculture and other Ministries about the alleged contamination of soil and atmosphere in vicinities such as Stoke-on-Trent.

Parliamentary & Scientific Committee

A meeting of the general committee of the Parliamentary and Scientific Committee will be held on Thursday next, 16 April, in Committee Room 12 of the House of Commons. In addition to the transaction of business matters there will be an address on 'Primary Factors in African Agriculture,' by Sir Frank Engledow, Professor of Agriculture, Cambridge University.

Chemical Expansion in Lincolnshire

One of Lincolnshire's largest chemical works, Bitmac, Ltd., is planning to raise its manufacturing capacity by from 15-20 per cent. It is hoped to have the project completed by September this year when increasing supplies of materials from the Redbourn (Scunthorpe) steelworks of Richard Thomas and Baldwins, Ltd., will be able to be dealt with. The expansion is part of a gradual continuous development scheme, and the present phase has been timed to coincide with a battery of coke ovens now being installed at the steelworks. New installations include a 10,000-gallon capacity benzole still and two fractionating columns.

Antimony Oxide Cheaper

The price of antimony oxide was reduced by Associated Lead Manufacturers, Ltd., by £10 a ton as from 1 April. New prices are £195 a ton for 'Red Star' in five-ton lots, and £192 10s. a ton for 'O' quality in one-ton lots.

Coronation Seats

One hundred free places to see the Coronation procession from Dunlop's headquarters in St. James's Street are being balloted for by their employees in England, Scotland and Wales. The lucky hundred will have their railway fares paid to London and back.

Fine Chemicals Group

At the fourth annual meeting of the Fine Chemicals Group of the Society of Chemical Industry, to be held at King's College, Strand, W.C.2, on Friday, 17 April, at 7 p.m., the business will include the presentation of reports by the hon. secretary and the hon. treasurer. Officers for 1953-54 have been appointed by the committee as follows: chairman, Dr. William Mitchell; vice-chairmen, Professor F. Bergel and Dr. Norman Evers; hon. secretary, Dr. J. D. Kendall; hon. treasurer, Dr. J. Elks; hon. recorder, Dr. S. H. Harper.

Oil Group's Exports

Export orders, totalling nearly £39,000.000 compared with just over £26,000.000 in 1951 and representing some $2\frac{1}{2}$ per cent of the whole of the materials exported from the United Kingdom, were placed by the Royal Dutch/Shell Group of oil companies. This sum was in addition to the expenditure incurred in this country both for the continuation of the refinery programme and for new tankers for the Shell fleet.

Aluminium Price Reduction

A reduction in the price of virgin aluminium ingots from £166 to £161 per ton has been announced by the Ministry of Materials with effect from 1 April. The British Aluminium Company Ltd. is passing on this reduction generally as $\frac{1}{2}$d. lb. for basic and larger quantities, despite the fact that present prices have not reflected the increased costs resulting from a wages award and increases in cost of fuel.

· OVERSEAS ·

Pakistan Ammonium Sulphate Project

An agreement to build a 50,000-ton ammonium sulphate factory near Daudkhel is said to have been reached by the Technical Co-operation Administration and the Pakistan Industrial Development Corporation. The corporation already has under construction a 3,500-ton caustic soda plant at Nowshera, and is planning a superphosphate plant in conjunction with a sulphuric acid factory at Lyallpur.

Glass Fibre in South Africa

The first glass fibre to be produced in South Africa has recently gone 'on stream' in Johannesburg. The producers, Glass Development Corporation (Pty.), Limited, state that current demands can be met, but further expansion and capital outlay is anticipated in the near future.

Exports Stopped

Found guilty of sending 'worthless clay' to Hong Kong in the place of sodium hydrosulphide, The Hilliard Corporation of New York, has been deprived of export privileges for two years.

To Stop 'Smoker's Throat'

A non-burnable substance to replace paper as a cover for cigarettes is to be introduced shortly by H. J. Rand & Associates, of Cleveland, Ohio. It is a wood product called regenerated cellulose which, it is claimed, decomposes (not burns) ahead of the live ember. The company maintains that it is the paper round the tobacco in cigarettes that causes throat irritation.

Anti-freeze Warning

The United States Government has notified the C. G. Whitlock Chemical Company, of Springfield, Ill., that if it continues to sell its 'Frigid-O-BG' as an anti-freeze for internal combustion engines it must be stated on the label that the preparation 'will rust and corrode the cooling system, clog the passages and otherwise damage the engine, it is reported.

Furfural in Italy

A factory for the continuous extraction of furfural from exhausted olive cake is being built by the Termodinamica Co., in Gioia Tauro. The plant is scheduled for completion at the end of this year.

New Canadian Industry

The establishment of a new industry in the Niagara area was recently announced by the Hon. William K. Warrender, Ontario's Minister of Planning and Development. The Minister disclosed that the Lubrizol Corporation of Cleveland, Ohio, had purchased an industrial site on which it is planned to erect immediately a one-storey factory. The corporation manufactures various chemical 'additives.' The new Canadian plant will produce full lines of both motor oil and car lubricants.

New Anti-moth Treatment

A moth-proofing product which can be added to the water when woollens, blankets, sweaters and so on, are being washed, has been developed by scientists of the U.S. Department of Agriculture. Known as E.Q.-53, the product is expected to be on the market in time for housewives to prepare the woollens for summer storage.

Brown Coal into Black

Australian research officers at the University of Sydney have developed equipment which turns brown coal into black coal in a few months. The process cannot be used commercially, and is used only for small quantities of coal in research designed to give a better understanding of the general chemical and physical structure of coal. In the Sydney tests 40,000,000-year-old brown coal from Yallourn, Victoria, was converted into black, similar to the New South Wales coal, which is 250,000,000 years old. A better understanding of the origin of coal, and of its present chemical and physical constitutions, would help in its utilisation, and could lead to use of solid coal as a raw material in the chemical industry as a replacement for coal tar.

British Firm's Canadian Project

It has been announced at Cornwall, Ontario, that Howard & Sons (Canada), Limited, a wholly owned Canadian subsidiary of the 155-year-old English company of the same name, is to build a factory for the hydrogenation of phenol and cresylic acid. The reason for selecting Cornwall for the site was stated to be the availability of by-product hydrogen from the nearby caustic soda plant of Canadian Industries, Limited.

· PERSONAL ·

BRIGADIER-GENERAL SIR WILLIAM ALEXANDER, chairman of Tennants Consolidated, the parent company of the Tennant group of companies, has retired from the Board. He has also announced his retirement from the Boards of the other companies in the group of which he is a director, with the exception of Charles Tennant and Company (Eire). Among the appointments he has relinquished are the chairmanship of Cleveland Petroleum Company and Commercial Solvents (Great Britain) and the deputy-chairmanship of Kern Oil Company. Sir William, who is 78, remains on the boards of Canadian Celanese, Celanese Corporation of America and Irish Tar Distillers and Engineering Supplies.

MR. FRANCIS L. WARING, joint managing director of the Coalite and Chemical Products group has been elected chairman of the chemical group of the Association of Chemical and Allied Employers. Mr. Waring will remain a member of the executive board of the association in an *ex officio* capacity and will continue to be an employers' representative on both the Chemical and Allied Industries Joint Industrial Councils.

Mr. Waring is a director of the Creosote Producers' Association and represents the Low Temperature Distillers' Association of Great Britain on the executive committee of the Association of Tar Distillers. He is also a member of the Council of the Institute of Fuel and a past chairman of the Yorkshire section of the Institute.

At the annual meeting of the Institute of Industrial Supervisors held in London on 28 March, SIR PERCY H. MILLS, managing director of W. & T. Avery Limited, was re-elected president of the Institute for a further year. Sir Percy is chairman of the National Research Development Corporation. MR. J. K. EVANS, Labour Officer, Metals Division, Imperial Chemical Industries Limited, was elected chairman of the Institute Council.

DR. C. L. WILSON, Reader in Analytical Chemistry, The Queen's University of Belfast, will present the first in his series of four radio talks on forgery over the North of Ireland Home Service at 7.45 p.m. on 15 April. Dr. Wilson, who is an expert on handwriting and forgery and is often called upon to give evidence in court, has given radio talks on the same subject in the United States.

The election of two new Fellows is announced by the Textile Institute.

MR. J. R. HANNAY, B.Sc., F.R.I.C., development manager, Brotherton & Co., Ltd., Leeds, elected a Fellow, graduated from Manchester University in 1922. He was for many years a member of the Bleaching and Finishing Sub-Committee of the British Cotton Industry Research Association, and is a vice-president of the Society of Dyers and Colourists. Mr. Hannay has lectured extensively, has contributed papers to technical publications and is holder of several patents, in particular describing processes for imparting non-shrink properties to yarns and fabrics.

The other new Fellow is MR. P. F. C. SOWTER, B.Sc., F.R.I.C., A.R.C.S., Duffield, Derbyshire, who has had over 30 years' experience in the field of fibres and textiles, having worked with British Celanese, Ltd., since 1925 as chemist, acetate technologist and latterly as superintendent. He holds, independently and jointly, several patents covering the wet spinning of cellulose acetate, the dyeing of cellulose acetate in solvents, and the adjustment of yarn properties.

The directors of Borax Consolidated, Limited, announce that MR. A. H. REID has retired as joint managing director but will remain on the board. MR. F. A. LESSER, hitherto joint managing director, has been appointed sole managing director. MR. N. C. PEARSON and MR. R. B. SNAGGE have been appointed to the board.

MR. GEORGE FERGUSON, senior partner in the business of Ferguson Shaw & Sons, soap manufacturers, Port Dundas, Glasgow, has retired from active business as from 1 March. The company is to be continued as formerly under the same name by the remaining partner, Mr. William Lambert Fullarton Shaw.

Publications & Announcements

DEVELOPMENTS in pH measuring instruments and possible future trends are discussed by C. Chalmers (research and development department, George Kent, Ltd.), in the April issue of *Instrument Engineer* (Vol. 1, No. 3), published by George Kent, Ltd., as a contribution to the science and art of industrial instrumentation. Other features include a discussion by G. H. Toop, A.M.I.Mech.E., on the relative merits of derivative action and open-loop controls in correcting for process lags, and the recruitment and training of the application engineer is dealt with by D. P. Lant in the second of a series of articles on 'Training the Instrument Engineer.'

* * *

INFRA-RED equipment and its application to many industrial processes is described in a new illustrated brochure issued by the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester. After a general introduction, description of the lamp and the element and some operational notes, the brochure deals with the uses of infra-red in paint stoving, moisture extraction, and in the curing and softening of plastics and rubber. The illustrations besides covering a wide range of applications also show some of the stages in the making of the elements.

* * *

CHEMISTRY plays an important part in improving the efficiency and increasing the economy of the iron and steel making processes, and the chemical laboratories hold a prominent position in the new Central Research and Development Department of the United Steel Companies, Ltd., at its Swinden Laboratories, Moorgate, Rotherham. A well-illustrated and handsomely produced brochure describing the Research and Development Department, its staff, equipment and methods, the various sections—minerals, refractories, fuels and furnaces, iron and steel making plant, metallurgy, chemistry, physics, and so on—has now been issued by the company. In the chemical field facilities are provided for chemical and spectrographic analysis, corrosion testing, chemical metallurgy, the determination of gases in metals, and experimental steel making. The lay-out provides for segregation of different types of work, each subdivision forming a compact unit.

CHEMICAL and finishing processes and analysis and testing form important sections of the subject catalogue of literature in the library of the Textile Institute which is included in the 'Year Book of the Textile Institute, 1952-53 (No. 5),' now published. The present edition includes a list of current textile literature, summarises standards relating to textiles and tabulates information on yarn count systems and other matters likely to be of use to the practical technologist. Other features deal with education in textile technology, sources from which films on textile subjects can be obtained, and the addresses of British and overseas research organisations, textile societies and textile and allied organisations. The names and addresses of the institute's 6,000 members and 150 patrons are also incldued. Members receive a copy of the Year Book free. Copies are available, however, to non-members (15s. post paid) on application to the Textile Institute, 10 Blackfriars Street, Manchester 3.

* * *

A NEW journal, *Applied Microbiology*, under the sponsorship of The Society of American Bacteriologists had its first issue in January this year, and is to be published bi-monthly by The Williams & Wilkins Company, Baltimore, 2, Maryland, U.S.A. The editor is H. B. Woodruff, Microbiological Research Department, Merck & Co. Inc., and a general statement says the *Applied Microbiology* is designed for the publication of studies orientated towards the application of microbiological sciences to the fields of industry, foods, sanitation, agriculture, and other areas involving the use or control of micro-organisms, with the exception of the microbiological aspects of animal and plant disease. Articles in the first issue include: 'Effect of Alcohols on the Mycological Production of Citric Acid in Surface and Submerged Culture—1. Nature of the Alcohol Effect,' by Andrew J. Moyer; 'The Microbiological Degradation of Plasticisers—1. Growth on Esters and Alcohols,' by William H. Stahl and Helmut Pessen; and 'Preservation of Bacterial Cultures under Paraffin Oil,' by S. E. Hartsell. Annual subscription is 63s. post paid. Orders should be placed with Baillière, Tindall & Cox, Ltd., 7 & 8 Henrietta Street, London, W.C.2.

MECHANICAL vibration has only comparatively recently been made the subject of scientific study. The measurement of vibration presents special problems which, it is claimed, have been overcome by the Muirhead-Pametrada Wave Analyser, the first wave analyser to be designed primarily for this purpose. The instrument is described together with its application in various industries and medicine, in an illustrated brochure issued by Muirhead & Co., Ltd., of Beckenham, Kent. It was developed in conjunction with Parsons Marine Engineering Turbine Research and Development Association (from the initial letters of which the word ' Pametrada ' is formed) and was originally designed for vibration measurements on marine turbines and their reduction gears. A variable bandwidth control allows for the measurement of fluctuating frequencies; the frequency range is 19 c/s to 21,000 c/s with an extension down to 2 c/s by a small additional unit; a tuned filter type of circuit ensures constant selectivity at all frequencies. Measurements can be made either by attaching a pick-up directly to the vibrating surface or by using a microphone to pick up the sound produced.

* * *

LAMINATED materials based upon inorganic fillers are being increasingly used in industry, and because of the need for ever more efficient materials Bakelite, Limited, have in recent years devoted intensive research to this problem. The standard range of Bakelite laminates has long included grades based upon asbestos to provide increased resistance to heat, and recently there have been developed materials based upon glass fabric, in which this property has been both improved and combined with certain others not to be found in earlier materials, such as mechanical strength, anti-tracking, and maintenance of electrical properties while hot. The three grades of glass-filled Bakelite laminated are described in a news sheet issued by the company which has also published a new booklet on the use and installation of Bakelite laminated gears which not only reduce transmission noises when incorporated with metal gears, but are also resistant to most acids and mild alkalis and will operate satisfactorily in the presence of oil, water or steam.

NOTES summarising the chemical and physical properties, specifications, applications, and the information in the literature regarding the compounds hydroxylamine sulphate and hydroxylamine hydrochloride have been issued by The British Drug Houses, Ltd., Poole, Dorset. New entries in the B.D.H. catalogue in March, under organic and inorganic chemicals, are acrolein acetal, cadmium (metal) powder, and *p*-chloro-benzophenone. The company also announces the second edition of ' Adsorption Indicators,' extensively revised. Technical data sheets on semi-carbazide hydrochloride (available in industrial quantities) have also been issued.

* * *

FACTS about Mutual Life Assurance and the importance of all Life Assurance to the economy of Britain and the Commonwealth at the present time are simply set out in a 12-page illustrated supplement issued to its members with the 1952 Report and Accounts by the United Kingdom Provident Institution. Mr. John Benn, chairman and managing director, is in the forefront of those who affirm that every business undertaking has a duty to explain to its employees, its shareholders or its members, and where possible, to the public at large, its contribution to the nation's welfare. Mutual understanding gained from a more widely offered explanation of functions and services undoubtedly redounds to the benefit of commerce and industry. 'Our Policy—and Yours,' as the supplement is called, is liberally illustrated with diagrams and a double-page map shows by symbols where and how the larger part of the UKPI funds are invested.

* * *

THE Fédération des Industries Chimiques de Belgique has published the 1953 edition of its directory. This work, which gives interesting information about the Belgian chemical industry, contains full details of the organisation of the Federation; a list of the members of the Federation; a list of the products made and sold by members; a list of affiliated laboratories; a list of sales organisations; an alphabetical index in English, Dutch, Spanish and German; and a list of trade marks. The volume (492 pages) is bound in brown cloth and is sold at Belgian Fr.150, plus Belgian Fr.30 for postage. The address of the Federation is: rue Joseph II, 32, Brussels.

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.)

GREENWOOD RAWLINS & CO., LTD., Southend-on-Sea, plastic manufacturers. etc. (M., 11/4/53.) 27 February, £1,800 charge, to G. U. L. Sartoris, Stock (Essex); charged on properties at Brook Road, Rayleigh. *£4,355. 31 October, 1952.

New Registration

Tudor (Timber Preservations) Ltd.

Private company. (517,686.) Capital £1,000. Develop, market and exploit chemical and other scientific processes for the preservation and treatment of timber and wood, etc. Directors: F. K. Worthington, F. W. S. Worthington, G. R. Philby and Dr. J. H. Davidson. Reg. office: Crownfield House, 243 High Road, E.11.

Company News

Hull Distillery Co., Ltd.

As part of an internal re-organisation in The Distillers Co., Limited, Group, Hull Distillery Co., Limited, ceased trading as a separate company at midnight, 31 March, 1953. The responsibility for outstanding commitments and liabilities of Hull Distillery Co., Limited, will be undertaken by The Distillers Co., Limited.

Carr & Company

As from 1 April, 1953, the business of waterproof paper manufacturers hitherto carried on under the name Carr & Co. [Proprietors Carrs (Birmingham), Limited] will be conducted by Carr & Co. (Paper), Limited, a wholly owned Subsidiary Company of Carrs (Birmingham), Limited. All business as from 1 April, 1953, will be for the account of Carr & Co. (Paper), Limited. The management will remain in the same hands as heretofore.

Laporte Industries Ltd.

Laporte Chemicals, Limited, is a holding company in that it owns all or a majority of the shares in its subsidiary companies and an operating company in that it has undertaken the manufacture and sale of chemicals.

The growth of the Laporte Group of Companies in recent years has led the board of directors to the conclusion that the more logical structure of the group would be that of a holding company controlling subsidiary companies through which all manufacturing and trading operations would be carried out.

As from 1 April, 1953, the company will change its name to Laporte Industries, Limited, and become the holding company.

A new operating company has been formed under the name of Laporte Chemicals, Limited. It is in fact an entirely new company, the whole of the share capital of which is held by Laporte Industries, Limited.

Laporte Industries, Limited, is transferring to the new company the properties and assets at Luton, Warrington and elsewhere, to enable it to continue manufacturing and trading activities. The new company will assume responsibility for all purchase and sales contracts made with this company, the debts of this company and the accounting for all sales effected. Payment to the new company of any outstanding accounts in favour of the old company will constitute a complete discharge.

Albright & Wilson, Ltd.

Group profit for 1952 of Albright & Wilson, Ltd., after all charges excluding tax, decreased to £1,527,341 compared with £2,346,418 in the previous year. Deducting U.K. and overseas tax of £896,164 (£1,425,855) the group net profit was £631,177 against £920,563, of which £594,653 (£859,256), is attributable to shareholders of the parent company. In consolidating the accounts of the overseas companies both for 1952 and 1951, the U.S. dollar rate was taken at \$2.80, the Canadian at \$2.72⅝ to the £, and the Australian £ at 126½ to £100 sterling.

A second interim dividend of 10 per cent is recommended which maintains the annual distribution at 15 per cent.

A. Boake, Roberts & Co., Ltd.

Reorganisation of A. Boake, Roberts & Co., Limited, is announced by the directors. A new subsidiary company has been formed under the style of A. Boake, Roberts & Company (Manufacturing), Limited, which came into operation on 1 April. The new company has taken over all the trading assets and liabilities of the parent company. The parent company will act as a holding company, ceasing to manufacture or trade. It is estimated that the group as a whole will save something more than £100,000.

Monsanto Chemicals, Ltd.

Group trading profits of Monsanto Chemicals, Limited, in 1952 were nearly halved, the total of £1,476,400 falling £1,412,930 short of the 1951 level of £2,889,330. The setback is reflected in the final dividend on the £2,700,000 ordinary stock which is reduced from 15 5/6 per cent to 11⅔ per cent, making a total of 18⅓ per cent as against 22½ per cent in 1951. The latter was paid on capital as increased by 200 per scrip issue. In a letter to stockholders, Mr. E. A. O'Neal, junior, says that the results for 1952 fell short of original estimates in respect to turnover. Economic changes within industry resulted in an emphatic shift from a seller's to a buyer's market in the chemical industry. The company's programme had been revised and consolidated accordingly. Although profit margins suffered partly because of lower selling prices the total value of goods sold was only 3 per cent below 1951. Goods exported increased to 39 per cent.

Market Reports

LONDON.—Business on the industrial chemicals market has not been particularly active during the past week, partly due to the interruption of the Easter holiday and partly perhaps to the uncertainties created by the possible change in the international situation, although there is a tendency to exaggerate the influence of the latter. Deliveries against contracts have been called for in good quantities and inquiries for export have been reasonably good. The convention quotations for white lead and red lead were reduced as from 1 April, the new prices being:—dry white lead, £134 10s. per ton; dry red lead and litharge, £118 5s. per ton. The coal tar products market has been without feature.

MANCHESTER.—Trading conditions on the Manchester market for heavy chemical products have been quiet during the past week. This has been largely in consequence of the Easter holiday break and the stoppage of operations for varying periods at many of the consuming establishments. The movement of supplies of the alkalis and other heavy chemicals, as well as of fertilisers and tar products, has been affected. The coming week, however, is expected to see a quick recovery in the volume of trade. Except for some easiness in the lead products, there has been little change on balance in the general price position.

GLASGOW.—The increased demand for general chemicals experienced last week has been maintained and manufacturers and merchants report that the volume of business conducted this week has been very satisfactory.

Obituary

Dr. G. J. Fowler

The death has been announced in Bangalore, India, of DR. GILBERT JOHN FOWLER, who was for a number of years superintendent and chemist of the Manchester Corporation Rivers Department. He was a pioneer in the development of the activated-sludge process for the treatment of sewage, which has since been adopted all over the world. Dr. Fowler was born in Paris and educated in Paris, Heidelberg and Manchester. In 1935 he went to India where he held many academic posts, including the headship of the Harcourt-Butler Technological Institute in Cawnpore, and became president of the Indian Chemical Society.

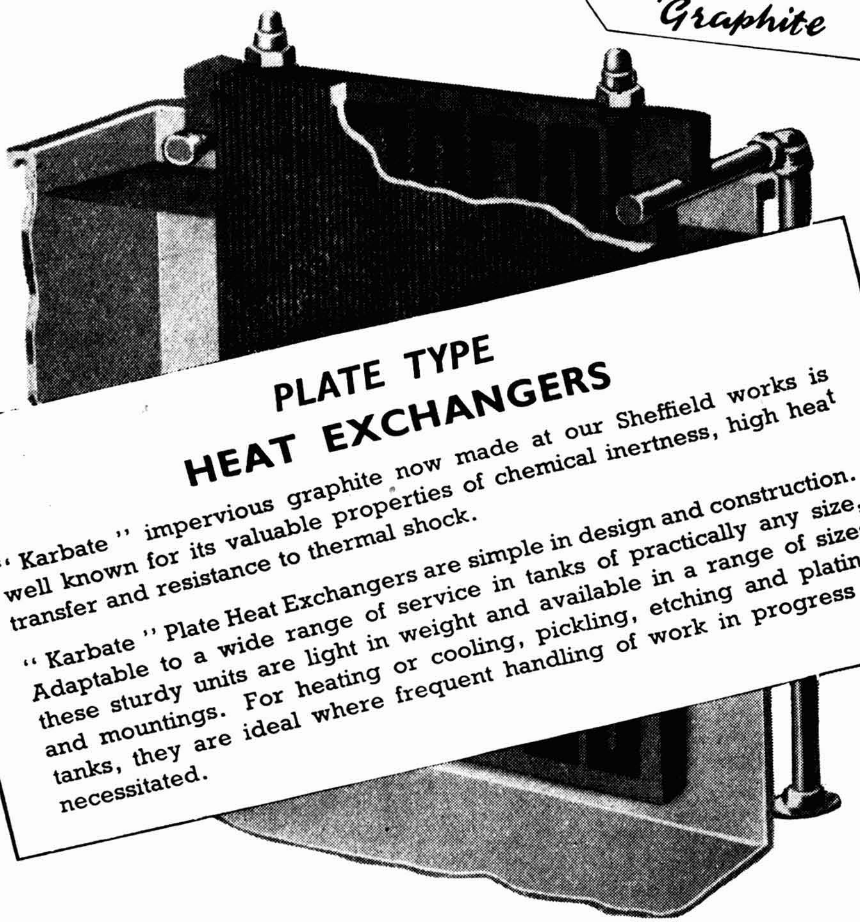
Mr. P. G. Jackson

The death has occurred at the age of 75 of MR. PERCY G. JACKSON, F.R.I.C., who had practised as a consulting chemist in Manchester for nearly 40 years. Trained in the Midland Railway laboratories at Derby under Archbutt, one of the early masters of analytical chemistry in this country, Mr. Jackson was later retained in Manchester by the National Boiler and General Insurance Company, Limited. He became an authority on the industrial use of water and was the author of a book on boiler feed-water.

KARBATE

REGD. TRADE MARK

Impervious Graphite



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Next Week's Events

MONDAY 13 APRIL

The Physical Society

London: Annual Exhibition, Imperial College of Science and Technology, S.W., until 17 April. Opening day 10 a.m. to 2 p.m., last day 10 a.m. to 5 p.m.; other days 10 a.m. to 8 p.m.

Society of Chemical Industry

Leeds: The University, 6 p.m. Yorkshire Section. Fourth Brotherton Memorial Lecture. Professor J. B. Speakman: 'The Chemical Revolution in Textile Technology.'

British Ceramic Society

Leamington Spa: Ashorne Hill. Spring meeting of the Refractory Materials Section (until 15 April).

TUESDAY 14 APRIL

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. G. G. Haselden: 'The Fractionation of Liquid Air.'

Society of Chemical Industry

Chester: Joint meeting of the Chemical Engineering Group with Liverpool and Manchester Sections. 1.15 p.m. Luncheon, Grosvenor Hotel; 2.30-5 p.m. Visit to Stanlow Oil Refinery; 5.30-6.15 p.m. showing of film 'The Stanlow Story'; 7.15-8.30 p.m. Meeting at Grosvenor Hotel.

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Physical Methods Group. Dr. B. J. MacNulty, G. F. Reynolds, and E. A. Terry: 'The Polarographic Determination of Fluoride'; D. Pickles and C. C. Washbrook: 'The Amperometric Titration of Zinc and its Application to the Determination of Zinc in Lubricating Oils'; Mrs. Bertha Lamb: 'A Tentative Method for the Determination of Calcium by Means of the Polarograph.'

WEDNESDAY 15 APRIL

The Chemical Society

Dublin: University College, Upper Merrion Street, 7.45 p.m. Joint meeting with the RIC, SCI and the Institute of Chemistry of Ireland. Professor E. C. Dodds: 'The Influence of Chemistry on Medical Practice.'

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Corrosion Group. C. F. Porter: 'The Corrosion of Aluminium and its Alloys in Supply Waters.'

Oil & Colour Chemists' Association

London: Criterion Restaurant, W.1. annual general meeting.

THURSDAY 16 APRIL

Royal Institute of Chemistry

Luton: The Town Hall, 8 p.m. Dr. W. McG. Morgan: 'Synthetic Soil Conditioners.'

Society of Chemical Industry

London: 11 Chandos Street, Cavendish Square, W.1, 6.15 p.m. Microbiology Group. Dr. Lois Dickinson: 'The Use of the Bacteriophage in the Study of Viruses'; L. J. Meanwell: 'Bacteriophages of the Lactic Streptococci.'

FRIDAY 17 APRIL

The Chemical Society

St. Andrews: United College, 5.15 p.m. Royal Institute of Chemistry Lecture. Professor F. S. Spring: 'Some Developments in the Chemistry of Cortisone.'

Institution of Chemical Engineers

London: University College, Gower Street, W.C.1, 9.30 a.m.-12.45 p.m.; and 2 p.m. Symposium on: 'Effluent Disposal.'

Society of Chemical Industry

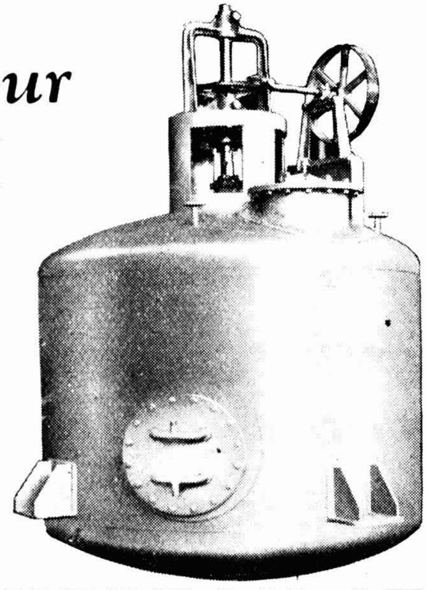
London: King's College, Strand, W.C.2. 7 p.m. Fine Chemicals Group, annual general meeting; 7.30 p.m. Dr. William Mitchel: 'Isolation of Fine Chemicals from Natural Sources.'

Society of Dyers & Colourists

Manchester: 10 Blackfriars Street, 6.30 p.m. Annual general meeting.

Lime Spreading Subsidy Restored

Arrangements have been made to give immediate effect to the announcement in the recent White Paper (Cmd. 8798) to increase the value of the lime subsidy to farmers by the inclusion of part of the cost of spreading. This restores the subsidy removed in 1951. Payments will be in addition to the existing subsidy, and deliveries made on or after 2 April will qualify. Payment will be made at the standard rates irrespective of the actual spreading costs. Contribution per ton of lime spread range from 5s. category 1 to 1s. 6d. in category 4, with a maximum contribution of 15s. per acre.



CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering this advertisement 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.

AUSTRALIA. Two **JUNIOR SALESMEN** required for **VICTORIA** and **NEW SOUTH WALES,** by well-established Company with important Swiss and British representation for dyestuffs, chemicals and auxiliary products. Applicants must have sufficient fundamental knowledge of colouring and processing all textile fibres to require only short intensive training in application of Company's products. Good prospects of advancement in expanding country. State age, qualifications, experience and marital state. Applications in first instance to **BOX No. C.A. 3213, 154, FLEET STREET, LONDON, E.C.4.**

ORGANIC CHEMIST. Vacancy in recently established Chemical Factory in N. Lincolnshire, for well-qualified Organic Chemist, preferably with good University degree. Candidates should have some years' experience in full charge of substantial production, e.g. of dyestuff intermediates or fine chemicals. The man appointed will be responsible to the Factory Manager initially for part of the production programme. There are good prospects for a man able to accept authority and win the confidence of those working under and over him. Age preferably between 35 and 45. Starting salary not less than £1,200, with excellent contributory pension fund. **APPLY BOX No. C.A. 3214, 154, FLEET STREET, LONDON, E.C.4.**

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Three Unused Horizontal M.S. Steel-jacketed **DISINFECTORS** by Thresh. Internal dimensions 6 ft. by 43 in. diam., with swing door each end. Steam jacket 7 lb. pressure. Galvanised cradle. New 1944.

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

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

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

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

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

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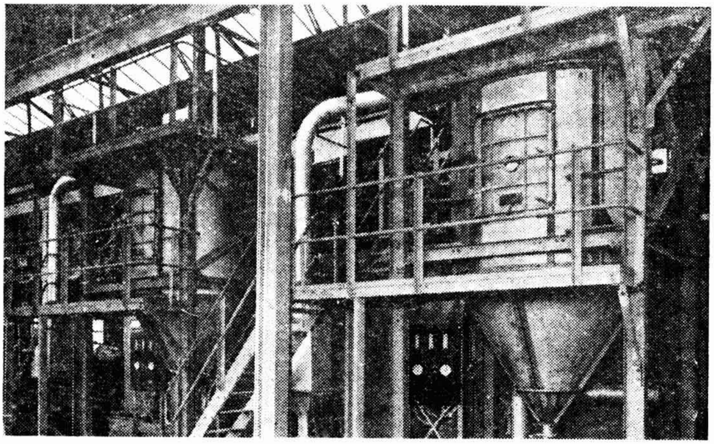

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