Chemical Age

ALBATROS—T.V.A. FERTILISER PROCESS

(page 99)

VOL. 84 No. 2140

16 July 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

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The first figures refer to advertisements in **Chemical Age Directory & Who's Who,** *the second to the current issue*

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INDEX TO ADVERTISERS

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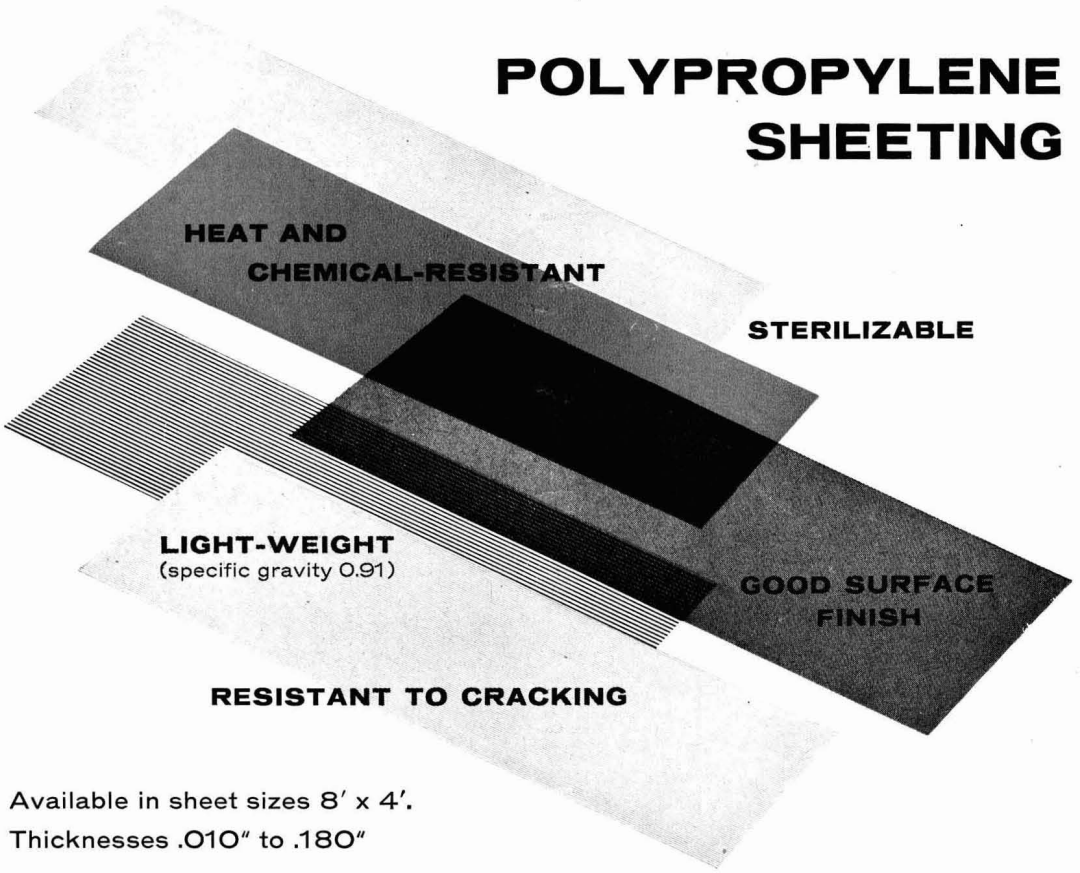

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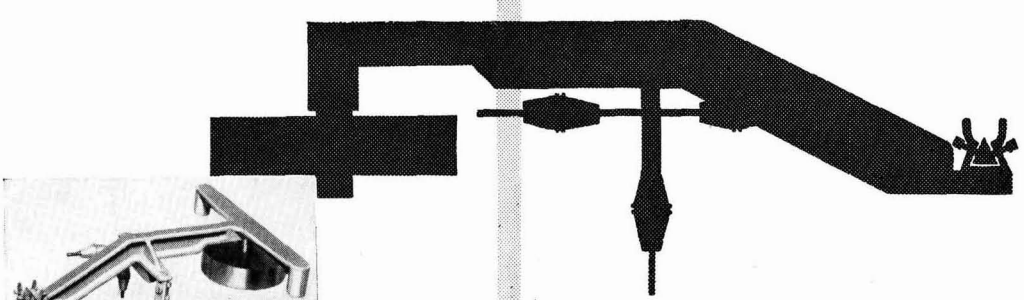

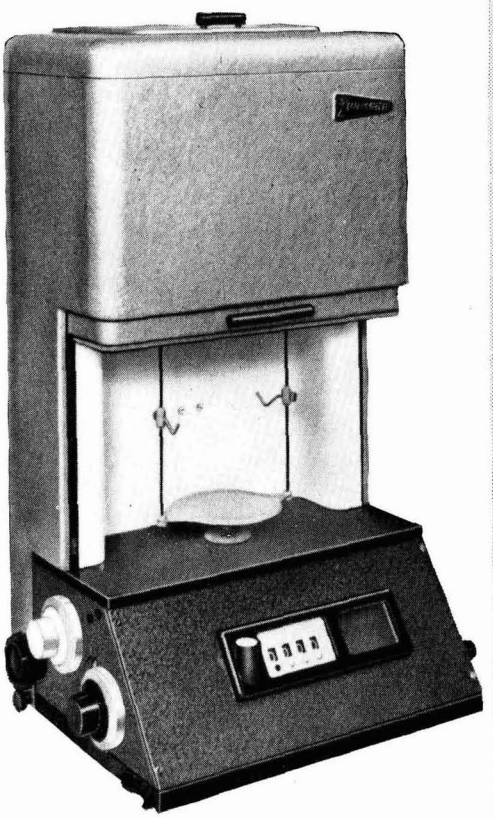

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Leeds Office
Permanent House, The Headrow, Leeds 1. [*Leeds* 22601]

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IN THIS ISSUE

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CHEMICAL AGE

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S.C.I. AND PUBLICITY

THAT the 79th annual meeting of the Society of Chemical Industry, reported last week in p. 59 and this week, p. 101, was such a success was due to the untiring efforts of the organisers. As in previous years the emphasis was on the social side and the various events were well supported, giving plenty of opportunity for contacts to be made. The papers were of a review nature and each covered much ground, giving a good picture of recent trends in the fields concerned.

The only jarring note introduced at the annual general meeting was when Dr. H. K. Cameron, hon. secretary for home affairs, referred to a steady decline in membership from the peak year of 1952. Membership has fallen by 11% since then to the current total of 6,890.

Doubtless the new council will be considering ways of reversing this decline. One obvious means of attracting new members, and one which the Society has fought shy of in the past, but which it cannot afford to ignore if it is to achieve the maximum possible membership, is publicity. Some societies—and the S.C.I. must be counted among them—have in the past looked on publicity as a means of increasing their strength and influence with a measure of distaste.

The days when this attitude could be justified have gone. As Sir Alexander Todd pointed out at the annual dinner, this is the era of the specialist and the past few years have seen the setting up of what he called splinter societies catering for specialists operating in very narrow fields. This element of competition, which does not seem to have affected the qualifying societies, has tended to weaken those societies that cater for a whole field of interest, such as the S.C.I. This tendency is regrettable and Sir Alexander called for a closer knitting together of chemists in the interests of chemistry as a profession.

There is a vital task to be done here, and as far as the industrial chemist is concerned, the S.C.I. should take the lead. This task can only be accomplished successfully by making full use of all the available means of communication through the medium of publicity.

A first step could well be the issue of preprints of papers to the technical Press—a drastic change of policy for the S.C.I., but it would bring it into line with nearly every other society. The normal practice is for societies to reserve the right to publish papers in their own journals, but to allow other publications the right to use a proportion, between 10% and 30%. Thus if a paper covers any new ground, it will be widely reported. This has several merits. It ensures that the author's work is brought to a wide audience, other workers in the same field are acquainted at an early stage with the developments that the author has made, and the Society itself receives invaluable publicity. The benefit to the Society is twofold; firstly, its name is continuously in the pages of journals that are read by potential members; secondly, any reader who is interested in a report of an S.C.I. paper will not be satisfied with a summary of it, he will need to study the whole paper—and he can only do that in the society's official journal.

The S.C.I. could not fail to gain from the wider reporting of such work; even if there was no intention to publish a particular paper itself, the

issue of copies to other journals for the purpose of publishing abstracts, would ensure that the author's work was not lost to the literature.

There can be no doubt that the hundreds of papers presented at S.C.I. meetings held each year throughout the country cover a variety of developments that could be classified as representing news of national interest. Brief extracts, suitably written for a lay audience, would merit publication in the national newspapers. Such a service would not only bring new developments in industrial chemistry, as well as the activities of the Society to a wider audience, it would also give invaluable publicity to the profession of chemistry and to the chemical industry.

LIQUEFIED GASES BY PIPELINE

CURRENT interest in liquefied gases by both private industry and Government, has led the U.S. National Bureau of Standards to investigate the accepted methods for the long-distance transfer of these fluids. The purpose of the study was two-fold: firstly to discover what equipment and techniques are required, and secondly to determine what losses will occur. The results of a recent theoretical study indicate that the pipeline method, now employed only in relatively short-distance transfers, can be extended to appreciable distances, provided that the performance limitations introduced by cooling are kept in mind.

The design of such a system, which in many cases could undoubtedly increase efficiency, safety and economy, is relatively straightforward. The Bureau's conclusions are derived from a mathematical model based on the laws of conservation of energy, momentum and mass. These laws, together with verified assumptions and empirical data, yield a unique model consisting of twelve equations which describe the flow characteristics of a transfer line. This flow model permits the design of a transfer system by relating all the pertinent design parameters of flow rate, line length, line diameter, pumping pressure, heat leak and fluid properties. Thus, a transfer system which consists primarily of a length of insulated pipe along which the fluid is forced either by pumping systems or a process, plant such as a liquefier, could be fully investigated. Pumping stations distributed along the transfer line may be more desirable than supplying all the necessary energy and the inlet. Since it is wasteful to carry unavailable energy (as sensible heat) through the system, intermediate stations along the line cool the liquid by one, or both, of the two methods, refrigeration and flashing. If the liquid is flashed to atmospheric pressure, its vapour is discarded or piped back to the liquefier and the remaining liquid, at its normal boiling point, is pumped through the next section of the pipe.

Losses of liquefied gas in the system were also investigated by means of the same mathematical model. There are four ways in which losses occur: at the pump due to energy dissipation in the pump container and cooling prior to line entry; flashing loss caused by heat leak and energy introduced by the preceding pump; loss which occurs when the system is cooled from ambient to operating temperatures; and trapped liquid loss from liquid that cannot be removed at the end of the transfer. The Bureau formulated relations from which each loss can be computed.

When designing a particular system from mathematical formulations, empirical information must also be employed correctly. Equations for heat leak and fluid drag was therefore included. Experimental verification of the theoretical conclusions on long-distance transfer systems are being undertaken.

News of another development in the transfer of liquefied gases by pipeline also comes from the U.S.; that is the transfer of liquid nitrogen over short distances—up to 25 ft.—without the use of insulated pipes. The technique, developed by the Garrett Corporation's AiResearch Manufacturing Division at Los Angeles, is being used to move nitrogen through flexible plastics pipes to cool infra-red detectors and other electronic equipment.

Details of the technique are not revealed since AiResearch have patents pending. However, the method used by Union Carbide Linde Co., also to transfer liquid nitrogen, is to admit specific quantities of the fluid to the transfer line using a timing or pressure-relief valve. As the droplets of nitrogen bounce down the line some vapour is formed, which acts as an insulation for the pipe.

STARCH PHOSPHATES

BOTH the food and industrial markets may well benefit from a development that comes from U.S. American Maize Products are starting commercial production of a new group of starch derivatives, starch phosphates, which they expect will find uses as thickeners in packaged (frozen and tinned) foods, fillers and binders in pharmaceuticals, and coagulants and binders in ore refining, water treatment and adhesives.

The method used for the formation of these esters is based on a process from International Minerals and Chemical and will use patents licensed from that company. (*Chem. & Engng. News,* 26, **38**, 84.) According to the patents, starch is reacted with the phosphate salts of the alkali metals to form the ester. American Maize uses mono- and disodium orthophosphates in their version of the process. The reaction works equally well with root and cereal starches.

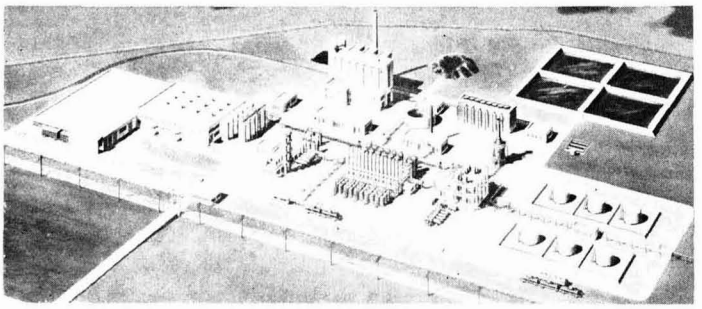
Some of the properties of starch phosphates differ remarkedly from those of starch itself. For example, starch phosphate dissolves in water whereas normal starch is insoluble in cold water and needs precooking before use. At room temperature an aqueous solution of starch phosphate is a gel and the viscosity remains about the same when the temperature is raised. Different viscosities are obtained only by changing the degree of esterification, or by treating the starch before esterification. A point very much in the favour of starch phosphates as far as the food industry is concerned is their stability under freezing, and thawing, unmatched by conventional starch. Normally manufacturers of frozen foods discourage frequent freezing and thawing which often breaks down their products. Used in both frozen and tinned foods, the esters prevent curdling and the formation of a sponge-like appearance.

The gum-like properties of the starch phosphates, comparable with those of some vegetable gums currently in use, make them suitable for the pharmaceutical and cosmetics industries, and American Maize speculate that they might even compete with higher priced products such as gum arabic, locust bean gum and carboxymethylcellulose.

American Maize believe that this development has great possibilities. At the moment production is on the pilot plant scale but a full-sized unit is scheduled to be on stream by the end of the year.

Project News

LUMMUS TO BUILD $30 M. SYNTHETIC RUBBER PLANT IN INDIA



Artist's impression of the $30 million Indian synthetic rubber project

THE contract to build India's first synthetic rubber producing plant near Bareilly, Uttar Pradesh, has been awarded to the Lummus Co., New York, U.S. The Lummus Co. Ltd. of London will direct the $30 million project for Synthetics and Chemicals Ltd.—a company formed recently by the Firestone Tire and Rubber Co. and Kilachand Devchand and Co. Private Ltd., a Bombay banking and industrial firm. Construction work on the project will commence within several months. The contract calls for units to produce butadiene and styrene as well as a copolymer plant to manufacture the final S.B.R. product. Lummus also will construct all the plant utilities and off-site facilities. While the plant will be designed for an initial annual capacity of 20,000 tons, it will be "rapidly expandable" to 30,000 tons. Technical divisions of the Firestone Tire and Rubber Co. will furnish the basic engineering and 'know-how' for the butadiene, styrene and copolymer units. The plant site is conveniently situated right in the heart of the sugar cane and alcohol producing area, which provides a source of alcohol for use in the manufacture of the butadiene.

The financing of the $30 million project in India will be assisted by an £8½ million loan from the Export-Import Bank of Washington. This constitutes the largest foreign currency loan in the bank's history. The remainder of the financing will come from private banks in the U.S., U.K. and India. Operation of the synthetic rubber manufacturing plant is expected to save India about $10 million/year in foreign exchange.

● NEW building and plant for the production of solid chemicals for Coalite and Chemical Products Ltd. is nearing completion and is expected to be ready by the end of September. This will permit the production of larger quantities of existing products, particularly catechol and its derivatives, and will facilitate the translation of pilot plant work on new products to commercial production. A new research centre at Bolsover, expected to be ready by April 1961, will provide accommodation for the chemical, chemical engineering and process investigation sections.

● A NEW plant for *p*-formaldehyde has been commissioned by the Walker Chemical Co. Ltd., during the financial year to 31 March, said Mr. Roger Walker, chairman of Walker and Martin Ltd. in his annual report. Plans for the manufacture of other new products are at an advanced stage and the first of the new plants should come into operation later this year. Under the long-term development plan for the Bury and Bolton chemical works, much has been done in the instrumentation of existing plants to raise productivity and efficiency. New research and development laboratories are in use and staff of the chemicals company has been widened.

● WITH completion of a new chemical plant at Stanlow, the output of C. C. Wakefield and Co. Ltd was increased by more than 50% in 1959. In addition to meeting the group's current requirements of chemical additives this plant produces supplies for resale by Edwin Cooper and Co. Ltd., a subsidiary. Increased sales and profits were achieved by this company in 1959 and these results have encouraged the board to "explore avenues for further expansion in this direction." This was stated by Mr. L. W. Farrow in his annual report as chairman of C. C. Wakefield and Co. Ltd. It is proposed that the company's name be changed to Castrol Ltd.

Distillers to Produce Acetic Acid by Direct Hydrocarbon Conversion

PRODUCTION of acetic acid has always until now involved the oxidation of acetaldehyde, itself derived from acetylene, ethylene or ethanol. These materials have been produced from coal or by fermentation and, more recently, in petrochemical processes from hydrocarbons. However, the Distillers Company Ltd. now plan to build a new acetic acid plant (CHEMICAL AGE, 11 June) for the direct conversion of readily available petroleum hydrocarbon feedstock to acetic acid.

D.C.L. believe that in using relatively cheap mixed hydrocarbon feedstock, and avoiding the isolation of acetylene or ethylene, they have a unique process, although acetic acid has been produced by the direct oxidation of relatively pure hydrocarbons, notably on a very large scale in the U.S. from butane.

Capital cost of this project is high (the plant will cost £2 million), but the yield and quality of the acetic acid produced make it an economically attractive process. Minor quantities of formic, propionic and succinic acids are obtained but these can be eliminated to an extent which meets with the strict specifications demanded, both for industrial and edible requirements.

This development arose out of the research programmes into the chemistry of the oxidation of hydrocarbons carried out at the central D.C.L. Research and Development Department over a number of years.

Laboratory tests and semi-technical investigations at Epsom were followed by a fully integrated pilot plant at Tonbridge, Kent, which was operated under automatic control for extensive periods in order to study the process variables, special equipment design, potential corrosion difficulties and product quality. Problems met with during these trials have proved capable of satisfactory solution; for example, it was found that the use of unusual materials for plant construction could be avoided by the correct choice of operating conditions.

The plant is to be built at Hull by the Lummus Company Ltd., London.

Lurgi Supersorbon Solvent Recovery Plants in U.K.

SOLVENT recovery plants using the Supersorbon process developed by Lurgi Gesellschaft für Chemostechnik GmbH in Germany are being offered in the U.K. by Chemical Engineering Wiltons Ltd., Bird Hall Lane, Cheadle Heath, Stockport, under an exclusive agreement with the German company. The process is based on the use of Supersorbon activated carbon, which is claimed to absorb, quickly and completely, organic solvents present in air or gases whatever the concentration. The solvent is recovered by steaming out the carbon, condensing the resulting vapours and separating the solvent from the condensate.

A continuous fully automatic plant is also available.

★ At the S.C.I. annual dinner (see p. 103), Sir Alexander Todd referred to the mass of literature brought about by increasing specialisation. He might well have had a few words to say about another of the results of this age of the specialist—the multitude of national international meetings and symposia that clamour for the chemist's attention. For instance, recent S.C.I. meetings in Brussels and Bristol coincided with meetings in Moscow (polymers) and Paris (catalysis); but then, inevitably, most meetings held today clash with other meetings.

To help overcome this, the new programme liaison committee of the Plastics Institute, the S.C.I. Plastics and Polymer Group, the Oil and Colour Chemists' Association and the Institution of the Rubber Industry has held its first meeting. Aim is to co-ordinate the timing, location and subject matter of conferences on polymers and related subjects. Other organisations sponsoring meetings on polymers will be asked to send their plans to the committee.

This should prevent the simultaneous holding of meetings on polymers, but the polymer chemist will presumably still be faced with the same number of conferences that he would like to attend. As Sir Alexander Todd suggested perhaps it is time that all the chemistry societies got together. They could then thrash out a common conference policy, maybe holding one gigantic conference dealing with all aspects of chemistry, with several simultaneous meetings—on unrelated subjects of course.

★ I see that some of the shipping and transport experts have been giving attention to ways in which liquefied petroleum gases can economically be carried in sea tankers. The success of the *Methane Pioneer* experiment, in which liquefied natural gas has been shipped to the U.K. from the United States, has caused oil producers to look more closely at their own waste petroleum gases, which, in the liquefied state, could make a very profitable export commodity if suitable sea transport was available. But the effect of the very low weight/volume ratio of L.P.G. is that an economically feasible tanker would have to have a capacity of 40,000-60,000 tons and the cost would be at least double that of a conventional tanker of similar size. The outlay on such a carrier would be at least £5 or £6 million.

However, a possible solution is seen in the fact that most countries which have insufficient or uneconomic domestic sources of fuel and are consequently potential liquid gas importers are also big importers of iron ore. Here we have a very different sort of cargo, very heavy in relation to its bulk—so much so that an ore carrier loaded right down to her Plimsoll mark is sailing with her holds half empty. So, why not let ships carry a combined cargo of L.P.G. and iron ore?

An expert on shipping finance and transportation problems estimates that by carrying ore and liquid gas in dual purpose ships, one of the two commodities would literally be carried for nothing. We should hear more of this simple but ingenious idea, which looks as though it might well turn the main disadvantage of L.P.G. where sea transport is concerned—its low density—into an advantage.

★ The Society of Chemical Industry has been extremely fortunate in its election of presidents. Mr. Ernest J. Solvay, head of Solvay et Cie., Belgium, and president for 1959-60 is followed in office by Sir Alexander Fleck, F.R.S., who has only recently retired as chairman of Imperial Chemical Industries Ltd.

Not only are Mr. Solvay and Sir Alexander two of the world's most eminent men of chemicals, who have piloted vast industrial empires through a period of unparalleled growth, they are also men of humanity who have accepted the responsibilities synonymous with wealth and power. They have done more than most to foster sound industrial relations, to encourage, by word and deed, the spread of knowledge and the training of young scientists.

The Society cannot fail to gain by having two such men occupy its highest office.

★ In celebrating its golden anniversary this month the U.S. Bureau of Mines can look back on the publication of 8,000 reports—an average of three a week—describing its findings in research and development work on minerals, mineral fuels, and industrial health and safety. An equal number of articles by its research workers has appeared in the world's scientific and technical press. Comprehensive 50-year lists of these reports and articles are to be issued soon.

Among outstanding achievements of the Bureau are its research and development work on new metals like titanium and hafnium, on which commercial production in the U.S. was afterwards based. The Bureau also engineered a process of zirconium production now operated in the U.S. In other fields, the Bureau's work has led to substantial increases in domestic supplies of mineral raw materials: thus, increased production of copper resulted from investigations at San Manuel, Ariz., and White Pine, Mich., and many additional barrels of crude petroleum have been produced through the Bureau's promotion of secondary oil-recovery techniques.

★ Familiar though a chemist may be with the elements of the periodic table, it is not often that he is able to see in bulk those which are normally only read about or, at the most, seen in tiny specimen tubes. Such an opportunity, however, recently came the way of the members of the London Section of the Royal Institute of Chemistry, when they visited the Royston works of Johnson, Matthey. There they saw such processes as the electrolytic refining of crude silver and its subsequent casting into ingots of 99.99% purity and the production of gold bars of a highly precise weight.

This visit was one of several that the London Section is making during the summer, including the firm of Baird and Tatlock (London) Ltd., where a demonstration of glass blowing proved very popular. A visit, which also no doubt proved popular, was that to the Brewing Industry Research Foundation. The foundation does not generally deal with the day-to-day problems of the industry but is more concerned with long-term investigations. As a result of this, the organic department has succeeded in isolating the major active constituents of hops, and the contributions to the flavour of beer are being studied. This problem is extremely complex since indications are that the 'bittering principle' is not any one constituent of the hop resins or oils but is partially produced by reaction in the beer.

★ Tranquillisers and cancer would seem to be poles apart, but Dr. Paul Fluss and co-workers at the New York Institute of Biology say that some tranquillisers increase blood serum's inherent ability to destroy animal cancer cells. Compazine and Frenquel have been found to step up the ability of animal blood serum to inhibit the growth of ascites tumours. When treated ascites cells were transplanted into test mice they were found to have lost their ability to produce tumours. Untreated cells, however, induced cancer in the test animals. Other chemicals such as urea and sugar, also seemed to decrease the serum's cancer-destroying ability.

Main aim of Dr. Fluss is to explain the cancer-killing properties of blood serum, a natural effect that has been recognised for some time. Observing that tranquillisers inhibited oxidative phosphorylation, a process essential to normal cell growth, Dr. Fluss became interested and studies are now in progress on the effect of tranquillisers on *in vivo* tumours.

Alembic

ALBATROS BRING T.V.A.–BASED PROCESS INTO OPERATION AT PERNIS FERTILISER PLANT

UNIQUE in the field of fertiliser production is the so-called 'Nitro-Phospho-Sulpho' process used at the plant of Albatros Superfosfaatfabrieken N.V., Utrecht, recently opened at Pernis, near Rotterdam. The process, developed initially by the Tennessee Valley Authority, U.S., and then worked up further for commercial use by the Albatros central laboratory in co-operation with T.V.A., is not based on manufactured materials as are conventional systems, but produces a mixed fertiliser granulate direct from raw materials. Thus, superphosphate, ammonium phosphate, ammonium sulphate and ammonium nitrate are not needed for the process, but simply phosphate ore, sulphuric acid, nitric acid, phosphoric acid and ammonia. Only the potassium is used in the form of salts. The product is a perfectly homogenous granule of highly concentrated mixed fertiliser, produced cheaply and in a plant with a high productive capacity.

First stage in the process is the disintegrating of the crude phosphate. This is first dissolved in nitric acid, the amount used equalling about one-half of the total nitrogen needed for the process, the other half being in the form of ammonia entering the process at a later stage. Phosphoric acid is added at this first stage, as is the sulphuric acid unless technical considerations make it advantageous to add it during the second (ammoniating-cum-granulating) stage.

Neutralisation

As the molecular proportion of CaO to P_2O_5 has to be between 1 : 1 and 2 : 1 in the product, while in crude phosphate this proportion lies at about 3.6 : 1, quantities of CaO—some 1.6 to 2.6 times the amount of P_2O_5 in the starting material—have to be neutralised or eliminated. This is brought about by the addition of either sulphuric acid (this incurring the formation of gypsum) or by that of phosphoric acid. Alterations in the proportions of the various acids used can be used as a means to vary the water solubility of the phosphate part of the finished fertiliser. At the completion of the first part of the process, the product is in the form of a thin mash—the nitric acid containing 50% water—with a temperature of about 60°C, and in which all P_2O_5 is fully disintegrated.

The second stage of the process, in which the granules are formed, is the most important. It is centred on the use of a 3 m. by 6 m. revolving drum, into which is introduced the necessary quantity of potassium salts; such magnesium salts and/or one or more trace elements as are needed for particular customers; an amount of recirculated product; the solution from the first, disintegration, stage, this being finely sprayed over the rolling bed of the recycled product; and gaseous ammonia, this being blown up from underneath the bed of product from the mouth of a feed unit. Also added, if not done so during the first part of the process, is the sulphuric acid.

During this second stage, rolling particles are moistened by the strongly acidic phospho-nitro solution, then to be neutralised.

At the same time, and during the development of heat, several reactions take place, the most important of which result in the formation of NH_4NO_3, $Ca(H_2PO_4)_2$ and $CaHOP_4$. The process heat evaporates part of the water, the rest of the water forming a saturated solution with the salts produced, principally nitrates. The volume of this solution is so great that were it not for the recycling of product a liquid compound impossible to handle further would be produced; as it is, enough product is recycled for the compound leaving the drum to have a moisture content of only 4 to 5%. Dependent on circumstances, the amount in circulation is between 4 and 10 times greater than the yield. The compound leaving the drum has a temperature of between 60 and 80°C and is in the form of a slightly plastic granulate.

The final two stages of the process are more or less conventional, involving the drying and cooling of the 1-3 mm. granules and their sieving and breaking. Particular care must be taken to ensure that drying temperatures are not too high since this can result in too great a plasticity and other disadvantages. Sieving is aimed at the production of an attractively-formed granule. Breaking is by roller crushers.

The whole plant is controlled by one man in charge of a control section, assisted by six other staff responsible for maintenance. Situation is on the New Maas Waterway, and it is planned to export quantities of the new fertiliser via this route.

Bakelite Develop Composite P.V.C. Sheet for Chemical Plant Duties

A TOUGH p.v.c. sheet of good chemical resistance and high impact strength (Vybak DVR.258) has been developed by Bakelite Ltd., 12-18 Grosvenor Gardens, London S.W.1, for the chemical plant and associated industries. This material is a rigid/flexible composite sheet and is particularly suitable for tank lining applications. The flexible portion gives added strength to the sheet and is more easily cemented to metal than rigid sheet. The rigid side, in its turn, has superior chemical resistance to the flexible portion.

DVR.258 can be sawn and drilled in machines similar to those used in the woodworking or light engineering industries, and is easily welded by the hot gas welding technique. Due to its thermoplastic nature it is easily formed by heating to around its softening point and cooling in contact with the desired contour.

Sheet sizes are 96 in. by 48 in., thickness range is 1/16 in., 1/8 in., 3/16 in. and 1/4 in. The flexible surface has a matt finish and the rigid surface a commercial bright finish. The rigid component of DVR.258 is resistant to most chemicals other than oxidising acids and some organic acids and certain solvents, such as ketones, esters, aromatic hydrocarbons and chlorinated paraffins. Full information, including recommended adhesives, is given in the company's advance information sheet K.14.

More Chemistry Students for Dip. Tech. Courses

AT 31 March there was a total of 359 students taking the Diploma in Technology in applied chemistry, chemical technology and industrial chemistry, compared with 204 a year earlier. This is stated in the annual report of the National Council for Technological Awards. In these subjects there were 13 courses compared with 10. In chemical engineering 112 students were engaged in five courses, compared with 61 students and three courses at 31 March 1959.

Organisations providing training in chemistry for students awarded the Diploma in Technology during the period 1 April 1959 to 31 March 1960, were: B.I.P. Chemicals Ltd., Dunlop Rubber Co. Ltd., General Electric Co. Ltd., Imperial Chemical Industries Ltd., Joseph Lucas Ltd., and the West Midlands Gas Board.

New Roche Drug with 'Anti-aggression' Properties

ROCHE Products Ltd., London, introduced a new 'anti-aggression' drug, Librium, in London last week. The product has been tested on a wide variety of animals, on 20,000 patients in the U.S. and on many hundred patients in the U.K. Librium has been developed for the treatment of anxiety states, certain more severe mental disorders including obsessive compulsions, alcoholism and physical disorders. The drug is already on sale, but the firm has asked pharmacies to dispense it only against a doctor's prescription.

The drug, a crystalline substance, with a molecular weight of 336, is chemically 7-chloro, 2-methylamino,5-phenyl,3-H,1,4-benzodiazapine,4-oxide hydrochloride. The powder must be protected from light, and is highly soluble in water giving an unstable solution.

Ministry of Power Reshuffles Scientific Advisory Council

THE Ministry of Power Scientific Advisory Council has been reconstituted and its terms of reference amended so as to emphasise that its advisory functions cover all aspects of research and development concerned with fuel and power from the laboratory to industrial application. The new terms of reference of the Council, which will be renamed the Advisory Council on Research and Development are as follows:

(1) To advise the Minister of Power on research and development in relation to his statutory duty of securing the effective and co-ordinated development of coal, petroleum and other sources of fuel and power in Great Britain, and of promoting economy and efficiency in the supply, distribution, use and consumption of fuel and power, whether produced in Great Britain or not;

(2) To advise the Minister of new scientific and technical knowledge or applications of knowledge throughout the world, which in the opinion of the Council should be taken into account in the performance of his statutory duties;

(3) To keep the whole field of fuel and power under continuous review with the object of identifying problems needing research and development and advising the Minister of these problems with a view to discussion with the industries concerned.

To ensure the co-ordination of the advice which the Minister receives on research and development matters, the Council will take over the functions of the Minister's Fuel Efficiency Advisory Committee. This Committee, is accordingly being wound up and the Council is being invited to appoint a standing Committee on Fuel Technology.

Chairman of the Advisory Council on Research and Development is Sir Alexander Fleck, K.B.E., F.R.S., D.Sc. Members include Mr. T. B. Clark, B.Sc. (Imperial Chemical Industries Ltd.), Mr. W. K. Hutchison, C.B.E., M.A., B.Sc., M.I.Chem.E., M.Inst.Gas E. (deputy chairman, Gas Council), Sir Harry Melville, K.C.B., D.Sc., LL.D., F.R.I.C., F.R.S. (secretary, Department of Scientific and Industrial Research), Prof. M. W. Thring, M.A., F.Inst.P., M.I.Chem.E., F.Inst.F. (University of Sheffield), and Dr. F. A. Vick, O.B.E., Ph.D., F.Inst.P. (Deputy Director, Atomic Energy Research Establishment, Harwell).

Kenya Supreme Court Reverses Finding on Pyrethrum Sampling Methods

THE Pyrethrum Board of Kenya is to apply for leave to appeal to the Privy Council against a judgment announced on 22 June in Nairobi by the Court of Appeal for Eastern Africa in favour of the East African Extract Corporation, a subsidiary of Mitchell Cotts and Co. Ltd. The decision reversed the judgment of the Supreme Court of Kenya of 28 August 1959, in favour of the Pyrethrum Board in the test case over hand sampling as against mechanical sampling of pyrethrum flowers.

It was then ruled that the board's hand sampling method was the correct one, and the Supreme Court rejected the corporation's claim for a refund totalling £25,675 against the board, which the corporation said it had overpaid on 500 tons of pyrethrum deliveries from the board between April and June 1958.

The flowers must be sampled to establish the average content in each batch of the insecticidal pyrethrins found in the flower heads. On this content the price of the batch is based. In the new judgment, the court said it was far from satisfied, and found it impossible to say, that either method was more accurate than the other.

The court decided that the true result of sampling rested somewhere between the two respective methods. Therefore the onus of proof was on the board to prove that its sampling method was more accurate. This the board had failed to prove, and the court ordered a refund to the corporation of £25,675 in respect of overpayments on 500 tons of flowers.

Ruling in favour of the Pyrethrum Board, the court refused to order that the Nairobi sample price should apply until June 1961, and said that samples taken at Nairobi govern the price for the three month period April to June 1958, only.

Obituary

Mr. C. C. Last, one of the pioneers of Bakelite Ltd. and a former sales director of the company, died recently. He joined Bakelite in 1927 and was appointed to the board in July 1951. In 1955 he became sales director and remained in that post until ill-health forced his retirement in December 1957. He made many outstanding contributions to the progress, not only of his own company, but to the plastics industry as a whole. He was the founder chairman of the council of the Plastics Institute (1931-33) and their founder president in 1933-35. Among the many other honorary posts he held during his career was that of chairman of the Plastics Material Manufacturers' Group from 1951-53 and chairman of the British Plastics Federation from 1956-58.

Government Chemist's Report Published

THE 1958/59 Report of the Government Chemist, published on Wednesday, covers a period of 21 months from 1 April 1958 to 31 December 1959. Unlike other Department of Scientific and Industrial Research stations which are engaged primarily on research projects, the work of the Laboratory of the Government Chemist is to provide analytical and advisory services for Government departments. These services cover a wide field from the estimation of diphenyl in citrus fruits to the analysis of pesticides and solanine in potatoes. The work of the laboratory has been reorganised into five divisions, each under the charge of a senior principal scientific officer. Four of the divisions are analytical, investigatory and advisory divisions, two dealing mainly with revenue, one with foods, drugs and agricultural chemicals, and the other with the general analysis of a wide variety of materials. The fifth is a research and physical methods division. The report is obtainable from H.M. Stationery Office, price 3s 6d.

Monsanto's New Semi-conductor Materials

FOLLOWING their announcement earlier this year that they will be in production of ultra-pure silicon by the end of 1960, Monsanto Chemicals Ltd. are now able to supply development quantities of intermetallic semi-conductor materials produced by Monsanto Chemical Company, St. Louis, U.S. Monocrystalline and polycrystalline gallium arsenide, polycrystalline indium arsenide and polycrystalline indium phosphide are already available, and additional materials, including single and doped crystals, will be available shortly.

New Sharples Centrifuge Gets U.K. Tour

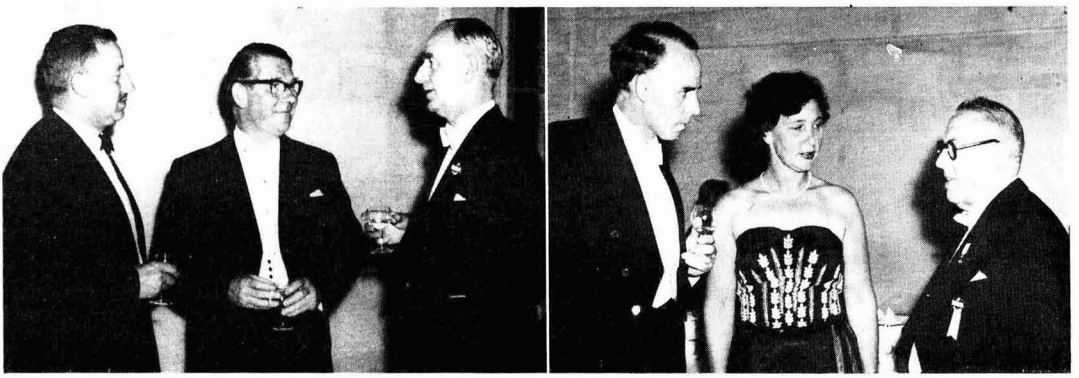
A YEAR of intensive design and development work was followed recently when Sharples Centrifuges Ltd., Tower Works, Camberley, took their new Gravitrol-1000 centrifuge on tour to some of the principal U.K. cities. While the centrifuge shown is for the purification of residual fuel oils and boiler fuel oils, the Gravitrol principle finds extensive use in the chemical and allied industries. This new centrifuge, therefore, becomes a useful addition to the Sharples disc/nozzle machine range.

The exhibition unit is now moving on to Holland and Germany, and shortly a similar machine will be shown in the U.S.

Chemicals for Textiles

The role of specialised chemicals for the textile industry will be the subject of the opening lecture by Mr. G. Whiston, assistant managing director of Catomance Ltd., at the symposium on "Chemicals—their use and application in textile finishing", to be held in Manchester on 23 September.

S.C.I. ANNUAL MEETING AT BRISTOL



At the civic reception, l. to r., D. L. Allen (Philblack Ltd.), E. P. Butler, chairman-elect, S.C.I. Bristol Section, George Brearley, director, Association of British Chemical Manufacturers, Prof. D. H. Everett, Prof. of Chemistry, Bristol University, Mrs. Everett, and Dr. Arthur Marsden, hon. secretary, Bristol Section

Attendance of 350 at Bristol : Lord Chandos Gives Messel Address

SEVENTY-NINTH annual meeting of the Society of Chemical Industry, held in Bristol from Monday to Saturday of last week, was attended by about 350 members and their ladies, below the numbers expected. It was generally felt that other recent conferences, including that on catalysis held in Paris last week, had affected attendance at Bristol.

As on previous occasions, keynote of the conference was informality. The quality of the papers was particularly good and as usual members had the choice of a number of interesting works to visit. The 1960 conference was generally voted to have been highly successful.

The week started with a reception and dance held by the Bristol Section on 4 July, at the Victoria Rooms. Following a meeting of the Council on 5 July, Alderman Hugh Jenkins, Lord Mayor of Bristol, gave an address of welcome in the Royal Fort. This was followed by the annual general meeting and the presidential address by Mr. Ernest J. Solvay (Solvay et Cie), which was reported in 'Chemical Age' last week, p. 59.

About 310 members and ladies were entertained to lunch in the Grand Hotel on 5 July by the Bristol Section. Mr. E. Peter Butler, chairman-elect of the section, welcomed those present and Mr. Solvay responded. In the evening, the Lord Mayor held a civic reception in the Council House.

Highlights on 6 July were the presentation of the Messel Medal to Lord Chandos, chairman of Associated Electrical Industries and a director of I.C.I., who gave the Messel address on 'Research and finance in industry', and the annual dinner of the Society in the Grand Hotel, when the chief guest was Sir Alexander Todd, F.R.S., president of the Chemical Society and Professor of Organic Chemistry, Cambridge.

Receptions were held by the University of Bristol on 7 July and by Albright and Wilson on 8 July. Final event of the conference on Saturday, 9 July, was an all day tour of Exmoor and the Lorna Doone country. Thirty firms took part in an exhibition held in Queen's Building during the conference, while visits were arranged to a number of works and places of interest.

In addition to the Messel address the following papers were presented: 'Industrial aspects of fluorine chemistry', by Dr. A. K. Barbour (Imperial Smelting Corporation Ltd.); 'A chemical approach to crop nutrition', by Dr. C. Bould (Long Ashton Research Station); 'Trialkyl phosphates, an example of process development', by C. H. G. Hands (Albright and Wilson (Mfg.) Ltd.); 'Metallurgical problems of the turbine engine', by E. R. Gadd (British Siddeley Engines); 'Urethane foams, methods of production, properties and applications', by J. M. Buist, R. Hurd and Dr. A. Lowe (I.C.I. Dyestuffs Division); and 'Modern aspects of polymers', by Dr. J. J. P. Staudinger (Distillers Company Plastics Division).

Alderman Hugh Jenkins, Lord Mayor of Bristol, left, with Mr. Ernest J. Solvay, S.C.I. president

Messel Address. Lord Chandos felt that the tendency to play down Britain's spending on research was not justified and that the U.K. effort on research and development compared favourably with that of the U.S. No reliable figures or estimates were available of research spending in the 1920's, but Lord Chandos gave estimates which he said were comparable to others that had been made. These put Britain's expenditure on research both by industry and Government in the 1920's at a rate of £25 million a year. Last year, U.K. spending on research and development on the part of the Government and industry totalled £450 million.

A figure of more than £300 million had been estimated for the year 1955-56 when industry paid for one-third of the cost of research and development that it carried out. The fact that this proportion had risen to two-thirds in 1958-59 reflected the fact that less research was carried out on defence contracts. About 27% of all research and development was carried out in Government establishments or in the nationalised industries.

In 1955-56 Britain spent 1.8% of the gross domestic product on research and development; that was a rather higher percentage than in the U.S. By 1958-59 this percentage had increased to just over 2% of the gross domestic product. Of the total research bill, 5% was spent on basic research in the U.K., against 3% in the U.S.

He was thanked for his address by Sir Alexander Fleck, F.R.S., S.C.I. president for 1960-61, who described it as a very unusual type of lecture, in fact "a

J. L. Wylie (I.C.I.), left, with Mrs. Douglas and R. L. Douglas (I.C.I.)

breakthrough" so far as Messel lectures were concerned.

Crop Nutrition. Dr. C. Bould reviewed recent developments in crop nutrition, discussing soil analysis in relation to the diagnosis of nutrient deficiencies and to crop manuring. He covered recent work on root cation exchange capacity and the part played by root excretions in relation to nutrient availability. He also dealt with leaf analysis as a guide to the nutritional status of plants.

Trialkyl Phosphates. The production at Oldbury of trialkyl phosphates by Albright and Wilson (Mfg.) was the subject of the lecture by Mr. Hands (CHEMICAL AGE, 7 November 1959, p. 645). Chemistry of the process—the reaction of alcohols with phosphorus oxychloride—was described as simple. A questioner who had sought quantities of triisobutyl phosphate was told that the company had quite recently made relatively small quantities. More could be produced if the demand warranted it.

Turbine Engines. Mr. Gadd said that finding materials of high strength and good oxidation resistance in the same alloy was becoming increasingly difficult and had led to the use of specialised coatings. He discussed the use of aluminium, magnesium and titanium as well as problems of corrosion, fabrication and application.

Urethane Foam. The paper by Buist, Hurd and Lowe was presented by Dr. Lowe who, to demonstrate the highly exothermic reaction involved, mixed a small quantity of diisocyanate with a resin, which foamed immediately to set hard in a few minutes. The paper dealt with the various raw materials used, methods of producing foam and applications. The increasing practice of producing urethane foams *in situ* was described, and Dr. Lowe displayed a number of spray guns in which the basic materials were mixed with catalyst, surfactant, pigment, etc., and sprayed simultaneously. This development, he pointed out, meant that each operator was in fact a chemical manufacturer. U.K. production of polyurethane foams was estimated by Dr. Lowe, as a rough guide, to be in the region of 10,000 tons a year, with that of the U.S. at some 70,000 tons a year.

Polymers. Dr. Staudinger said that U.K. production of plastics materials in the first quarter of this year totalled 146,000 tons, compared with a total production in 1959 of 500,000 tons, 415,000 in 1958, 395,000 tons in 1957 and 340,000 tons in 1956.

He described how Ziegler's work on the polymerisation of olefins with organocatalysts and Natta's work on the tacticity of α-olefins (syndiotactic, isotactic and atactic) had influenced the work of research teams throughout the world as well as bringing big changes to the world's plastics industry. He referred to the work done at Bristol University in connection with crystallinity of polymeric materials.

Modified Ziegler catalysts had led to the development of diolefins of the isoprene type, which gave control over the 1-4 addition, whether *cis* or *trans*. *cis*-1:4 Polybutadiene and *cis*-1-4-polyisoprene had now reached the semi-commercial scale and would be produced on a large scale in the near future. Dr. Staudinger saw a big future for these newer types of synthetic rubber, which could more closely reproduce the properties of natural rubber than other synthetic rubbers.

The work of Du Pont in developing polyoxymethylene, a high molecular weight linear polymer of formaldehyde, with a high crystal content, was also described. Specific gravity was high due to greater linearity of polymer chains. New uses would be found for this material, as well as for the polycarbonates, which with molecular weights up to 2,000, would replace metals in many applications. Among the new materials, Dr. Staudinger spoke of Czech work on the production of polymers, with as many as 900,000 molecules, from dimethyl ethane.

Dr. A. K. Barbour on Industrial Aspects of Fluorine Chemistry

IN his paper on 'Industrial aspects of fluorine chemistry', Dr. A. K. Barbour (Imperial Smelting Corporation) surveyed current industrial developments, with the emphasis on the organic compounds. To show the increasing interest in fluorocarbons Dr. Barbour said that in the U.S. in 1948, 57% of fluorspar was consumed in the steel industry, compared with 38% in 1957; chemical industry usage in the U.S. in 1948 accounted for 27% of available fluorspar, compared with 51% in 1957.

U.S. production of hydrofluoric acid totalled 35,000 tons in 1950, rising to 103,000 tons in 1959. Comparable figures for the U.K. were not available. Of U.S. consumption of hydrofluoric acid in 1957, 31.1% went for the production of fluorocarbons; aluminium fluoride took 29.6%; uranium production 11.8%; synthetic cryolite 7.4%; inorganic fluorides 5.6%; steel pickling 5.2%. In the U.K. the main consumption of hydrofluoric acid was also found in atomic energy and the production of fluorocarbons.

Mr. E. J. Solvay, president, left, listens to the Messel address given by Lord Chandos

Dr. Barbour described the various production processes for fluorocarbons, stating that halogen exchange reaction was the principal method for the fluoridation of organic compounds. He also referred to the production of the chlorofluoromethanes and ethanes, world production of which now exceeded 130,000 tons a year.

U.S. capacity for chlorofluorocarbons totalled 465 million lb./year in 1958, with sales totalling 200 million lb./year. Main outlets were for use as refrigerants and as propellants in aerosols. In the U.S. 40 million aerosol units were produced in 1951, a figure that rose to 575 million in 1959, not including aerosols for foodstuffs. Comparable U.K. figures were 1.25 million units in 1951, rising to 25 million in 1959.

Dr. Barbour then dealt with the use of chlorofluorocarbons as chemical intermediates, giving such products as p.t.f.e. and polychlorotrifluoroethylene. U.S. capacity in 1959 for p.t.f.e. totalled 3,100 tons, with a value of £10 million. The more recent development of fluoroelastomers by Du Pont and Minnesota Mining and Manufacturing had given products with properties possessed by no other materials.

Dr. Barbour felt that the scope for price reductions was marginal, except in the unlikely event that a process was evolved missing either carbon tetrachloride or hydrofluoric acid. But he stressed that many new discoveries in this field were still to be made and he felt that important developments would flow from the work of Professor Tatlow at Birmingham University which was opening up new fields of research in aromatics.

30 Companies Show Chemicals and Equipment at S.C.I. Exhibition

A SMALL exhibition with 30 companies, representing chemical producers and manufacturers of chemical and laboratory equipment, was held during the S.C.I. conference at Queen's Building, Bristol University.

Novadel Ltd., St. Ann's Crescent, London S.W.18, showed organic peroxide catalysts for the polymerisation of vinyl compounds, olefins and acrylates, for the vulcanisation of natural and synthetic rubbers, the cross-linking of polyesters and polyolefins, etc. A wide range of metal soaps recently introduced under the name of Siccatols was also shown. Based on a synthetic organic acid of known purity and composition and said to show many advantages over naphthanate driers, they are available as solutions of the following standard metal contents: 33% Pb; 10% Co; 5% Ca; 10% Mn; 10% Zn; 10% Fe; 10% Ce; and 10% Zr.

Interest was shown in the new one pan balances, Models HO5 and HO6, introduced by *L. Oertling Ltd.*, St. Mary Cray, Kent, to replace Model HO2. With a capacity of 200 g, these models have a sensitivity of 0.1 mg. to each vernier division. The scale has 100 divisions covering 0-100 mg. and accuracy is said to be a standard deviation (mean value) of 0.08 mg. Model HO5 is fitted with the Releas-o-matic mechanism that is said to ensure perfect release of the balance beam; Model HO6 has a conventional manual release.

Water Treatment Plant

Their range of water treatment plant was displayed by the *Permutit Company Ltd.*, Gunnersbury Avenue, London W.4. This included Deminrolit plant, ion exchange softeners and 'starvation' plant. Permutit, the only U.K. manufacturers of both ion exchange plant and ion exchange materials, stressed that their service is equipped to deal with the most complex as well as straight-forward water treatment problems.

A valve has been introduced by *Saunders Valve Co. Ltd.*, Cwmbran, Mon, to meet the call for a non-return valve with a chemical resistance equivalent to that of their hard rubber-lined A and KB valves. All parts are protected by rubber lining and H grade discs, newly developed for pressures of up to 100 p.s.i. can be supplied for use in the presence of oil. The valve has been designed for acid and chemical services.

A model of their Avonmouth plant was shown by the *Imperial Smelting Corporation Ltd.*, 37 Dover Street, London W.1. Their exhibit also dealt with their range of fluorine chemicals and anhydrous hydrogen fluoride. Two development products in the Isceon range are Isceon 14 carbon tetrafluoride, CF_4) for use as a low-temperature refrigerant and heat transfer fluid, and Isceon 13 (chlorotrifluoromethane. $CClF_3$) for use as a low-temperature refrigerant.

Edwards High Vacuum Ltd., Crawley, stressed the expansion of their Manor Royal site which since it was opened in 1953, has been extended from 100,000 sq. ft. to 145,000 sq. ft. and which is due for a second extension next year to 205,000 sq. ft. employing a force of 900.

Visitors to the stand of *Loughborough Glass Co. Ltd.*, Loughborough, learned that since its introduction a year ago the Stonwata A300 deioniser has been installed in many Government research laboratories. This model gives a constant choice of distilled or conductivity water. Output is up to 30 g.p.h., with between 200 to 2,000 gall. per regeneration. Essentially, the unit is two dioniser units in series. The first, a multi-bed type of novel design removes the bulk of the ions and yields water of distilled quality; the second, fed from the first, is a conventional monobed carriage, yielding conductivity quality water.

On the stand of *H. J. Elliott Ltd.*, Treforest, was shown the newly developed E-Mil burettes fitted with Loughborough p.t.f.e./glass stopcocks. This stopcock, specially designed for this application, makes possible a burette that can handle all solutions, including caustics, without seizure of the stopcock. No lubrication is needed. Capacity is 50 ml., sub-divided in 0.10 ml.; the stopcock is of a single straight bore.

Griffin and George (Sales) Ltd., Alperton, Middlesex, showed their new series of general purpose balances. Also shown was the Griffin absorption chromatograph. Used at the B.P. Research Centre for routine analysis of hydrocarbon gases, the technique makes it possible to analyse gaseous mixtures that are insoluble in concentrated aqueous potassium hydroxide. The range of gas mixtures includes nitrogen, oxygen, carbon monoxide, hydrogen, methane, ethane, propane, 2-methylpropane, n-butane, 2-methylbutane (concentrations up to 1%), ethene, propene, 2-methyl propene, 1-butene, *cis*-2-butene, *trans*-2-butene, and 1,3-butadiene. Quantitative accuracy is within the limits $\pm 0.25\%$.

Other exhibitors were: Albright and Wilson, Baird and Tatlock; Borax Consolidated; Doran Instrument; Evans Electroselenium; A. Gallenkamp; Golden Valley Colours; I.C.I.; Mond Nickel; Monsanto Chemicals; Permali; W. G. Pye; Quickfit and Quartz; Shell Chemical; Southern Analytical; Stanton Instruments; Stothart and Pitt; Townson and Mercer, Unicam; Walker Crosweller; and Wallace and Teirnan.

Era of the Specialist has Brought too Many Splinter Groups, says Sir Alexander Todd

THIS was the era of the specialist and it had brought about the setting up of splinter societies catering for the needs of the specialist—a dangerous trend. This was the view of Professor Sir Alexander Todd, F.R.S., president of the Chemical Society when he proposed the toast of 'The Society of Chemical Industry' at the S.C.I. annual dinner held in the Grand Hotel, Bristol, on 6 July. Mr. Ernest J. Solvay, S.C.I. president, presided over a company of some 400 members, their ladies and guests. After the speeches he invested Sir Alexander Fleck, president for 1960-61, with the chain of office.

Sir Alexander Todd suggested that the time had come for a closer knitting together of chemists, as opposed to the setting up of so many little splinter groups, all catering for narrow fields. Such a move would be of great value to chemistry as a profession. He felt that the current "flood of literature" and the need to keep up with one's own branch of chemistry, had been partly responsible for the current high degree of specialisation.

Excluding what he termed "the more exotic journals," and including the western journals and abstracts, if the organic chemist read for eight hours a day at the rate of 2½ minutes per page, with Sunday afternoons off and no holidays, he would cover the literature for 1957 in 1½ years. It might well be, he added, that chemists should be thinking a lot more about radical new methods of imparting information.

It was all very well to become a specialist, but in the industrial field the developments which might affect a chemist in one field often appeared in the journals in a different field.

Responding, Mr. Solvay paid tribute to the organisers of the annual meeting, particularly Dr. Arthur Marsden, who has been chairman for nearly 40 years of the S.C.I. Bristol Section. Mr. E. Peter Butler, chairman-elect of the Bristol Section, proposed the toast of 'The guests' and Mr. G. E. Maggs, Sheriff of Bristol, responded.

Following presentation of the Lampit Medal to Mr. H. Talbot, who had played a large part in the founding of the Chemical Engineering Group, Mr. Solvay invested Sir Alexander Fleck with the presidential chain. Sir Alexander spoke of the debt the Society owned to Mr. Solvay, their first Continental president, and presented him with the past-president's badge of office.

Arabic Edition of Petroleum Equipment Publication

An Arabic edition of *British Petroleum Equipment News*, the quarterly magazine of the Council of British Manufacturers of Petroleum Equipment has just been published. This is one of the occasional special-language editions published from time to time, and it contains a selection of articles from recent issues of the English-language version.

In Parliament

EAST GERMAN DUMPING LEADS TO £19-A-TON DUTY ON SODIUM CHLORATE IMPORTS

THE House of Commons last week approved a Government Order imposing an anti-dumping duty of £19 a ton on sodium chlorate originating in East Germany. Moving the Order, the Parliamentary Secreary to the Board of Trade, Mr. John Rogers, said that the U.K. manufacturer applied to the Board of Trade last August for a duty under the Customs Duties (Dumping and Subsidies) Act, 1957. The Board followed its normal practice of satisfying itself that dumping was actually taking place, and that it was causing, or threatening, material injury to the U.K. industry.

Last December representations were invited from interested parties. Those representations were carefully considered, along with the evidence from their own investigations.

As a result, the Board reached the conclusion that there was dumping; that it was causing material injury to the U.K. manufacturer, and that an anti-dumping duty would be in the national interest. The Act defined dumping as selling at an export price below the fair market price in the country of origin. In this case they had reason to believe that the price in East Germany was an arbitrary one; there was also no free rate of exchange for the East German currency by which the domestic price could be related to the export price, which was quoted in sterling by the East German exporter.

The fair market price was therefore determined by reference to the price charged by the exporting country for sales in any other export market. It was clear that sodium chlorate had been exported to the U.K. at prices substantially lower than those which the East German exporter had been charging elsewhere. They had established the margin of dumping by reference to a figure which seemed fairly typical of the price in other markets.

Sodium chlorate from East Germany had been selling here at prices substantially below the U.K. manufacturer's costs of production and thus he had been forced to sell at a loss in order to avoid losing too big a share of the market. Even so, East German material had been gaining an increasing share of the market at the expense of the U.K. producer and of other traditional exporters to this country. They therefore considered that imports from East Germany represented unfair competition.

Call for Subsidy on Organic Fertilisers

A plea that dried organic fertilisers from sewage purification should be eligible for subsidy, made in the House of Commons on 7 July, met the reply from Mr. John Hare, Minister of Agriculture, that "because of the varying content of this form of fertiliser it is much better to stick to our present arrangements." It had been pointed out that a number of sewerage authorities were finding difficulty in disposing of these fertilisers because of competition from subsidised materials.

Persomnia Formula Referred to in Commons

The manufacturers of Persomnia, which could not now be sold without a prescription, had produced a new formula and were marketing it under the same name, it was alleged in the House on 7 July. Mr. D. Vosper, Joint Under-Secretary, Home Department, said he had seen the advertisement; it was not a matter for the Poisons Board, but it might well be within the jurisdiction of working party on the law relating to medicinal substances, which was to review statutory restrictions on their advertisement.

Use of Synthetic Oestrogens in Poultry Production

Asked if he proposed to ban the treatment of chickens with stilboestrol, Mr. John Hare, Minister of Agriculture, said the Agricultural Research Council was studying the use of synthetic oestrogens in the production of poultry and livestock and he was awaiting their advice. He added that he had been advised that the risk was very slight and that no cases of harmful effects to human consumers in in the U.K. had come to his attention.

On the same day, Mr. Hare, representing the Minister for Science, was asked what research was being conducted into the carcinogenous effects of using stilboestrol in the production of broiler chickens. He was advised that stilboestrol was very little used in the U.K. for this purpose and even when used, the residue in the edible parts was very small. He thought it best to await the report of the A.R.C. expert committee.

Coal By-products Report Ready Soon

The report of the Wilson Committee inquiring into the potentialities of the by-products of coal should be ready for publication "in the very near future", according to the Minister of Power. He was answering a question by Mr. W. Hamilton, who pointed out that "there is a great volume of opinion in this country which believes that the future of coal lies in its by-products rather than in its burning". In view of the urgency of the problem, would the Minister do whatever he could to speed up the report, which has been subjected to considerable delay? The Minister gave his assurance that he expected to receive the report "very quickly" and that he would present it to Parliament as soon as possible.

Forestal Land Plan £2 Million Entry into Chemical Industry

UNDER the group diversification plan, the Ditton development unit of Forestal Land, Timber and Railways Co. Ltd., Shell Mex House, Strand, London W.C.2, has now brought its work to "launching point" in connection with several projects in the chemical field. Some of these projects involve know-how agreements with overseas associates which should be in operation before the end of this year.

Further details are not yet available, but the programme of projects, some of which have been approved and in operation, and some of which are still being studied, would involve—if they were all proceeded with—a total expenditure of the order of £2 million.

Sir Walter Worboys, formerly commercial director of I.C.I., joined the Forestal board earlier this year, and already his wide industrial experience is said to have proved of great value to the company, particularly in regard to the side of the business connected with projects outside the field of tanning materials.

Under the diversification programme an agreement has just been signed with the Dearborn Chemical Co. Ltd., a leading company in the water treatment and allied field. Dearborn know-how becomes available to Forestal, whose companies will be able to give the Dearborn service in the U.K., West Germany and Africa, thus expanding considerably their own range of water treatment compounds.

Forestal have also acquired Owen and Green Ltd., who are engaged in marine water treatment. These moves follow the decision to develop the company's interest in water treatment and the earlier acquisition of John Pittam and Co.

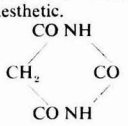
Griffin and George Stage Largest U.K. Exhibition

What is claimed to be one of the largest exhibitions of scientific equipment ever organised in the U.K. by one firm was held from 12 to 14 July at Birkbeck College, London. The Exhibition was staged by Griffin and George Ltd., and showed not only a comprehensive range of G and G Group instruments but also products of over 20 well-known scientific instrument manufacturers.

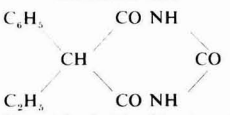
PREPARATION AND MANUFACTURE OF BARBITURATES

By
M. A. Phillips, D.Sc.,
F.R.I.C., M.I.Chem.E.

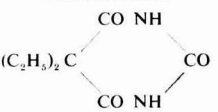
BARBITURATES, derivatives of the cyclic malonyl urea or barbituric acid, are well known as sedatives and hypnotics and many examples are known, mainly with one or two hydrogens at the 5 position substituted by alkyl or aryl groups. Such are phenobarbitone, veronal and cyclohexobarbitone, below. Other derivatives may have alkyl substitution at the 1(3) position; such is hexobarbitone, the sodium derivative of which is an intravenous short duration anaesthetic.



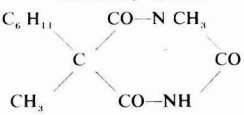
Malonyl urea
Barbituric acid



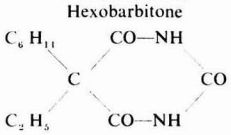
5-Phenyl-5-ethyl barbityric acid;
Phenobarbitone



5,5-Diethyl barbituric acid
Barbitone; veronal

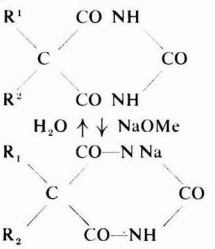


5-cyclohexenyl-1,3-dimethyl
barbituric acid;
Hexobarbitone



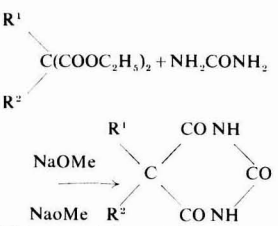
5-Cyclohexenyl-5-ethyl barbituric acid;
Cyclobarbitone.

The word 'derivative' is used and not 'salt' since these sodium compounds are normally made by reacting the corresponding barbiturate with sodium alkyloxide in anhydrous alcohol; they are hydrolysed readily and completely by even limited amounts of water. The following equation shows the constitution of these derivatives as —N—Na compounds:



Hexobarbitone sodium, being the derivative of a somewhat more acidic barbiturate than some others, is not precipitated rapidly by water although aqueous solutions are alkaline and do in fact precipitate with excess of water in due course.

Barbiturates can be obtained in a number of ways; two such can be used for preparation and manufacture. The first and most commonly used for the older barbiturates, such as barbitone, is condensation of substituted malonic ester with urea:

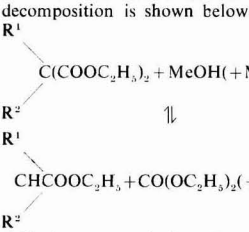


This method is used for the manufacture of barbitone, phenobarbitone and of similar products, sodium methoxide is used as condensing agent. Yields are normally of the order of 60% of theory and cannot readily be improved. The second method is in fact the classical one and is used for the manufacture of hexobarbitone and of cyclobarbitone; it consists of the condensation, again using sodium methoxide as condensing agent) of a substituted cyanoacetic ester with a methyl urea or with a dicyandiamide, in the latter case followed by hydrolysis of the N-cyano derivative.

The yields by this method may be better than by the malonic ester process, sometimes as much as 75% of theory.

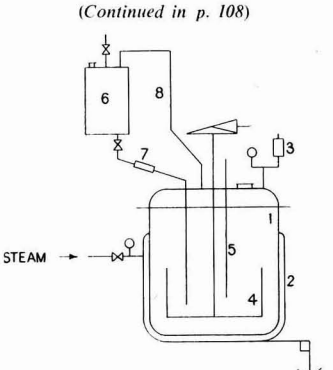
In both reactions it is desirable to ensure that the conditions are as anhydrous as possible since the presence of even as little as 2% of water in the barbitone condensation can reduce the yield to less than 50% and, in the case of phenobarbitone, from 90% to less than 20%.

However, even with anhydrous conditions, the condensation yields are not good and this has been found to be due to decomposition of the malonic or cyanoacetic ester by the sodium alkyloxide condensing agent; the usual method of this operation is to mix the ester, urea and the whole of the alkyloxide at the beginning and then to heat the mixture. This procedure favours the decomposition of the ester which is rapid to the detriment of the relatively slow condensations shown above. The ester decomposition is shown below:

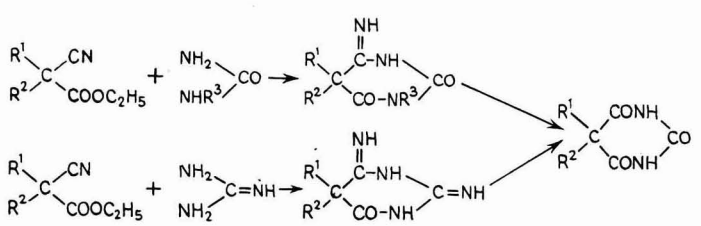


If the ester, whether the substituted cyano ester or the substituted malonic ester, is mixed with ethyl or methyl alcohol under practically anhydrous conditions and a pre-formed solution of anhydrous sodium ethoxide or methoxide is then added slowly to the heated mixture so that the reaction to a moist phenol phthelein paper is never more than a very faint pink, the yield can be

(*Continued in p. 108*)



Urea condensation stage in the production of barbiturates: 1, kettle, 2, steam jacket; 3, pressure gauge and safety valve; 4, agitator; 5, thermometer; 6, alkyloxide feed tank; 7, sight glass; 8, pressure equalising tube



Recent Advances in Commercial Terephthalic Acid Synthesis

DURING the 1960's, terephthalic acid production is expected to continue the rapid growth which has characterised it during the preceding 10 years. Commercial production of this compound in the U.S. began in 1951, and has now reached an estimated 75 lb. per year level. 1965 output is forecast at 125 to 150 million lb.

By far the most important outlet for terephthalic acid and its dimethyl ester is in the manufacture of polyester fibres (Dacron and Terylene) which are obtained by condensing dimethyl terephthalate with ethylene glycol and similar polyols. Second in importance is the use of TPA as intermediate for polyester film (Mylar and Videne). Finally, and definitely in third position, is the use of TPA for the manufacture of specialty plasticisers.

At present, production of terephthalic acid is based entirely on the partial oxidation of *p*-xylene. This synthesis involves two major problems: the difficulty of purifying *p*-xylene to a quality acceptable for the purposes of fibre-grade TPA production, and that of oxidising the second methyl group of xylene, i.e. oxidation beyond toluic acid.

Because of these problems, and because of the important growth potential of TPA, there is now underway considerable developmental activity which has as its goal improvement of both raw materials position and oxidation technique.

Separation of Xylenes

p-Xylene, still the only feedstock for commercial TPA production, is recovered from the aromatic C_8-fraction of petroleum reformate. This is essentially a four-component mixture, consisting of the three xylene isomers and ethyl benzene.

Removal of *o*-xylene from this mixture can be effected without too much difficulty by fractionation and this approach is taken by Oronite Chemicals Co. and Cosden Petroleum. *o*-Xylene recovered in this fashion can be used (and is used by Oronite) as raw material for phthalic anhydride synthesis.

The real difficulty in the isolation of *p*-xylene (b. pt. 138.5°C) is its separation from the close-boiling ethyl benzene (b. pt. 136.2°C) and *m*-xylene (139.2°C). Certainly styrene-grade ethyl benzene is now recovered by fractionation of petroleum reformate at Cosden Petroleum Company and will be recovered in this manner at a plant being built by Sinclair-Koppers at Houston, Texas. Such separation, however, involves an unusually large number of equilibrium stages. Furthermore, it does not solve the problem of *p*-xylene recovery from residual ethyl benzene and *m*-xylene.

Thus, to isolate TPA-grade *p*-xylene, recourse is made to methods of fractional crystallisation. Freezing point of pure *p*-xylene is 13.3°C and thus permits removal from *m*-xylene (−47.9°C) and ethyl benzene (−95°C).

Direct crystallisation of *p*-xylene can be carried out with only limited yield since the compound forms a eutectic mixture with *o*-xylene which contains approximately 25% of the para-isomer. Several techniques have been developed to improve both yield and purity of *p*-xylene recovered by crystallisation. These include crystallisation in the presence of adduct-forming solvents such as carbon tetrachloride (California Research Corporation) and two-stage crystallisation.

As far as is known, multi-stage crystallisation without solvent is employed at all commercial *p*-xylene plants but there are significant differences in execution. For example, Humble Oil Company employ indirect heat transfer while Standard Oil Company of California prefer an internal refrigerant, and Phillips use a special continuous purification column with internal reflux for its second purification stage.

Regardless of purification method selected, operating and investment costs are high, thus the cost of *p*-xylene in the 14-17 cent per lb. range, compared with approximately 4 cents for mixed xylenes. Numerous attempts have therefore been made to find a raw materials basis with a lower cost.

One such approach, taken at Amoco Chemical Company's liquid-phase oxidation plant at Joliet, Ill., is to feed mixed xylenes, separate the resulting isomeric acids and sell co-product phthalic, isophthalic and benzoic acids. Here, however, difficulty occurs in the separation of the acids and in the marketing of isophthalic and benzoic acids. Amoco were last reported as feeding mostly purified *p*-xylene due, in part, to a resulting increase in terephthalic acid capacity.

Other approaches to a different raw materials position have been developed, though none have become commercially significant. Mention must be made of the use of *p*-cymene (a wood distillation product) and of *p*-diisopropyl benzene. For the latter compound a liquid-phase oxidation process has been developed by Koninklijke/Shell Laboratorium.

Isomerisation of potassium phthalate and of potassium benzoate to potassium terephthalate has been developed by Henkel and Cie. as a TPA synthesis which avoids *p*-xylene. The process is reportedly used commercially in Japan (on a minor production scale). It has been licensed to I.C.I., but not used by them, and is reported to have been licensed to Hercules Powder and B.A.S.F.

Bergbau-Forschungs GmbH is now piloting a process for producing TPA from toluene via an intermediate chloromethylation step. Recent Russian work converts *p*-diethylbenzene to co-product terephthalate acid and chloroform by a two-stage oxidation-alkaline chlorination route.

The second big problem in TPA production by vapour-phase oxidation methods, analogous to phthalic anhydride synthesis, is conversion of the second methyl group in the two-stage oxidation process of *p*-xylene to TPA.

Commercial methods are geared to overcome this obstacle in various ways, and the following approaches are in operation: oxidation by nitric acid (Du Pont); liquid-phase oxidation by air (Amoco); air oxidation to toluic acid, followed by liquid-phase oxidation of methyl toluate (Hercules); oxidation by sulphur in the presence of aqueous ammonia (Oronite).

Oxidation Processes

Nitric acid oxidation is carried out in a single stage at 200-230°C and enough pressure (approximately 400 p.s.i.) to maintain liquid-phase conditions. Preferred nitric acid strength is between 25 and 40%. About 2.4 lb. HNO_3 is charged per lb. *p*-xylene. The reaction product is cooled and filtered for the recovery of crude water-insoluble TPA which is further upgraded by recrystallisation. Overall yield is slightly below 90% of theory, based on *p*-xylene.

Key to the liquid-phase air oxidation of *p*-xylene is the catalytic use of bromine compounds in conjunction with salts of variable-valence heavy metals such as manganese or cobalt. The reaction may be carried out without solvent, but advantages have been reported for use of a solvent, such as acetic acid, from which product TPA is precipitated. Yields of phthalic acids above 80% have been claimed.

Using only cobalt toluate as catalyst, air oxidation may be employed as first step in TPA synthesis, yielding toluic acid as intermediate. The reaction is carried out in the liquid phase at about 200°C. Product toluic acid is esterified acid or by air oxidation in the liquid phase. Basis of the latter approach is the finding that oxidation of toluic acid proceeds more readily if the carboxylic group is tied up.

Oxidation by sulphur compounds in the presence of water and ammonia is carried out at 315-360°C and correspondingly high pressure (2,500-6,000 p.s.i.). At high water : xylene ratios total yield of dicarboxylic acids has been reported in the 90-95% range.

Among TPA syntheses not based on *p*-xylene, the Henkel isomerisation-disproportionation is believed to be closest to commercialisation. Starting with potassium phthalate, cadmium salts have proved effective catalysts. Also added are drying agents (e.g. aluminium carbide) and an acid acceptor (K_2CO_3). The reaction is carried out in the presence of carbon dioxide at 50-100 atmospheres and at 380-420°C. Yields up to 85-90% on *o*-phthalate have been reported.

Will

Mr. Harold Arnfield, Ph.C., M.P.S., former managing director of J. C. Arnfield, manufacturing chemists, Stockport, who died on 14 March, aged 73 years, left £35,027 net. (Duty paid £8,853).

Analytical Review

Technique of Spot Testing on Ion-exchange Resins

By
T. S. West, Ph.D.

This article reviews three short papers; subject matters are concerned with:

1. **An extremely sensitive spot-testing method carried out on colourless or near-colourless ion-exchange resin particles by a simple and elegant technique.**
2. **The prize-winning 'Elwell Award' paper by R. T. Clark on a rapid and neat polarographic method for the simultaneous determination of tin and lead in zirconium alloys.**
3. **The application of acetyl acetone as a masking agent in EDTA titration of lead, zinc and bismuth to a xlyenol orange end-point.**

WITH so much attention focused today on the quantitative analysis of traces, it is well to remember that frequently it is necessary to establish the identity of the traces and the presence of other ions likely to interfere with the proposed quantitative procedure. Just as progress has been made on the quantitative side so it also has been forthcoming in the realm of qualitative analysis, and it is not amiss, therefore, to survey some recent progress in this field.

One of the most spectacular new methods is of course the ring-oven technique devised by Professor Weisz, of Vienna, but the merits of his method are too well known now to require further mention here and in addition his monograph on the ring-oven is expected shortly to appear. So it is to another sensitive and almost equally spectacular method devised almost exclusively by Japanese chemists and published in journals which are not readily accessible that we now turn our attention.

It is well known that traces of ions in solution can readily be recovered by sorption on a suitable ion-exchange resin and it is mainly with this point in mind that these workers have set out to devise their new spot-testing techniques. However, whereas the conventional use of an ion-exchanger necessitates elution of the trace from the resin and subsequent determination or detection by conventional chemistry, in this case the detection is carried out on the surface of the resin particles by application of chromogenic reagents or precipitating agents. In many cases the resin can be pre-treated with the reagent so that is is already in the detecting form. The idea is not entirely new, but the systematic study which it has received from these workers is praiseworthy.

Extreme Sensitivity

Resin spot-tests usually achieve a sensitivity which is of the order of at least 10 times that of the same detecting reaction used on a spot-plate and in many instances the colour is rendered more stable. In connection with the sensitivity achieved, it may be calculated that if 10 grains of a near colourless resin *ca* 0.25 mm. diameter, absorb only half of a species present in 2 drops of solution the concentration factor on the resin surface is approximately 500. Strongly acidic cation-exchange resins and strongly basic anion-exchangers of low cross-linkage are used in this work and of course it is necessary that the resin should be as near colourless as possible: many commercial resins are capable of meeting these demands after purification to remove traces of metals which would otherwise interfere with the highly sensitive test procedures.

A few instances may now be mentioned. The usual sensitivity of the spot-test procedure for silver ion based on the catalysis of the Mn(III) HCl reaction is *ca* 4×10^{-7}g. but on a strongly basic resin impregnated in the Cl^- form **(1)** it is as low as 5×10^{-9}g. Similarly 2.9×10^{-9}g. of Co(II) can be detected by Nitroso R Salt **(2)**. Another remarkable sensitivity, 7×10^{-10}g., is achieved in testing for Mo(VI) by its catalytic decolorisation of the methylene blue/hydrazonium chloride system **(3)**. These are perhaps rather exceptional sensitivities, but in most of the examples quoted in a recent review of this topic **(4)** the average limit of detection is down in the region 10^{-7} to 10^{-8}g. The same paper also illustrates several of the attractive manipulative tools used in such procedures and it is well worth study by all who are concerned with detection as well as determination of traces of inorganic ions.

At such low levels much could be gained by attempting to devise semi-quantitative procedures as with the ring-oven procedure. There is little doubt that recognition of the value of such methods with their extreme rapidity will soon lead to their evolution. If this proves to be the case it will be interesting to see whether the absence of rows of electronic switches and banks of photocells will detract from the "consumer appeal" of the method. I fear that for some laboratories this might well prove to be true.

Polarography of Lead and Tin. The Midlands Section, Society for Analytical Chemistry, has the excellent idea to make an annual award for the best paper submitted to it by a young research worker, who is not a full time research student, in its area. The Elwell Award, suitably named after the man who conceived the idea and donated the gift, was awarded for 1959 to R. T. Clark whose prize-winning paper appeared in the April issue of the journal of the society **(5)**. The paper shows an amount of originality and careful thought that is far too infrequent in papers appearing in many analytical journals; moreover it is an extremely useful contribution to working methods.

Lead and Tin Waves

Tin(II) yields a well defined wave polarographically which is conventionally used for its determination and such a procedure has previously been devised for the analysis of zirconium alloys **(6)** which was the problem investigated by Clark. However, such a method requires a reduction operation and of course care must be taken to maintain the tin in this valency state throughout the procedure. The author's method is based on an observation of Lingane **(7)** that tin(IV) yields well defined waves at -0.25 and -0.52 volt (S.C.E.) in an ammonium chloride/hydrochloric acid base-electrolyte. Since sulphuric acid is normally present in the opening out of a zirconium alloy, Clark first ascertained that tin(IV) gave a suitable performance in the above medium containing sulphuric acid. A wave was obtained at -0.42 volt against a mercury pool anode and proportionality existed between wave-height and concentration over the range 50-200 p.p.m. In addition it was found that reasonable variation of the constituents of the supporting electrolyte was without effect on the wave-height and moreover no tin was lost during solution of the alloy in sulphuric/hydrofluoric acids or during subsequent oxidation and fuming down to remove the unwanted acids.

Lead reduces at the same half wave potential and its effect on the tin wave was therefore additive inasmuch as the height of the resultant wave was equal to the sum of the contributions produced by each constituent separately. A procedure for splitting the waves by means of citrate addition to complex the tin was not successful, but the problem of resolution was solved neatly by addition of barium chloride to the medium and coprecipitation of the lead with barium sulphate. This simple expedient completely suppressed the interference due to lead in the tin determination and the lead itself was determined simultaneously by measuring the decrease in wave-height after addition of the barium. A correction of +5% was made to the tin wave to allow for dilution produced by addition of the barium.

Conventional amounts of aluminium, cadmium, chromium, cobalt, copper, iron, manganese, magnesium, molybdenum, nickel, titanium, tungsten, vanadium and zinc produced no interference. Some

zirconium alloys used for atomic energy projects do however contain appreciable amounts of copper and molybdenum and so this was investigated further. The former metal reduces at more positive potentials than tin (−0.25 volts) and so must be removed if present in appreciable amounts. As much as 1% of copper was readily rendered non-interfering however by addition of potassium ferrocyanide without deleterious effect on the lead-tin wave. The presence of 500 p.p.m. of molybdenum distorted the analytical wave, but it too was rendered harmless by addition of ferrocyanide or tartrate.

The method is inherently simple and rapid, for determination of both metals can be completed within half an hour of dissolution of the sample with a standard deviation of *ca* 2 p.p.m. at the 40 p.p.m. level. The paper leaves only two desirable pieces of information unmentioned, *viz* a definite statement that only one wave was obtained for tin (iv) in the presence of sulphuric acid and information concerning the position of the half-wave potential against a saturated calomel cell or other defined reference electrode. There is little doubt that the method can be applied to other tin and lead containing alloys. Clark has set a high standard to be aimed at by future recipients of the award.

2.4-Pentane Dione as a Masking Agent. The application of 2.4-pentane dione (acetyl acetone) as a masking agent in complexometric titration was first described by Fritz and his co-workers **(8)**, who employed potentiometric technique. Now Jablonski and Johnson **(9)** have reported its behaviour in titrations where xylenol orange is used as indicator in the complexometric determination of lead and zinc. Iron, aluminium, beryllium, palladium and uranium are completely masked and partial masking also occurs with copper, mercury, chromium and titanium. The following ions remain unmasked: zinc, lead, manganese, nickel, cobalt, thorium, cadmium, lanthanum, tin, bismuth and cerium. The chelates of acetyl acetone with iron and uranium are intensely coloured but may be effectively removed by extraction into a nitrobenzene or chlorobenzene layer while the aqueous layer in contact with it reveals the visual end-point.

Molybdenum interferes with the bismuth determination by partial precipitation of the bismuth and by weak complexing with the indicator. Fortunately the molybdenum complex of acetyl acetone is stable (only) in stronger acid solution so that this masking agent can be used even at the high acidity required for the bismuth-EDTA titration. This masking agent appears to be a very useful adjunct for EDTA titrations for it suppresses an array of metals that are normally quite difficult to mask. It is probable that experimentation with pH and reagent concentration could extend the range of masking to include at least those metals that are described as partially masked, and I suspect some of the others.

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Scottish Sulphuric Acid Plants Operated Satisfactorily, Says Alkali Report

IN retrospect 1959 appears to be dominated by a first assessment of the problems brought by the Registration of new processes under the Alkali, etc. Works (Scotland) Order 1958, which came into operation on 31 December of that year. This is stated by the chief inspector for Scotland, E. A. Balfour Birse in the 1959 annual report. (See CHEMICAL AGE, 2 and 9 July for England and Wales.) Preliminary work had been done on the newly registrable processes but detailed work remained. The number of visits made was 494. In the 1958 report, reference was made to the difficulty of reducing smoke from the hand-fired muffle furnaces for the production of salt cake. The new muffle furnace with oil-firing installed to deal with the trouble met with a serious accident in the course of the commissioning trials and reconstruction was only completed recently.

Sulphuric Acid Works. Three lead chamber process units were registered but there was no production at any of them. The use of tower plants at two other premises were registered and there was no infringement of the regulations reported. Four contact acid plants also operated satisfactorily. At one plant the high acidity of the discharge on restarting the process after a stop for unscheduled maintenance quickly returned to normal.

Chemical Manure Works. The alleviation of the troublesome mists caused by fumes from granulating fertilisers is being attempted by discharging through high chimneys. The now quite widespread use of reinforced plastics chimneys in the industry appears to have overcome practical difficulties. At the end of the year fertilisers were being granulated at 14 premises of which 10 were equipped with high chimneys. Complaints were received against one works where corrosion trouble was experienced with the high-speed fan on a Venturi scrubber. The substitution of a two-stage fan of lower speed appears to have overcome the frequent breakdowns.

Nitric Acid Works. A complaint concerning the excessive emission of brown fumes from one premises was received. It was found that the scrubber for reducing the oxides of nitrogen from a new process was operating with low efficiency. The installation of a second scrubber and the modifications to the first proved effective.

Miscellaneous Works. Sulphate and muriate of ammonia, muriatic acid, arsenic, bisulphite, benzene, pyridine, and hydrofluoric acid works have all operated satisfactorily and without cause for complaint.

Sulphuric Acid Production (Scotland)

Excluding Government Plants except those producing for trade purposes

	1959	1958	1957
	Tons	Tons	Tons
Production	164,000	172,000	154,000
	%	%	%
Proportion of Plant in use	75.7	74.8	61.8
Proportion made:			
Chamber and tower	31.5	36.6	36.2
Contact	68.5	63.4	63.8
Raw materials used:	Tons	Tons	Tons
Pyrites	22,000	40,000	39,000
Sulphur	43,000	36,000	31,000
Spent oxide	7,000	9,000	8,000
Zinc ores	—	—	—
Anhydrite	—	—	—

Ammonia Products (Scotland)

	1959	1958	1957
	Tons	Tons	Tons
Conc. ammonia liquor from by-product liquor calculated at 25% strength:			
from Gas works ...	3,740	3,320	2,590
from Coke ovens ...	58	300	400
By-product sulphate of ammonia:			
from Gas works ...	—	3,660	4,450
from Shale works ...	7,320	7,740	9,300
from Coke ovens ...	10,280	14,610	18,730
Synthetic sulphate of ammonia	—	—	—
Total production of synthetic ammonia calculated as NH_3 ...	51,480	52,120	52,320

Tar Distilled and Pitch Produced (Scotland)

	1959	1958	1957
	Tons	Tons	Tons
Crude tar distilled to pitch or other residue	215,650	237,330	266,430
Gross pitch production	71,430	74,730	79,860
Pitch oiled back ...	36,860	33,830	40,140

Production of Barbituric Acids

(*Continued from p. 105*)

improved from 60% in the case of barbitone (from urea and diethylmalonic ester) to over 92% of theory, up to 95% in the case of the similar phenobarbitone condensation and of the same order for the preparation from the appropriate cyanoacetic esters in the case of cyclobarbitone and of hexobarbitone.

The slow addition of sodium alkyloxide is best facilitated by the use of pressure equalising devices that the internal pressure does not obstruct the addition; a plant scheme for this is given in the attached drawing. This shows plant designed for use at slightly elevated pressures; this is desirable when the alkyloxide is sodium methoxide in order to attain reaction temperatures of about 70°-75°C. This is less necessary when sodium ethoxide is used but the methoxide has more advantages, one being that anhydrous methanol at 99.8% is a commercial material whereas anhydrous ethanol has to be specially prepared.

Overseas News

S.D.'S NEW FUMARIC ACID PROCESS UPGRADES MALEIC AND PHTHALIC SCRUBBER SOLUTIONS

A NEW fumaric acid process likely to be of major interest to producers of phthalic and maleic anhydride as a means of utilising waste product streams and avoiding effluent problems by cleaning up residue streams, has been introduced by Scientific Design Co. Inc., New York and London. Suitable for recovering fumaric values from almost any maleic-containing feedstock, the process can also be used for straight fumaric acid production from prime feedstock.

Employing a special catalyst and based on moderate isomerisation conditions, the process can be used to upgrade maleic scrubber solution, phthalic scrubber solution and maleic refiner bottoms. Prime feedstocks include benzene and butenes. The process is said to be comparatively simple and to involve the use of no chemicals or equipment that are difficult to obtain. Resulting in high yields, the fumaric acid product meets commercial specifications. The process can be adapted to plants with a fumaric acid capacity as small as 2 million lb./year.

Pakistan to Make Drugs

Manufacture of certain important drugs in Pakistan will start with projects of Opal Laboratories, in collaboration with Archifar Laboratories of Italy, for the production of chloramphenicol, antimalarial and anti-T.B. drugs. These are expected to be on the market in October.

Japanese Firms to Supply P.V.C. Plant to U.S.S.R. and Portugal

The Soviet Union is reported to have ordered a plant for the production of p.v.c. from the Japanese chemical concern, Sekisui Chemical Co., Osaka. Capacity of the unit has not been made known.

Between 4,000 and 6,000 tonnes of p.v.c. is to be produced annually as from next year in a plant to be built at Aveiro, in Portugal. Plant and equipment is to be supplied by the Japanese firm of Shin-Etsu Chemicals.

U.S. Producers Raise Phthalic Anhydride Prices

Four U.S. producers—American Cyanamid, Witco, Koppers and Pittsburgh Coke—have raised their prices for phthalic anhydride by 1 cent to 19 cents per lb. for flaked material in carloads. Reichhold Chemicals have increased their price 2 cents to 23 cents per lb. due to increasing raw material costs. Amoco Chemicals have increased their price by 1 cent to 18½ cents. Allied Chemical and Monsanto Chemicals are already selling phthalic anhydride at 19 cents/lb.

Shortage of domestic naphthalene, due to the falling off in steel plant operations, and the fact that West Europe and the U.S.S.R. are exporting less naphthalene to the U.S., are responsible for the cuts. In the first three months of 1960 imports dropped to about 14 million lb., compared with about 24 million lb., most of the decline being due to the U.S.S.R. (*Chem. & Engng. News*, 28, **38**, 23). U.S. domestic crude naphthalene prices have risen by about 1 cent/lb. to 6 cents/lb.

Two U.S. Firms Join to Make Polydiene Rubbers

There will be a further increase of 30,000 tons a year in the U.S. synthetic rubber capacity when the new polybutadiene and polyisoprene rubbers plant, planned jointly by Stauffer Chemical and American Synthetic Rubber, comes into operation. A new firm, to be called American Rubber and Chemical, equally owned by both parent companies, is to be set up.

The plant, to be built by Stauffer engineers, will produce the synthetic rubbers under licence from Phillips Petroleum by a stereospecific polymerisation process using an alkyl metal catalyst. Construction is expected to begin shortly at Louisville, Ky., adjacent to American Synthetic Rubber's existing styrene-butadiene rubber plant, and is scheduled to go on stream in September 1961. Although initial capacity is 30,000 tons a year it can be increased to 50,000 tons with minor modifications.

American Synthetic will manage the production and marketing of the new rubbers and both companies will staff the pilot plant and research laboratories which are part of the scheme.

Petrolchimica Complete Priolo Ammonia Plant

Petrolchimica have completed construction of their new plant at Priolo, Sicily, for the production of ammonia. The plant, with a potential output of 33,000 tons of ammonia a year, is connected to the nearby refinery by pipeline and by two gas conduits.

Plans for New Petrochemical Centre in Japan

The Japanese concern Sumitomo Chemical Co. Ltd. is planning to build a new petrochemical centre in the Nagoya area of Japan, and expansion of existing plant at Miihama and Ohe. Total cost of the company's plans will be 49,000 million yen (£48.5 million). Work on the expansion programme is to be started as soon as Government sanction is received and is hoped to be completed by 1962. The Nagoya plant is to contain plant producing 50,000 tonnes/year of ethylene by the Stone and Webster process, as well as installations for the production of xylol and benzol. Expansion elsewhere will raise Sumitomo polythene capacity from its present level of 13,000 tonnes to 28,000 tonnes/year by next April and 50,000 tonnes by 1962.

Fertilisers and Heavy Chemicals Output in Israel

Output of the Haifa, Israel, chemical producers Fertilizers and Chemicals Ltd. in 1959 was 97,000 tonnes of superphosphates, 115,000 tonnes of sulphuric acid, 12,700 tonnes of potassium sulphate, 18,000 tonnes of ammonia and 67,000 tonnes of ammonium sulphate. A nitric acid plant being built on the company's production site is nearing completion.

Dutch Project to Produce Phenol from Toluol

The Dutch State-owned coal mining and processing concern Staatsmijnen, of Limburg, are to invest some of 5 million florins (nearly £500,000) in a company to be formed for the production of phenol in the Botlek industrial complex of Rotterdam, and will advance a similar amount in the form of a loan. Dow Chemical, U.S., are to put a similar total into the new company, the rest of whose capital will be raised on the capital market under the guarantee of Staatsmijnen and Dow. The plant will produce phenol not from a benzene base, but from toluol, by a cheaper production process. (See also CHEMICAL AGE, 23 April, p. 688.)

Texaco to Make Benzene and Toluene in Canada

Texaco Canada Ltd. are to build a plant at Port Credit, Ontario, for the production of benzene and toluene. The new plant will go into production next year. Total cost is estimated at $2 million and initial throughput will be 1,500 barrels daily. Provision is also being made for the future production of xylenes and ethylbenzene. The operation will be highly automated.

There is a domestic shortage of benzene with Canadian imports running at a rate of 8 to 10 million gal. annually from U.S. and European sources. British American Oil Company announced last week plans to enlarge their Montreal benzene plant.

Mammoth Petrochemical Project for E.N.I. in Sicily

The foundation stone of the "biggest petrochemical plant of its type in Europe" has been laid at Gela, Sicily, on the site of the State-owned E.N.I. complex. The plant, which will take as raw material crude oil from the local deposits recently discovered by the E.N.I. subsidiary Agip-Mineraria, will cost between L. 100,000 million and L. 150,000 million.

Products, after the opening of the

plant in about two years, will include 55,000 tonnes/year of liquid gas, 15,000 of polythene, 21,000 tonnes of other ethylene derivatives and quantities of synthetic fertilisers, solvents and petroleum coke. The plant will also have on its site equipment for the production of 110,000 tonnes of sulphuric acid and hydrogenous products, making possible the output of 60,000 annual tonnes of urea and 65,000 tonnes of ammonia.

Pakistan Frees Chemical Imports

Chemical products including caustic soda, gas in cylinders, coal tar dyestuffs, colouring and tanning agents, carbon black and synthetic rubber, have been introduced to open general licence for importation by Pakistan. Also transferred to the open licence are explosives, laboratory glassware and scientific instruments.

Union Carbide to Double Altona Polythene Capacity

Capacity of the polythene plant now under construction at Altona, Victoria, is to be doubled from 15 million lb./year to 30 million lb./year, by Union Carbide Australia. Market surveys have shown that demand has been increasing more rapidly than had been anticipated. First stage of the plant will be on stream as planned in the middle of next year.

Big Increase in Phillips Sales of Polythene Resins

Sales of their Marlex high-density polythene resins for the first six months of this year were substantially greater than had been predicted, announce Phillips Chemical Co., U.S. Industry sources estimated total high-density sales last year at 80 to 85 million lb. The sales increase has been attributed to accelerated detergent bottle production.

State Monopoly of 16 Petrochemicals in Mexico

Sixteen petrochemical products are in future to be produced by the State only in Mexico. This means that the monopoly for their production will be held by the State oil concern Pemex, now starting an ambitious petrochemical programme (see CHEMICAL AGE, 25 June, p. 1067). Private companies will, however, be allowed to process these raw petrochemicals. The products concerned are ethylene, propylene, polypropylene, polythene, dodecyl benzol, toluol, benzol, xylol, styrene, butadiene, methanol, isopropanol, ethyl chloride, ethylene dichloride, cumene and ammonia.

Hungary to Import More Complete Chemical Plants

In the second five-year plan, starting next year, Hungary is to give priority to the development of the chemical industry and it is reported from Budapest that one-sixth of the country's industrial investment would be made in chemicals. Half of the total will be used to develop production of fertilisers, plastics materials and man-made fibres.

Import from abroad of complete chemical plants is also to be speeded up. Already two contracts have been placed with Krebs, Paris, for the supply of complete plants. One, in Budapest, will have an annual output of 10,000 tons of chlorine, 11,000 tons of caustic soda and 19,000 c.m. of hydrogen. It will come into operation in 1962. The other to be built at Berente, will supply materials to a new p.v.c. plant, that is to be supplied by Friedrich Uhde, GmbH, Dortmund.

Reichhold, U.S., Plan Vinyl Acetate Monomers Production

Reichhold Chemicals Inc., U.S., are to take up production of vinyl acetate monomers in the near future. Production will be under a licence agreement with the Wacker-Chemie GmbH, licenceholder of Munich.

Carbon Black Plant for Durgapur, India

Erection of a carbon black plant near the Durgapur steelworks, India, with an annual output of some 22 million lb., is planned in a joint project of Phillips Carbon Black Ltd.—a subsidiary of the American Phillips Petroleum group—and Duncan Bros. and Co. Ltd., of Calcutta. Phillips and Duncan Bros. will each hold 30% and private investors the remaining 40% of the shares of the company to start operation of the planned plant in about 18 months.

Spanish Firm to Make Ethylene, Methanol and Polythene

Unión Quimica del Norte de España have announced plans to produce ethylene, methanol and polythene at a plant to be set up at Axpe, near Bilbao.

Polybutadiene to be Made at Berre

The French company Société des Elastomères de Synthèse, a subsidiary of the Shell-St. Gobain group, the Cabot-Texas Butadiene group and the Michelin tyre company, are to expand the capacity of their butadiene-styrene plant which will be opened in Berre next year. Capacity of the unit was to have been some 50,000 tonnes annually; a unit will also be installed for the annual production of 25,000 tonnes of polybutadiene.

The company is raising its capital from N.Fr.2 million to N.Fr.42 million.

Bayer-Jap Agreement on Foam-making Compounds

An agreement has been signed between the West German chemical producer Farbenfabriken Bayer AG, of Leverkusen, and Nippon Polyurethane Industry, Tokyo, under which the Japanese company is granted the exclusive right for the production and marketing of certain of Bayer's isocyanates, polyesters and allied compounds for the foam industry.

S.D. to Construct Houston's Ethylene Oxide Plant

Scientific Design Inc., New York, will design and construct the 80 million lb. a year ethylene oxide plant that Houston Chemical, the recently formed subsidiary of Chatham and Reading Chemical, are to build at Beaumont, Texas. It will be the world's largest ethylene oxide plant to use direct air oxidation. Part of the ethylene glycol produced will be used for Houston Chemical's own antifreeze product.

Abbott Move Further Into Industrial Field with Piperidine

Commercial production of piperidine is being started at the Chicago plant of Abbott Laboratories, pharmaceutical producers, as part of the company's plan to move into the field of industrial chemicals. It is claimed that the company's new piperidine process yields a product of higher purity—better than 99%—than is now available.

This development follows large-scale production of mono- and dicyclohexylamine at Abbott's Wichita, Kan., plant.

Hypalon Lining for Caustic Soda Tankers

AN experimental coating of Hypalon rubber proved to be in excellent condition after two years' service as a lining for a rail tanker carrying caustic soda solution, indicating that this material is likely to rival the neoprene latex coating used hitherto. Pennsalt Chemicals Ltd. operates a large fleet of rail tankers to transport 50% and 73% solutions of caustic to its customers, and all these tankers are given protective linings—not so much to protect the tanks, since caustic soda is not likely to attack the stress-relieved steel enough to damage it, but rather to prevent metal contamination of the product. For many years the standard lining has been a sprayed-on neoprene latex formulation.

Corrosion tests carried out on Du Pont neoprene and Hypalon by immersion in hot concentrated caustic soda showed that up to 120°C the two materials appeared equivalent but above this temperature the Hypalon coating was superior. A thickness of only 8-10 mils of Hypalon was required to provide a satisfactorily resistant film, against the 20-mil coating of neoprene needed. This gave Hypalon a slight 'edge' on a cost basis, which led to it being tried out in regular rail tanker service.

The 50% solution is most often shipped at 65°C, occasionally at 80-90°C. The 73% is normally transported at 90-115°C but might be loaded as high as 140°C. In addition there is the wear and tear to be expected with a public carrier handled by many different individuals. It was encouraging to find, therefore, that the Hypalon lining inspected after two years' service was light in colour, had retained its original smooth finish and had resisted underfilm attack at points where there were small mechanical breaks or microscopic discontinuities.

PEOPLE in the news

● **Mr. F. S. Walker,** for the past six years chairman of Lever Brothers Port Sunlight Ltd., has retired after 50 years' service with the Unilever organisation. He is succeeded by **Mr. J. G. Parkes,** at present technical director and formerly area technical manager at the Avonmouth Oil and Cake Mills. Lever Brothers Port Sunlight Ltd. have now become solely a soap manufacturing company; a new company, Unilever Merseyside Ltd., will handle all Unilever estates and industrial services in the area. Chairman of the new company is **Mr. Alex W. Walker,** formerly head of Unilever personnel division.

● **Dr. Rex E. Lidov** has been appointed to the newly created post of director of research planning, for Scientific Design Inc., New York, and will be responsible for the development and evaluation of new research ventures. **Dr. Joseph L. Russell** is now director of research, and in charge of all activities of the research centre at Little Ferry, N.J. **Dr. Robert S. Barker** is now assistant director for special projects, conducting research in special fields of new reactions and catalysts. **Mr. Mitchell Becker,** assistant director for project research, will be in charge of optimising and commercialising research projects. **Dr. Charles N. Winnick,** assistant director for exploratory research, will be in charge of initiating new and original projects.

● **Dr. T. Harrington** has been appointed vice-chairman of Hickson and Welch (Holdings) Ltd., Castleford, Yorks, effective from 4 July. He will continue as joint managing director of Hickson and Welch Ltd. with his co-director, **Mr. G. K. Day.**

Dr. T. Harrington

● **Dr. Robert Albert Ernest Galley, B.Sc., Ph.D., F.R.I.C.,** director of the Tropical Products Institute since 1953, who has been appointed to succeed **Dr. J. E. Hardy** as manager and director of research of the Woodstock Agricultural Research Centre of 'Shell' Research Ltd., near Sittingbourne, Kent, took up his duties on 1 July. Aged 50, Dr. Galley was awarded a Ph.D. in 1932 for his thesis on the hydrogenation of conjugated compounds. A member of the World Health Organisation Expert Panel on pesticides since 1949, Dr. Galley has been chairman of the W.H.O. Expert Committee on pesticides on four occasions. He has served on the scientific secretariat of the Office of the Lord President of the Council and on numerous Government and scientific society committees, and on controlling boards of research associations. In particular, he has been closely concerned with the problem of the control of residues from pesticides on foodstuffs. **Dr. J. E. Hardy,** who became manager of Woodstock in 1950 and who is well known in the agricultural chemical field, will shortly be taking up an appointment with Shell International Chemical Co.

● **Professor C. S. Whewell, B.Sc., Ph.D., F.R.I.C., F.T.I., F.S.D.C.,** Professor of Textile Technology, Leeds University, has been awarded the Textile Institute's Warner Medal in recognition of outstanding work in textile science and technology.

● **Gen. Sir Nevil Brownjohn** has been appointed to the board of Manchester Oil Refinery (Holdings) in succession to **Lt.-Gen. Sir Wilfred G. Lindsell,** who has retired.

● **Mr. T. H. Cook, B.Sc. (Eng.), M.I.E.E.,** has been appointed chief applications engineer of the Morgan Crucible Co. Ltd. He was previously carbon department technical sales promotion manager.

● **Mr. P. F. Dale Rees, B.Sc., D.I.C., A.M.I.Chem.E.,** has been appointed a senior chemical engineer in the chemical plant department of Simon-Carves Ltd.

● **Dr. G. L. J. Bailey** relinquishes his position as superintendent of the Mond Nickel Co.'s development and research laboratory in Birmingham and will transfer to London to become manager of research. **Mr. E. J. Bradbury** succeeds Dr. Bailey as superintendent of the Birmingham laboratory.

● The 17th annual general meeting of the Council of British Manufacturers of Petroleum Equipment was held at the Hyde Park Hotel, London, recently. **Mr. J. M. Storey, C.B.E.,** has taken up office as chairman of the Council in place of **Mr. G. H. Thorne. Mr. N. H. Birdseye** was re-elected hon. treasurer, **Mr. Hector Walker, Mr. L. S. Dawson** and **Mr. F. R. Newman** were re-elected, and **Mr. J. Neill-Thompson** and **Mr. G. C. Fairbanks** elected to the executive committee.

● **Dr. D. B. Mulholland, M.Sc., Ph.D. (Q.U.B.), A.R.I.C., M.I.Chem.E.,** has been appointed head of the department of chemical engineering at West Ham College of Technology, and takes up duty in September.

● **Dr. D. Matheson, M.A., B.Sc., Ph.D.,** has been appointed H.M. Senior Chemical Inspector of Factories in place of **Mr. S. H. Wilkes, M.C., M.A., B.Sc., F.R.I.C.,** who retired on 30 June. Dr. Matheson joined the Inspectorate in 1931 and was transferred to the specialist engineering and chemical branch in 1938. He has been deputy to the Senior Chemical Inspector since 1957.

Market Reports

Steady Market for Industrial Chemicals

LONDON Steady conditions have been reported on the industrial chemicals market with no outstanding price changes to record. The movement against contracts continues to cover good quantities, while the volume of new business is regarded as satisfactory for the period. Hydrogen peroxide, borax, boric acid and sulphate of copper are in steady demand and the outlet for fertilisers is reasonably good.

There is little of fresh importance to report on the coal tar products market and prices are well held.

MANCHESTER Holiday stoppages at the consuming end continue to affect the contract movement of supplies of chemical and allied products, but otherwise conditions on the Manchester market have been satisfactory. A fair number of fresh enquiries covering a wide range of products have been dealt with and new home and shipping business has also been on a fair scale. Prices generally are steady. Most light and heavy tar products, including creosote oil, cresylic and carbolic acids, refined tar, and xylol and benzol, are going into consumption in good quantities.

SCOTLAND There has been a reasonable demand from most sections of industry during the past week in the Scottish heavy chemical market. Quite a good volume of business can be reported from these areas not yet affected by the holiday period, and in some cases increased demands have been evident due no doubt to manufacturers endeavouring to complete production programmes before the ensuing holidays.

Contract quantities have been well sustained and the general range of industrial chemicals have been varied. Agricultural chemicals have been active with seasonal demands, particularly weedkillers. Prices on the whole have remained fairly firm. The export market is also fairly active with a good volume of enquiries being received.

Commercial News

- **B.I.P. Merger Talks Fall Through**
- **Coalite Group Profit Higher by £170,000**
- **Hickson Issue to Finance Expansion**
- **Interhandel Appoint Ownership Negotiator**

British Industrial Plastics

Merger talks in which British Industrial Plastics Ltd. have been involved recently have been discontinued without agreement being reached. The directors reaffirm their confidence in the company's progress and point out that the improvement in profits has been more than maintained.

Last month (CHEMICAL AGE, 18 June, p. 1032) the company cleared up rumours about merger proposals by circularising its shareholders to the effect that approaches had been made with a view to a merger by more than one substantial company.

British Tar Products

An increase in dividend, from 13¼% to 15% with a 10% final, is announced by British Tar Products, for the year ending 31 March 1960. Trading profit was £121,411 (£88,084). After all charges, including depreciation £24,990 (£20,479) and tax £31,783 (£27,531), the profit balance shows an increase from £39,284 to £54,971.

Coalite and Chemical Products

Group profit of Coalite and Chemical Products Ltd. was £550,997 compared with £380,335 for the previous period. A final dividend of 11½% is proposed. It has been decided to capitalise £964,375 and an extraordinary general meeting is to be held on 27 July.

The chairman's statement reveals that the increase in capacity of the chlorination plant has been fully absorbed. The demand for certain specialised chemicals is such that a further increase in manufacturing capacity is planned.

Rheinpreussen AG

The Homberg, West Germany, chemical and coal-mining concern Rheinpreussen AG für Bergbau und Chemie have declared a dividend of 8.8% (7) on its DM100 million of share capital. The chemical activities of the company were to be intensified, the chairman revealed.

Hickson & Welch (Holdings)

The directors of Hickson and Welch (Holdings) Ltd. are to raise further permanent capital to finance the group's continuing expansion programme. They propose later this month to offer ordinary shareholders a 1-for-4 rights issue. The proceeds of the issue will be used mainly in the U.K. in the development of the group's chemicals activities. In the absence of unforeseen circumstances the directors expect to recommend a final ordinary dividend for the year to 30 September 1960, of not less than 10% in which the new 10s shares will participate.

Howards and Sons

A final dividend of 10%, against a forecast of not less than 6%, making 14% for the 16 months to 30 April 1960, compared with 4% for the year 1958, is announced by Howards and Sons Ltd. Group net profit, was £100,837 for the 1959-60 period (£23,219 for 1958), after charging tax of £76,702 (£34,900).

The U.K. tax borne by the profit for the 16 months includes adjustments resulting from the change of accounting date and is after relief in respect of investment allowances.

Johnson Matthey

Group profits of Johnson Matthey and Co. for the year ended 31 March were £1,925,299 (£1,455,909). The net balance was £960,130 (£828,282); while tax took £965,169 (£627,628). A final dividend of 9%, making 12% (same, but on capital increased by a 50% scrip issue) is announced.

Manchester Oil

The offer of Lobitos Oilfields to acquire the issued ordinary capital of Manchester Oil Refinery (Holdings) Ltd. has been accepted by holders of more than 89½% of ordinary shares. The offer is now unconditional.

Simon-Carves

The arrangements giving effect to the merger of Henry Simon (Holdings) and Simon-Carves has now received the sanction of the Court. It is hoped to post allotment letters and cheques for the cash distribution on 22 July.

Alchemica N.V.

A new company set up for the production and marketing of chemical products has been set up in Schoonebeek, Netherlands, under the name of Alchemica N.V. Shareholders are Scado-Archer-Daniels N.V., Zwolle, and Mr. W. A. M. ten Doeschate, of Zwollerkerspel. The capital will be of Fl.2,010,000, consisting of 10 priority and 2,000 ordinary shares, each of 1,000 florins, all of the priority and most of the ordinary shares to be held by Scado-Archer-Daniels.

Celene S.p.a.

Celene, S.p.a., Palermo, are to raise their capital from Lire 3,000 million to Lire 6,000 million.

Colonial Sugar

Colonial Sugar Refining Co. Ltd., Australia, earned a higher profit in the year to 31 March, the ninth successive rise in profit. Profit is disclosed at a record £A2.2 million, an increase of £A250,000 or nearly 14%. The movement follows similar rises in the previous two years. Sales of industrial chemicals and plastics by C.S.R. Chemicals Pty. Ltd. (60% owned by C.S.R., 40% by Distillers Company) improved substantially. C.S.R. will present group accounts and profits next year.

Interhandel

The Basle holding company Interhandel AG have requested Mr. Charles Wilson, former president of the General Electric Corp., to play the part of a negotiator in the talks being held between Interhandel and the U.S. Government with regard to the ownership and possible future of the General Anilin and Film Corporation, the chemical company confiscated by the Americans during the last war under the Enemy Aliens Act under the claim that it was a German concern. Interhandel claim a holding in it and contest the Government's right to sell it to private interests.

Montecatini

Sales by Montecatini during January to May 1960, showed an increase of about 10% compared with the first five months of 1959.

Pétroles d'Aquitaine

The company engaged in the exploitation of the south-western French natural gas reserves of Lacq, Société Nationale des Pétroles d'Aquitaine, announce neither profit nor loss for 1959 financial year, in which they recorded operating revenue of N.F.172.7 million (55.6 m.), and depreciations of N.F.83 m. (31.9 m.). Dividend payments on the company's N.F.209.25 million share capital are expected to start next year, when production will have been raised from its present level of 10 million cu. m./year to 20 million cu. m.

Union Carbide

Record sales amounting to $1,650 million as against only $1,530 million last year, are expected for the current year by the Union Carbide Corporation, U.S. Nevertheless, it is expected that profit per share of the company for the first half of 1960 will be under $2.80, as compared with $3 for the same period of last year.

Steirische Chemie AG

The Austrian chemical producers Steirische Chemie AG, of Kapfenberg, are to pay a 1959 dividend of 3½% (same) on its capital of 12 million Schilling. The company announces its automation of carbon disulphide production over the report year and its cessation of methanol and wood alcohol output.

(*Continued in p. 113*)

TRADE NOTES

U.K. Suppliers of Dowpac

The Hydronyl Syndicate Ltd., 14 Gloucester Road, London S.W.7, have acquired from Saro Products Ltd. the sole right of supplying in the U.K. and the Benelux countries Dowpac, the plastics tower packing developed by the Dow Chemical Company, Midland, Mich., U.S. Enquiries particularly in connection with trade effluents, sewage treatment and water cooling, should be addressed to 14 Gloucester Road, London, S.W.7.

Design Office Expansion

Petrocarbon Developments Ltd. are expanding their design offices at Sunlight House, Quay Street, Manchester 3. The Lloyd Street and Twining Road offices will, in future, be used solely for administrative purposes. New telephone number of the design offices Blackfriars 9145.

Gas from Hydrocarbons

The Otto continuous catalytic reforming process is the subject of an illustrated folder by Simon-Carves Ltd., Cheadle Heath, Stockport. The process, which is fully automatic, is for the production of town's gas and synthesis gas from hydrocarbon feedstocks. It is claimed to provide great flexibility of operation with respect to volumetric output and gas characteristics.

Moulded Electronic Circuits

A new method of mass-producing electronic circuits relies on phenol/formaldehyde mouldings combined with nickel phosphorus circuits produced by the Kanigen chemical deposition plating technique. The resulting rigid, three-dimensional circuit is claimed to have a number of advantages over conventional circuits. Literature is available from Albright and Wilson (Mfg.) Ltd., 1 Knightsbridge Green, London S.W.1.

Coumarone Resins

P.G. pale coumarone resin, recommended for use in formulating paints, varnishes and inks where an inert, neutral, unreactive resin is required, is the subject of a new technical bulletin (101/P/60) available from the Anchor Chemical Co. Ltd., Manchester 11.

Thermoplastic Polymer Price

Price reductions for their Penton thermoplastic polymer, amounting to roughly 30%, are announced by Hercules Powder Co. Ltd., 1 Great Cumberland Place, London W.1. Price, per lb. delivered, of extrusion/injection granules is now: natural, 22s; olive green/black, 23s. Price of finely divided Penton powder (recently introduced for organic liquid dispersions) is: natural, 30s; olive green/black, 31s.

Plastics Laboratory Taps

A new range of taps, cocks and fittings made for laboratory use are now being introduced into this country by Tough Plastics Ltd., Addlestone, Surrey. Welded in nylon (various colours) in polythene and polypropylene, the wide range of designs available makes provision for practically all requirements. Manufactured in Germany these new fitments are little dearer than traditional laboratory fittings and have the advantages inherent in the materials of their construction. Tough Plastics are the sole U.K. concessionaires.

Silastomer Prices Cut

Lower manufacturing costs stemming from higher production and a considerable sales growth have led Midland Silicones Ltd. to make immediate price cuts of up to 10% for several large-volume grades of their silastomer silicone rubbers. Prices of some of their newer development grades of silicone rubbers have also been cut. New prices per lb. for 500 lb. lots, are: Grade 50, 28s; 80, 28s; 122, 24s; 125, 24s 9d; 156, 30s 9d; 152, 28s; 160, 15s; 181, 18s 6d; 6-126, 25s 6d; 2455, 30s; 2472, 2473, 2474 and 2475, 31s; Polysil 2432, 33s.

Agents for Tar Acids

C. Tennant Sons and Co. Ltd. in conjunction with Fallek Chemical Corporation, New York, have taken over the U.K. sales distribution for the Pitt-Consol Chemical Co., New Jersey, so far as tar acids and thiol products are concerned. Some of their aryl mercaptans are available in commercial quantities, particularly thiophenol, thiocresol (mixed isomers) and thioxylenols (mixed isomers). Pitts-Consol are studying several new derivatives with a view to commercial scale production. These include mono-methyldithiohydroquinone and S-methylthiophenol (thioanisol). C. Tennant and Sons have available a U.S. booklet entitled 'The chemistry and end uses of thiophenols.'

High-solubility Dyestuff

Farbwerke Hoechst AG have introduced a new dyestuff 'Fat Yellow 5G,' which is said to be a greenish yellow of high solubility, state Industrial Dyestuffs Ltd. It is suggested as being of interest for the wax-processing industry and for manufacturers of polystyrene products.

Copon Protective Coatings

From 1 August Surface Protection Ltd. will transfer the marketing of the Copon range of corrosion resisting coatings to the Copon Division of the parent manufacturing company, E. Wood Ltd., 18 London Street, London E.C.3, whose factory is at Talbot Works, Stanstead Abbotts, Ware, Herts.

Precision Balances

S. Garcia Ltd., 780 Seven Sisters Road, London N.15, have been appointed as accredited maintenance, service and repair agents by Optical-Mechanical (Instruments) Ltd., sole importers of Mikrowa precision balances.

New Polythene Pipe Firm

Deltathene and Deltaplast polythene pipes are now to be produced and marketed by a new company—Foster Brothers Plastics Ltd., state the Delta Metal Co. Ltd. and Foster Brothers Ltd. The new company will embrace all the activities of the plastics divisions of these two companies. The entire extrusion, fabrication and sales organisation of the new company will be centred at Lea Brook Tube Works, Wednesbury, Staffordshire, where extensive new workshops and offices are nearing completion.

Delta's trade marks Deltaplast for conventional 'soft' polythene pipe and Deltathene for the 'high tensile' pipe, extruded from material made by the Zeigler low pressure process, together with Foster's patented Bulldog flanging process—claimed to be the only efficient means of jointing polythene pipe in sizes over 2 in.—will be transferred to the new company.

New Crosfield Publications

Three new progress reports, Nos. 5, 6 and 7, have been issued in pamphlet form by Joseph Crosfield and Sons Ltd., Warrington, Lanes. No. 5 deals with Neosyl (white precipitated amorphous silica in hydrated form) as a matting agent in paints, varnishes, etc. No. 6 describes Microcal precipitated hydrated calcium silicate and its use in anti-corrosive primers. No. 7 deals with Nicat NP/AC.60 as a (nickel) catalyst of general applicability for a wide range of industrial hydrogenation reactions.

Impact Testing of Polythene Film

The Monsanto dart-drop impact strength test for polythene film is described and illustrated in technical service bulletin No. M2/1 from Monsanto Chemicals Ltd., Monsanto House, Victoria Street, London S.W.1. Apparatus consists essentially of a two-piece annular clamp to hold the film specimen in place, a dart with a hemispherical striking head and a shaft to accommodate removable weights, the dart being supported above the specimen by an electro-magnet. Procedure for carrying out tests is explained in the bulletin.

Commercial News

(*Continued from p. 112*)

NEW COMPANIES

GLAXO-ALLENBURY'S (EXPORT) LTD. Cap. £100. Importers and exporters of and dealers in and distributors of drugs, chemicals, etc.

PENETONE-PARIPAN LTD. Cap. £20,000 in £1 shares. To manufacture and sell in the U.K. chemicals and chemical products and other products similar to those presently being manufactured by the Penetone Co., Tenafly, New Jersey, U.S., etc., and to enter into an agreement with C. Ljungdahls Handels and Fabriks AB of Sweden, Paripan Ltd. and Penetone International Corp. of New Jersey, U.S., etc. Directors: H. I. Etelman and H. R. Etelman, G. Ringstrom, P. G. Randall, K. J. Reece. Solicitors: Arthur Benjamin and Cohen. London W.C.2. Reg. office: Windsor Road, Egham, Surrey.

INCREASE OF CAPITAL

EXPLOSIVES AND CHEMICAL PRODUCTS LTD., Finsbury Pavement House, Moorgate, London E.C.2. Increased by £55,000, in 37,500 ordinary shares of £1 and 350,000 deferred shares of 1s each, beyond the registered capital of £100,000.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 10 August

Method of isotope concentration. Spevack, J. S. **845 501**

Nuclear substituted diethylaminoacetyl-2 : 6-dimethylanilides and process for their manufacture. Howards of Ilford Ltd. **845 742**

Process for the production of gases containing hydrogen. Gas Council. **845 401**

Manufacture of alkyd resins. Berger & Sons Ltd., L. **845 861**

Process for the production of titanium dioxide pigments. Laporte Titanium Ltd. **846 085**

Production of metal hydroxides. Permutit Co. Ltd. **845 511**

Low-temperature gas absorption. Hydrocarbon Research Inc. **845 755**

Manufacture of metal chromates. Glaser, W. **845 873**

Production of fibrous structures impregnated with adhesives. Freudenberg Komm-Ges., Auf Aktien, C. [Addition to 828 214.] **845 418**

Purification of chlorine. Diamond Alkali Co. **845 550**

N-oxides of compounds of the reserpine series. Ciba Ltd. **845 522**

Process for polymerising olefins with catalysts containing organo-tin compounds. Montecatini Soc. Generale Per L'Industria Mineraria E Chimica. **845 878**

Preparation of anhydrous solutions of acrylonitrile vinyl-pyridine copolymers. Chemstrand Corporation. **845 993**

Method for washing liquid hydrocarbons from used solid absorbents. Socony Mobil Oil Co. Inc. **845 551**

Process for the hydrogenation of carbon monoxide. Ruhrchemie A.G., and Lurgi GmbH Fuer Waermetechnik. **845 558**

Manufacture of mixed chlorination products of low pressure polyolefines and hydrocarbons. Farbwerke Hoechst Aktiengesellschaft Vorm Meister Lucius & Brüning. **845 361**

Process for accelerating reactions between gases which advantageously cannot be influenced catalytically. Uhde, GmbH. **845 759**

Pyrimidine derivatives. Farmaceutici Italia S.A. **845 552**

Hydrolysis products of polymers of hydrocyanic acid and composition containing same. Monsanto Chemical Co. **845 363**

Ethylvinylsiloxane cyclic polymers. Union Carbide Corporation, formerly Union Carbide & Carbon Corporation. **845 554**

Steroid compounds. Merck & Co. Inc. **845 555**

Production of aluminium phosphate. Huber, H. **846 001**

Production of cellulose esters. Wasag-Chemie AG. **845 430**

Method of improving the stability of polytrifluorochlorethylene. Farbwerke Hoechst Aktien-Gesellschaft Vorm Meister Lucius & Brüning. **846 120**

Organic liquids having increased electrical conductivity. Bataafsche Petroleum Maatschappij N.V., De. **846 144**

Solutions of carboxylic acid esters of cellulose. Celanese Corporation of America. [Addition to 793 858.] **846 147**

Production of tetracycline. American Cyanamid Co. **845 715**

Process for fluorescent brightening fibres and fibrous materials. Farbenfabriken Bayer AG. **846 148**

Process for the ethylation of 17-keto-steroids. Schering AG. **845 441**

Polymerisation of olefins. Sun Oil Co. **845 903**

Manufacture of steroid compounds. Schering AG. **845 442**

Stable aqueous polyamide dispersions and a process of producing same. Badische Anilin- & Soda-Fabrik AG. **845 573**

Diisocyanates. Imperial Chemical Industries Ltd. **845 446**

Thiophosphoric acid esters. Farbenfabriken Bayer AG. **845 447**

Naphthylaminooxazolines and their acid addition salts, their preparation and compositions thereof. Pfizer & Co. Inc., C. **845 448**

Purification of phenoxy-methyl-penicillin. Lepetit S.p.A. **845 578 & 845 579**

Tetracycline antibiotic compositions. American Cyanamid Co. **845 454**

Indoline compounds. Ilford Ltd. **845 586**

Indoline cyanine dyes. Ilford Ltd. **845 587**

Trinuclear cyanine dyes. Ilford Ltd. **845 588**

Tin-activated barium phosphate phosphors. Sylvania Electric Products Inc. [Addition to 738 490.] **845 594**

Preparation of bis-quaternary ammonium compounds. Ciba Ltd. [Addition to 785 142.] **846 030**

Fungicidal compositions. Boots Pure Drug Co. Ltd. **845 916**

Production of low molecular weight homopolymers. Monsanto Chemicals Ltd. **845 672**

Polyethylene coating compositions and coated pellicular structures. Du Pont de Nemours & Co., E. I. **845 372**

Manufacture of monovinylacetylene. Du Pont de Nemours & Co., E. I. **846 155**

Naphtha reforming process. Esso Research & Engineering Co. **845 679**

Dithiophosphoric acid esters and process for their production. Farbenfabriken Bayer AG. **845 373**

Detergent compositions. Hedley & Co. Ltd., T. **845 376**

Di- and tri-nuclear phenols having antioxidant properties. Distillers Co. Ltd. **845 608**

Pyrimidines. Imperial Chemical Industries Ltd. **845 378**

Alkylation of heterocyclic compounds. Midland Tar Distillers Ltd. **845 562**

Process for the manufacture of alkyl isothiocyanates. Schering AG. **845 564**

Organic phosphorous compounds having pesticidal properties. Soc. Des Usines Chimiques Rhone-Poulenc. **845 647**

Processes for producing mixed alumina/silica gels. English Clays Lovering Pochin & Co. Ltd. **845 565**

6-deoxytetracyline and 6-deoxyoxytetracycline. American Cyanamid Co. **845 649**

Monoazo-dyestuffs of the benzene and naphthalene series containing halogen acylamino groups and their manufacture and use. Ciba Ltd. **845 567**

Thermoplastic resinous materials and pigments made therefrom. Switzer Bros. Inc. **845 462**

Production of nickel oxide. Mond Nickel Co. Ltd. **845 464**

Synthetic polyiminocarbonate resins. Chemische Werke Albert. **845 650**

Extraction of tungsten from tungsten-containing materials. Du Pont de Nemours & Co., E. I. **845 652**

Process for the preparation of polycarbonates. Beiersdorf & Co., AG, P. **846 044**

Method of preparing cyanogen. American Cyanamid Co. **845 471**

11, 12-epoxy steroids. Smith Kline & French Laboratories. **846 045**

Alkenyl-pyridine synthesis. Phillips Petroleum Co. **845 740**

Stabilised phenothiazine preparations. Smith Kline & French Laboratories. **845 943**

Process for the production of aldehydes. Compagnie Francaise des Matieres Colorantes. **846 166**

2-diarylalkyl-3, 4, 5, 6-tetrahydropyrimidines. Searle & Co., G. D. **845 486**

Purification of benzene. Coal Tar Research Association. **846 172 & 846 173**

Aluminium-containing organic compositions and method of preparing the same. Continental Oil Co. **846 174**

Sweetening of petroleum products. Compagnie Francaise de Raffinage. **846 175**

Weather and age resistant polyurethane compositions. General Tire & Rubber Co. **846 176**

Ethylene polymerisation. Imperial Chemical Industries Ltd. **845 683**

Catalytic reforming of petroleum hydrocarbons. British Petroleum Co. Ltd., Porter, F. W. B., and White, P. T. **845 619**

Method of treating polyethylene glycol terephthalate filaments or fibres in order to facilitate subsequent processing of the filaments or fibres, for example on a card. Vereinigte Glanzstoff-Fabriken AG. **845 688**

Grafting of polymers to cellulose substrates. Du Pont de Nemours & Co., E. I. **845 690**

Process for the manufacture of aluminium trialkyl etherates. Leuna-Werke W. Ulbricht Veb. **845 693**

Ion-exchange resins. Röhm & Haas GmbH. **845 950**

Method for preparing chlorophenylchlorosilanes. General Electric Co. **845 815**

Recovery of aluminium in subhalide distillation. Aluminium Laboratories Ltd. **846 189**

Copper-containing diazo dyestuffs. Farbenfabriken Bayer AG. **845 491**

Production of new resinous condensation products. Chemische Werke Albert. **845 494**

Piperidine derivatives. Searle & Co., G. D. **845 822**

Stabilised compositions comprising therapeutic amine derivatives and the preparation thereof. Sumitomo Chemical Co. Ltd. **845 823**

Acceleration of the reactions of organic compounds. Union Carbide Corporation. **845 827**

Beryllium fluoride glasses of extremely low refraction. Jenaer Glaswerk Schott & Gen Veb. **845 952**

Preparation of homoserine and alkyl esters thereof. Du Pont de Nemours & Co., E. I. **845 831**

Lubricating compositions containing di-alkali metal salts of hydroxy benzoic acids. Esso Research & Engineering Co. **845 624**

Substituted sulphonic acid amides. Farbenfabriken Bayer AG. **845 834**

Method of sealing vinylidene chloride polymer surfaces to one another. Dow Chemical Co. **845 626**

Lubricating oil compositions. Bataafsche Petroleum Maatschappij N.V., De. **845 628**

Uranium extraction processes. Commissariat a L'Energie Atomique. **845 842**

Phenoxy-glycerin diesters and their use as herbicides. Badische Anilin- & Soda-Fabrik AG. **845 632**

Amino-alkyl- and aminoarylkyl-cyclopentadienyl iron. Union Carbide Corporation. **845 499**

Acetophenone and isoquinoline derivatives and a process for the manufacture thereof. Hoffmann-La Roche & Co., F. **845 500**

Polyamide resins. General Mills Inc. **845 560**

Process for the preparation of an ammonium borate perhydrate free from water of crystallisation. Henkel & Cie, GmbH. **845 846**

Purification of ethylene. Engelhard Industries Inc. **846 077**

Removal of sulphur compounds from hydrocarbons. Badische Anilin- & Soda-Fabrik AG. **845 855**

Production of metal chromates and chromate pigments. Glaser, W. [Divided out of 845 873.] **845 874**

Process for the hydrogenation of carbon monoxide. Ruhrchemie AG, and Lurgi GmbH, Fuer Waermetechnik. [Divided out of 845 558.] **845 559**

Open to public inspection 17 August

Treatment of ores. United Kingdom Atomic Energy Authority. **844 841**

Pesticidal organic dithiophosphates, their manufacture and products containing them. Murphy Chemical Co. Ltd. **844 741**

Halogenated organic compounds. Haszeldine, R. N. **844 604**

Expandable resin compositions. United Aircraft Corporation. **844 682**

Continuous process for the production of hydrofluoric acid. Buss AG. **845 273**

Process for the manufacture of water-insoluble salts of polyvalent metals. Hustinx, E. **844 683**

Esterification of pyridine carboxylic acids. Aries Associates Inc. **844 684**

Di-tricyclodecane ether dicarboxylic acid and a process for its production. Ruhrchemie AG. **845 194**

Process for the manufacture of synthetic resins. Farbenfabrik Wolfen Veb. **844 687**

Polyester bonded-fibre fabric. Minnesota Mining & Manufacturing Co. **844 760**

Preparation of N-vinyl lactams. Rohm & Haas Co. **844 689**

Photographic materials and processes using light-sensitive polymers. Kodak Ltd. **844 767**

Preparation of condensation products from fatty acid anhydrites. Unilever Ltd. [Divided out of 28 590/55.] **844 620**

Methylene-hydrophenanthrenes and process for their manufacture. Ciba Ltd. **845 283**

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