Chemical Age

VOL. 85 No. 2179

15 April 1961

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

AROMATICS IN EUROPE (page 617)

INDEX TO ADVERTISERS

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

(Continued on page 604)

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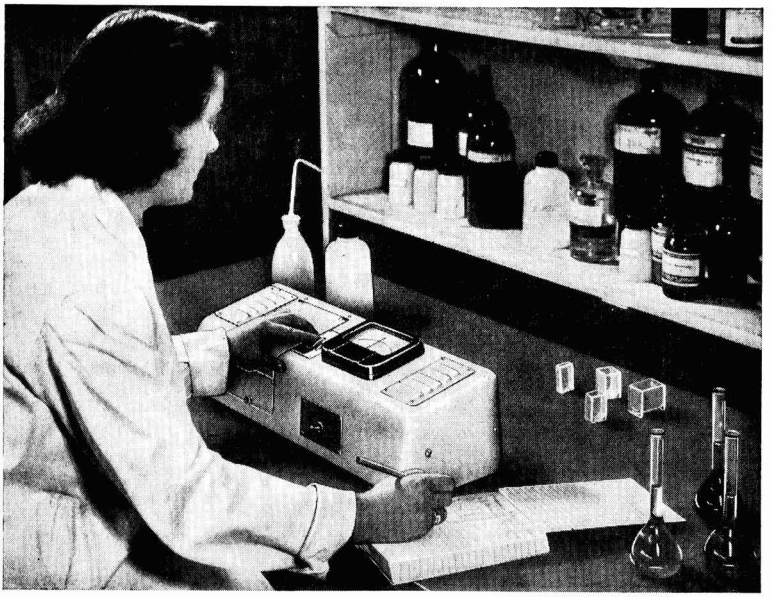

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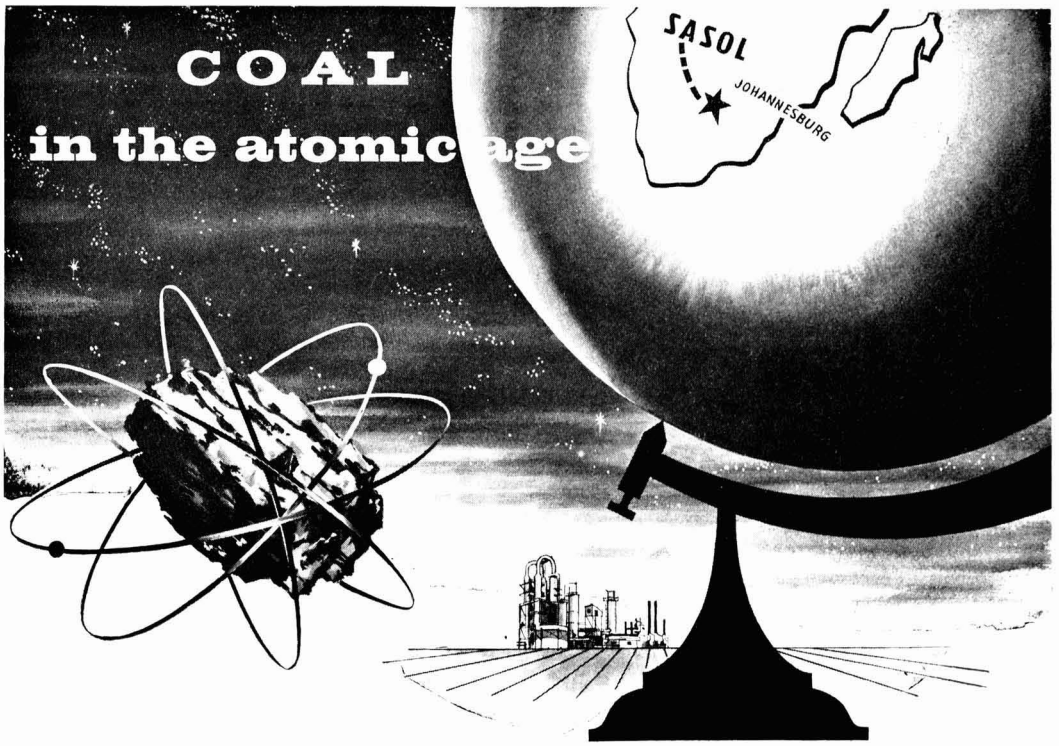

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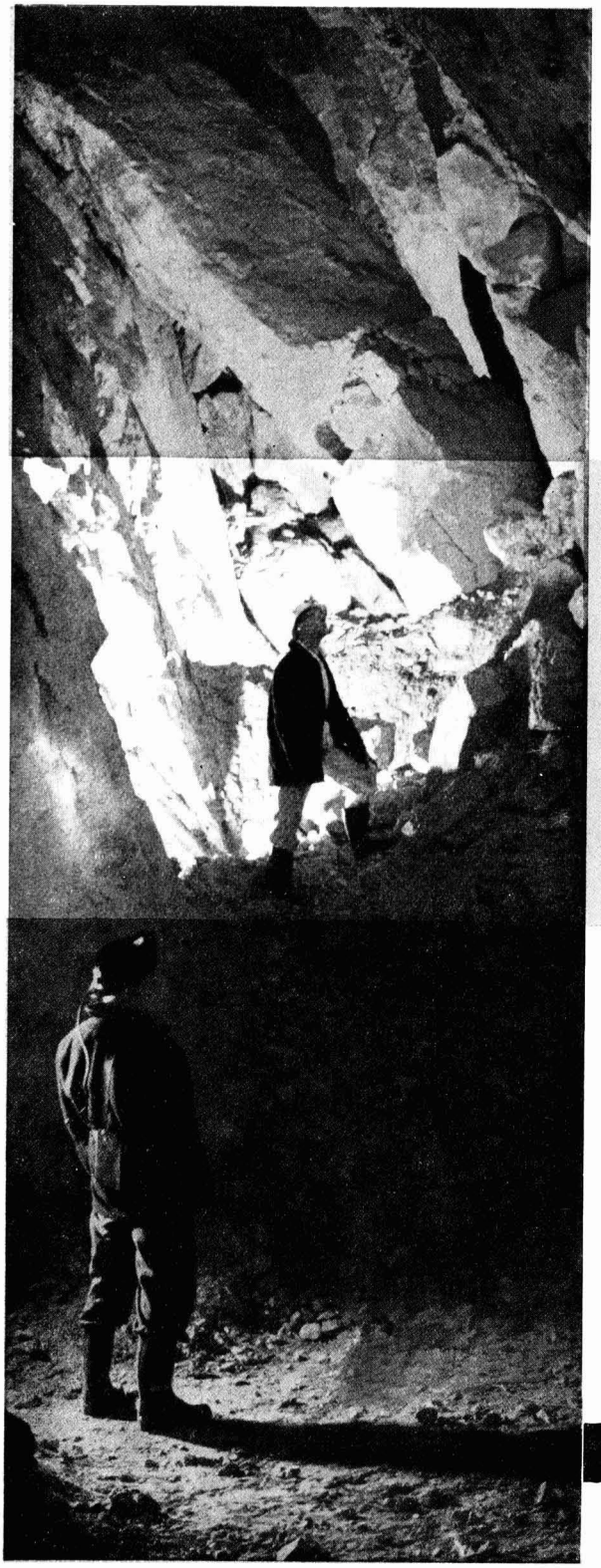

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VOL. 85 No. 2179
APRIL 15 1961

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CHEMICAL AGE

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IN THIS ISSUE

Annual subscription is: home, 57s 6d, overseas, 65s, single copies 1s 9d (by post 2s)

D.C.L.'s YEAR OF GROWTH

ANNOUNCEMENT of the first projects of British Hydrocarbon Chemicals at Baglan Bay, expected shortly, will cap a period of great expansion for the chemicals and plastics interests of the Distillers Co. Ltd., who jointly own B.H.C. with British Petroleum. Since B.H.C. first stated their intention last October of opening a second petrochemicals complex, to be sited in South Wales, Forth Chemicals Ltd. (owned two-thirds by B.H.C. and one-third by Monsanto) disclosed plans to make 50,000 tons of styrene monomer at Baglan Bay; when in production in 1962-63 this plant will double existing capacity at Grangemouth.

By the end of this year, B.H.C. will have invested something approaching £40 million at Grangemouth; the projects announced by D.C.L., their subsidiaries and associated companies during 1960 will involve total capital spending of some £29 million, of which about £15 million is being spent at Grangemouth. The Baglan Bay projects now announced will account for some £10 million, while the Forth Chemicals project will cost more than £3 million. To this must be added a considerable sum involved in the entry of Grange Chemicals Ltd. into phthalic anhydride, announced last week.

In 1960, B.H.C. brought their third olefin plant at Grangemouth on stream, giving a capacity of more than 300,000 tons/year; this unit, which more than doubled ethylene capacity to a total of 130,000 tons/year, is the largest outside the U.S. Also last year, B.H.C. came into operation with a cumene-phenol plant, with a capacity for 13,000 tons/year. This year will see new plants coming into production to double butadiene capacity to 20,000 tons/year and to produce undisclosed quantities of methanol and ethylene dichloride.

Other D.C.L. associates are also busy with expansion. British Geon Ltd. are boosting p.v.c. capacity at Barry and on completion in the middle of this year, will start a further expansion project. Hedon Chemicals are increasing vinyl acetate capacity. The D.C.L. Chemicals Division is in full production with its phthalate plasticisers plant at Hull and are due on stream early in 1962 with a £2 million acetic acid plant, also at Hull.

Acquisition of British Xylonite Ltd. at a cost of £12.7 million has recently been approved, further adding to D.C.L.'s rapidly increasing stake in chemicals and plastics. The company does not disclose the percentage of its turnover (£233 million in 1959-60), due to industrial interests, but profits from chemicals, plastics, pharmaceuticals and a smaller Food Division accounted for about 20% of the £30.4 million group profit. It is significant that earnings from industrial companies rose by 27% in 1959-60.

The turnover figure must be considerably swollen by the fruits of D.C.L.'s original research and development work. The cumene-phenol process, developed jointly with Hercules Powder in 1950, and now in use at Grangemouth, has been licensed widely overseas. D.C.L. are using their own process for making acetic acid by direct hydrocarbon conversion at Hull, while the company's propylene and ammonia route to acrylonitrile has been licensed to Ugilor of France. *(Continued on p. 614)*

Albright's New Planning Department Will Probe Group's U.K. Sites, Facilities and Methods

A NEW department now being formed by Albright and Wilson Ltd., and to be known as 'inter-company planning', will examine ways of improving overall efficiency of the A. and W. Group in the U.K. by inter-company co-operation. One of its first tasks will be a study of the various sites, facilities and operational methods of the group in this country.

Mr. S. Barratt, A. and W. chairman, announcing this new venture, said the work of the department would initially be largely exploratory. Because it is a

Dr. R. A. Gregory, who will head the new department

new venture, its method of operation will be experimental. The inter-company planning department is non-executive and will act in an advisory capacity to the group chairman. It will be empowered to set up working parties in collaboration with individual companies or departments.

The new department will be headed by Dr. R. A. Gregory, joint managing director of Midland Silicones Ltd. Although resigning his Midsil executive position, Dr. Gregory remains a director of that company. From 10 April, Mr. K. A. M. Barton has assumed full responsibility as Midsil managing director.

A. and W.'s U.K. operations have expanded greatly in recent years with take-overs, the most recent of which brought into the group two companies, who between them hold a major share in the essences and flavours field—A. Boake Roberts and W. J. Bush. British operating companies, and their interests, are:

A. and W. (Mfg.)—phosphorus and compounds, carbon tetrachloride, oil additives, organotin compounds, aluminium salts and other general and fine chemicals.

Boake Roberts—plasticisers, stabilisers, intermediates, metallic soaps, synthetic lubricants, oil additives, fire-extinguishing compounds, aromatic isolates and synthetics for perfumes, etc., essences, flavours and fruit-juice concentrates.

W. J. Bush—essences, flavours, fruit juices, food and drink colourings, essential oils, perfumery chemicals, isolates and compounds, bulk organics, pharmaceutical and dyestuff intermediates.

Marchon Products—phosphoric acid, sodium tripolyphosphate, surface-active chemicals.

Potter and Moore—perfumes and toiletries, particularly lavender products.

Solway Chemicals—sulphuric acid, Portland cement.

Midland Silicones (in whom Dow Corning have a part interest)—silicones, including fluids, resins, rubbers, lubricants, anti-foaming agents, water-repellents and release agents.

A. and W. Match Phosphorus (owned jointly with Bryant and May)—phosphorus sesquisulphide and amorphous phosphorus.

Lubrizol Great Britain (a subsidiary of Lubrizol of Cleveland, Ohio)—lube oil additives, etc., which are made at Oldbury by A. and W. (Mfg.).

Proban (owned jointly with Bradford Dyers Association)—flame-resistant and durable pleating finishes for textiles.

Bayer Net Profit Increased 25% on Sales Rise of 14.6%

GERMANY'S largest chemical company and second only in Europe to I.C.I.—Farbenfabriken Bayer AG, Leverkusen—announce a 1960 turnover of DM2,818,500,000 (£234 million), or 14.6% more than the previous year's figure of DM2,459 million. Net profit totalled DM132,300,000 (£11 million), an increase of 25.2% on the 1959 result of DM105,600,000.

Of total turnover, inland sales rose by 11.5% from DM1,394 million to DM1,554,900,000 and export turnover by 18.6% from DM1,065 million to DM1,263,600,000. Share of export sales in total sales thus rose from 43.3% to 44.8%. Over 58% of all Bayer exports went to European customers. Turnover of subsidiary companies at home and abroad owned 50% or more by Bayer (excluding 100% owned branch companies) rose to some DM800 million. Excluding internal deliveries, the total turnover of the Bayer group for last year thus approximated DM3,300 million.

Sales prices fell over the year by a further average of nearly 2%, thus causing a fall in possible revenue of some DM50 million. Prices were last year only 81.2% of the 1952 level by the end of the year. All branches of production, particularly pharmaceuticals and plant-protection chemicals, were affected by these falling prices. Prices for raw materials remained generally stable.

Almost all Bayer plants were working to full capacity last year. In the period 1952-60 productivity has been doubled, while new products are playing an ever-increasing role in overall Bayer's programme.

A dividend of 18% (16%) is to be paid for the year. A total of DM100 million (DM29,200,000) is to be passed into reserves. Company capital, of DM735 million, is expected to be increased further at the start of 1962. Over the last year depreciation of DM236,000,000 was recorded.

Over 1960 some DM403,800,000 (DM284,400,000) was invested by Bayer, of which DM348,700,000 went to Farbenfabriken Bayer and the rest on their 100%-owned subsidiaries. Research expenditure accounted for DM124,600,000, or 4.5% of turnover, and was higher by DM12,800,000 than that for 1959. Some DM120 million to DM150 million is to be spent in the period 1961-65 on extension of research laboratories.

Bayer last year spent DM31,600,000 on inland holdings (excluding 100%-owned subsidiaries) and DM28,400,000 on foreign holdings.

For 1961 investments of some DM400 million are planned. Volume of business is expected to grow further. Despite growing inland and foreign competition and greater losses of possible revenue due to revaluation of the German mark, a satisfactory 1961 result is expected. The rate of increase should, however, be lower than that for last year.

Basing most expansion on their Dormagen and Uerdingen plants, Farbenfabriken Bayer are to increase production of chlorine, sodium lye, rubber auxiliaries, Perbunan synthetic rubber, plant-protection and insecticide products and also of Dralon and Perlon synthetic fibres. Companies in which Bayer are interested which are to expand production include Ets. Société Nouvelles As de Trêfles, France (Copyrapid paper), Mobay Chemical Co., U.S. (toluene diisocyanate), Bayer do Brazil, Brazil, (sulphuric acid and hydrofluoric acid), Bunawerke Hüls GmbH, Germany (synthetic rubber) and probably Bayer de Mexico Industrias Quimicas S.A.

D.C.L.'s GROWTH

(Continued from p. 613)

The company has been reported as studying sorbic acid, water-based paint resins, isoniazid, picolines and partly synthesised antibiotics. D.C.L. also have a thoroughly competent Engineering Division, capable of designing complete plant installations.

It must be considered highly probable that before the end of this year, Distillers and their associates will have announced further projects in petrochemicals and other lines. In any event, D.C.L. are thrusting ahead vigorously both in chemicals and plastics and will obviously play an increasingly important part in these industries.

Kellogg Award Contracts for Major Portuguese Fertiliser Complex

● CONTRACTS covering ammonia and urea plants, offsite facilities and construction of all major process facilities for a new fertiliser complex planned by **Uniao Fabril do Azoto**, Lisbon, have been awarded to **M. W. Kellogg Co.**, New York, and two of their subsidiaries. Ammonia and urea plants will be engineered by M. W. Kellogg and **Kellogg International Corporation**, London. K.I.C. will be responsible for offsite facilities and will handle procurement of materials in the U.K. **Kellogg of Panama** will handle local procurement in Portugal and will carry out all construction, except for administrative buildings.

The new complex to be built at Barra a Barra, on the south bank of the Tagus, near Lisbon, is scheduled for completion in 1962. It will consist of a 180 tonnes/day ammonia plant, a 40,500 tonnes/year urea unit, a nitric acid plant, an ammonium nitrate plant and a nitro-limestone plant.

Engineering and procurement for the nitric acid plant, the ammonium nitrate plant and the nitro-limestone plant will be undertaken by **C. and I. Girdler International Ltd.**, Nassau, Bahamas. The nitric acid and ammonia nitrate plants are scheduled for operation in early summer. Initially, these units will utilise ammonia imported from nearby Portuguese plants.

I.C.I. Terylene Contract Goes to Wimpey

● CONTRACT for the proposed I.C.I. Terylene spinning plant in Northern Ireland (see CHEMICAL AGE 19 November 1960, p. 859) has been awarded to **George Wimpey and Co. Ltd.** They have been appointed comprehensive contractors for the design, erection and procurement of all site services and ancillary buildings and for the erection of specialised plant and machinery.

The design and procurement of specialised plant and machinery is being undertaken by the Engineering Department of I.C.I. Fibres Division.

It is expected that production will begin in 1963.

Celcure Get Planning Permission for Glasgow Extensions

● PLANNING permission to carry out extensions to their chemical mixing building at 1036 Crow Road, Glasgow, has been received by **Celcure and Chemical Co. Ltd.**

B.B.H. Award Water Treatment Contract

● CONTRACT for demineralisation and de-aeration plants worth £6,000 has been awarded by **Burt Boulton and Haywood Ltd.** to **William Boby and Co. Ltd.**, Rickmansworth, Herts.

Project News

I.C.I. WILL USE OWN BUTENE PROCESS FOR NEW MALEIC PLANT

THE new 10,000 tons/year maleic anhydride plant which the **I.C.I. Heavy Organic Chemicals Division** will build at Wilton Works, Yorks, will use a new process in which butene is oxidised with air. At present, I.C.I. use this C_4 olefinic feedstock mainly for the production of anti-oxidants; the division's entry into the U.K. maleic field will, therefore provide a valuable new and major use for butenes, which are obtained from the Wilton olefin plants.

I.C.I. will use a process developed in their own research department; it is similar in principle to the benzene process, but there are many differences in detail. I.C.I. have no plans at present to make fumaric acid at Wilton, but this material can be produced later if required.

This route to maleic is not at present being utilised by any plant in the free world, although Petro-Tex will shortly come on stream with a 3 million lb./year project in the U.S.; Scientific Design are also offering a butene-oxidation process. Basically this is a two-stage process involving the relatively simple oxidisation stage and the more complicated working up of the maleic and liquors. With plenty of butenes available at Wilton, I.C.I. will have a relatively low-cost starting material of their own production, instead of having to buy in more expensive chemical grade benzene.

Other U.K. producers of maleic are Monsanto Chemicals Ltd., who recently came on stream with a 15,000 tons/year plant, supplementing a much smaller plant, and Alchemy Ltd., who also recently brought a new and much smaller unit into production. Monsanto, who stated when they came on stream that their plant would meet all foreseeable U.K. requirements and provide an export surplus, have since announced their entry into the fumaric acid field. Whether Monsanto's new capacity will completely eliminate imports remains to be seen, but the threat of low-cost material from the Continent is likely to remain. Last year U.K. imports of maleic anhydride totalled 2,483 tons (996 tons in 1959), with the December figure of 615 tons nearly three times up on the previous record monthly import total.

I.C.I. have given no on-stream time, but it is not thought that this could be before 1963-64, by which time U.K. demand for maleic will have increased considerably. Biggest increase in usage is seen in the production of polyester resins for reinforced plastics and surface coatings, with a smaller expansion in the preparation of agricultural chemicals, insecticides and other derivatives. A new use now being developed in the U.S. is in styrene maleic anhydride copolymers.

In the U.S. maleic production is scheduled to rise from the 1960 figure of 90 million lb. to 115 million lb. this year and to an estimated 180 million lb. in 1965; consumption, at 93 million lb. in 1960, should reach 102 million lb. this year and 164 million lb. by 1965. In the U.S. polyester resins took 60 million lb. of maleic in 1960, expected to rise to 66 million lb. this year and about double that by 1965. Judging by polyester statistics, maleic anhydride use in the U.K. may grow at about the same rate, or a little faster.

European capacity for maleic is expected to double in the next few years.

Midsil Bring New £500,000 Silicone Plants on Stream at Barry

FIRST new units of the Midland Silicones Ltd. factory at Barry, Glamorgan, representing over half of the total £1 m. investment in this expansion project, are being brought into operation during this month. They include a plant for manufacturing methyl chloride, one of the primary raw materials for silicone production; a new direct process unit for the production of chlorosilanes which will nearly double the previously existing capacity, and a silicone fluids production unit with more than twice the capacity of the equipment being used at present. Hydrochloric acid obtained as a by-product in the fluids unit will be used in the methyl chloride process.

Engineering of the methyl chloride and silicone fluids plants was carried out by Midsil's own staff, while work on the direct process unit was done by the central engineering department of Albright and Wilson (Mfg.) Ltd.—Midsil, Europe's largest silicone manufacturers, are jointly owned by Albright and Wilson and Dow Corning Corporation, U.S.

Further capital construction projects at Barry include new plant to quadruple output of emulsions for use as release agents and for the treatment of textiles and paper, to be brought into operation this year; a further direct process reactor, to be completed in 1962; additional distillation columns, to come into service in 1962; and new equipment for the manufacture of various siloxane intermediates. This unit, also to be in operation in 1962, will have a capacity more than three times that at present available.

Besides the £1 m. plant expansion project, the current Midsil construction

programme includes a £150,000 laboratory extension to be completed early in 1962 and a £65,000 canteen.

The other major U.K. producers of silicones—I.C.I. Nobel Division—are also engaged in an expansion project at their Ardeer plant and completion of the first important phase was reported last month (C.A., 18 March, p. 447). Neither I.C.I. nor Midsil discloses any production figures but current U.K. production of silicones has been estimated at 1,000-1,200 tons/year. The Barry plant, operated by Albright and Wilson Ltd. before Midland Silicones Ltd. was formed, started production in 1953 and was described in CHEMICAL AGE, 16 October 1954, p. 817. The original plant was built at a cost of about £1.5 m. and was designed for a throughput of 600 tons/year.

I.C.I./S.-C. Sell Four Polythene Plants to East Europe

IMPERIAL Chemical Industries' know-how and Simon-Carves design and engineering services are involved in a £7 million contract that has just been signed by **Simon-Carves Ltd.** (a member of the Simon Engineering Group) in connection with four polythene projects for Czechoslovakia, East Germany, Poland and Rumania. This is the first time I.C.I. have sold polythene know-how to Eastern Europe.

The figure of £7 million for the entire contract is provisional and further talks will take place at which it is expected the proportion of the value to go to I.C.I. and Simon-Carves and the amount paid by each of the four countries will be decided. The same type of plant, with a capacity of 24,000 tons, will be built in each country and the amount of equipment supplied by the countries themselves will differ. This will obviously affect the proportion of the contract each country will pay. It is not known whether all the plants will function at full capacity initially.

The four plants will be built during the next three years. Simon-Carves engineers will assist in their erection, and will remain on hand to see them put on stream. All the specialised equipment covered by the contracts will be manufactured in the U.K.

Simon-Carves stated that the placing of the orders in the U.K. represented "a considerable achievement for all the parties concerned, particularly in view of the language complications and the varying technical, legal and statutory requirements of each country."

Simon-Carves have designed the polythene plants now being built in Mexico and Yugoslavia. The company was also responsible for the first polythene plant to go into operation in India. This was built for I.C.I.'s Indian company, A.C.C.I.

The negotiations were carried out with Limex, an organisation representing all East German firms interested in the international exchange of patents, know-how and trade marks. Particularly important for E. Germany are the countries which are in the earlier stages of industrialisation, such as India, Brazil, Yugoslavia and the United Arab Republic who prefer to adopt industrial processes already developed, but Limex also feel that East Germany have much experience to offer in exchanges with the more highly developed countries.

Limex have already completed an agreement with Humphreys and Glasgow which ensures that East German processes can be used throughout the world in conjunction with Humglas. This gives the U.K. possibilities of exporting processes with Humglas acting as intermediaries for the supply of equipment.

The East German plant will be built at Leuna, and the ethylene will be produced in the country by the process which was the subject of a recent agreement with Humglas (see CHEMICAL AGE, 29 October 1960, p. 727).

Humglas–CIBA Link on Engineering Know-how for Indian Plant

● FURTHER details of the expansion programme of **Atul Products Ltd.**, at Bulsar, 120 miles from Bombay, India, are revealed with the announcement that **CIBA Ltd.**, Basle, will make their manufacturing processes and know-how available to Atul and to Humphreys and Glasgow Ltd., London, who will be responsible for engineering, planning and construction of the plant. Representatives of CIBA and of Humglas have been in Bulsar to finalise the details of the £2½-£3 m. project, which is concerned with the production of naphthalene intermediates and fast colour bases in the dyestuffs field. Atul operating personnel will be trained in the CIBA works at Basle. The plant is expected to be ready for operation in 1963.

Only the intermediates section of the project has previously been announced and it was reported in CHEMICAL AGE, 7 January, p. 7, that Humglas had been awarded the contract for this, worth about £1.3 m. The remainder of the expansion programme adds considerably to this contract.

B.H.C. Award Ethylene Butadiene Contracts for Baglan Bay

CONTRACTS for the construction of ethylene and butadiene plants at the Baglan Bay, South Wales, site of **British Hydrocarbon Chemicals Ltd.** have been awarded to **Stone and Webster Engineering Ltd.**, 20 Red Lion Street, London W.C.1. No further details were available at the time CHEMICAL AGE went to press, but it is believed that an official announcement will be made shortly.

Stone and Webster built the three existing B.H.C. ethylene plants at Grangemouth, which use a Stone and Webster steam cracking process. Capacity is 130,000 tons/year. B.H.C. also have a 10,000 tons/year butadiene unit at Grangemouth, which is currently being expanded to 20,000 tons/year. The Esso Research steam cracking and extraction process is used.

Forth Chemicals, owned 66⅔% by B.H.C. and 33⅓% by Monsanto, are building a 50,000 tons/year styrene plant at Baglan Bay; they already have capacity at Grangemouth for 30,000 tons/year, which is currently being expanded to 50,000 tons/year by 1961-62.

In 1960, U.K. capacity for ethylene was around 400,000 tons, with B.H.C. accounting for 130,000 tons, British Celanese, 21,000 tons, Esso, 40,000 tons, I.C.I., 140,000 tons, and Shell Chemical 80,000 tons. By 1962 U.K. capacity will reach 410,000 tons and by 1965 is expected to top 600,000 t.p.a.

Butadiene capacity in 1960 totalled 66,000 tons, with B.H.C. accounting for 10,000 tons (due to rise this year to 20,000 tons), Esso 42,000 tons and I.C.I. 14,000 tons (with expansion believed to be in hand).

U.K. Firm Gets Canadian Gas Pipeline Contract

● CONTRACT worth about £670,000 to supply steel pipe for Canada's natural gas project has been awarded to the Canadian subsidiary of **Stewarts and Lloyds Ltd.** by Hudson's Bay Oil and Gas Co. and Shell Oil Co. of Canada. More than 100 miles of pipe, weighing 11,100 tons, will be supplied to convey sour gas from the Alberta gas field to cleaning plant now being built.

Control Equipment for S. African TiO_2 Project

● ORDER to supply control equipment for **South African Titan Products'** new titanium dioxide factory at Umbogintwini, near Durban, has been received by **Brookhirst Igranic**, a company in the Metal Industries Group. Value of the contract is not disclosed but it is revealed that Brookhirst Igranic's Chester unit is to supply seven Chester Major boards on this contract and the Bedford unit is responsible for the supply of two 3.3 kw. high tension boards. The services controlled are fans, conveyors, elevators, pumps and agitators. The assembly of these control equipments is being undertaken by Brookhirst Igranic S.A. (Pty) Ltd. of Johannesburg, who are also entrusted with the commissioning of the controls on site.

Struggle Ahead for Europe's Aromatics Markets

Esso's Dutch Plant Will Help Raise Europe's Petro-aromatics Output to 750,000 Tonnes

ESSO are planning their second aromatics plant in Europe on the site of their Botlek, Rotterdam, refinery. Here facilities will be built with an initial capacity of some 220,000 tonnes of benzene, toluene and xylenes a year. The new plant of Esso (Nederland) N.V. will cost £6.5 million and will, when in production in the middle of 1963, be the largest in Europe.

The plant will use the process of Esso Research and Engineering Co. involving catalytic conversion of mineral oil fractions followed by hydrodealkylation. Construction will start this year using Dutch labour and mainly Dutch materials. Aromatic products will be marketed not only in the Netherlands, but will also help meet expanding needs in other Common Market countries, as well as in the U.K. and Scandinavia. Products will be available immediately in limited quantities from other Esso plants in Europe and the U.S.

Demand for chemical aromatics is increasing rapidly in Europe because of the the mounting call for their use as intermediates in the plastics, synthetic fibre, detergent, resin, insecticide and other industries. Unlike the situation in the U.S., where petroleum is by far the largest source for aromatics, European production is still very largely based on coke ovens and tar distilleries. But rapidly expanding markets in the coming years call for the large-scale development of petroleum sources.

U.S. Build-up

By 1963, when the latest Esso aromatics plant is due on stream, European production of petroleum-based aromatics will exceed 750,000 tonnes/year. Before then, however, a major struggle for the European market will have started. Vast capacities for aromatics are currently being built up in the U.S., far in excess of national demand.

In benzene alone, U.S. exports tripled from 7.3 million gall. in 1959 to nearly 23.6 million in 1960; this year the figure is expected to reach some 50 million gall. and next year a total of 100 million has been forecast; this seems over-optimistic, and a more realistic figure of 150 million has been quoted for 1965. With the completion a few weeks ago of the Soviet contract to supply benzene to the U.S., the U.S.S.R. will be seeking to raise exports to other parts of the world, including West Europe; already two trade agreements signed this year, between that country and West Germany and Italy, have stipulated the shipment from the Soviet Union of large quantities of aromatics. (C.A., 11 March, p. 400.)

Some U.S. producers estimate that *o*-xylene exports will exceed 400 million lb. by 1962, but that they will decline rapidly after that year as foreign *o*-xylene plants come onstream. It is thought that overseas markets could absorb some 150 million lb./year of *p*-xylene.

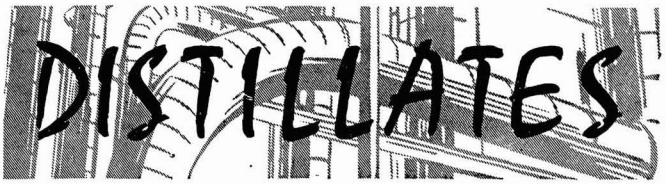
In any event the next few years will see large-scale increases in U.S. manufacturing capacities. By 1962, U.S. benzene capacity is expected to total 916 million gall. of which some 70% will come from petroleum sources. Petrobenzene output in 1960 totalled 369 million gall., including 10 million gall. of benzene as a petrochemical by-product. By 1962, 156 million gall. of petrobenzene produced will come from toluene.

U.S. toluene production in 1960 totalled 276 million gall., with petroleum sources contributing 88% of the total. This year coke oven production is expected to remain the same, with petroleum firms producing about 320 million gall., bringing total output to about 350 million gall. Capacity for toluene-from-petroleum in 1962 is expected to total 468 million gall.

Reported U.S. production of xylenes in 1960 was 328 million gall., with 320 million coming from petroleum sources; the latter figure should this year rise to 355 million gall., and should top 500

(*Continued on p. 620*)

COMPANY AND LOCATION	PRODUCTS	CAPACITY (T.P.A.)	STATUS
Antar Petroles d'Atlantique			
Donges, Nantes	Benzene & xylenes	30,000	In production
B.P.-California			
Isle of Grain	*o*-Xylene	9,500	First units due on stream
	p-Xlyene	11,000	late-1961
	Ethylbenzene	8,000	
Dinslaken	*o*-Xylene	9,500	First units due on stream
	p-Xylene	11,000	late-1961
	Ethylbenzene	8,000	
British Celanese			
Spondon	Benzene, toluene & xylene	?	Due on stream mid-1961
Californie-Atlantique			
Donges, Nantes	*p*-Xylene	8,500	In production
Esso (Nederland)			
Botlek	*o*-Xylene, *p*-xylene & benzene	220,000	Due on stream mid-1963
Esso Standard Francaise			
Port Jerome	Benzene & xylenes	45,000	Due on stream mid-1962
Gelsenberg Benzin AG			
Gelsenkirchen	Benzene	21,000—43,000	Due on stream autumn 1961
	Plus toluene & xylene	?	,,
Mobil Chimica Italiana			
Naples	Benzene, ethyl-benzene, *o-xylene & p-xylene*	130,000	Due on stream late-1962
Sarda Industrie Resini (S.I.R.)			
Porto Torres, Sardinia	Development plans *include aromatics*	—	—
Shell Chemical Co.			
Stanlow	Xylenes	?	In production
Shell Italiana			
Rho, Milan	Benzene & xylenes	100,000	Due on stream mid-1961
Soc. Nationale Petroles d'Aquitaine			
Lacq	Benzene, toluene & xylenes	70,000	Due on stream late-1962, early-1963
Union Chimique Belge			
Zandvoorde, Ostend	Benzene *o*-xylenes	30,000	In production early-1961



THANK heavens for at least one national newspaper that can take a common sense view of the use of seed dressings in agriculture. On Monday, *The Financial Times* describing criticisms as 'frivolous' said that not only were modern pesticides more effective, they were far less dangerous than the cruder weapons of earlier days. If makers' warnings are heeded there need be little trouble, but producers cannot, of course, control the field usage of their products.

The *F.T.* speaks of the high cost of research and development in this field, quoting I.C.I.'s search for a new organophosphorus systemic insecticide—Amiton. It proved highly successful, but after involving expenditure of some £400,000 it was abandoned because it was considered too poisonous to man.

Promising new products mentioned are a diquat from I.C.I., a desiccant that will dry up potato haulm, which is just coming into production "after difficulties with the chemical plant" and a new Shell weedkiller, from their Woodstock laboratories, presently known as 2,6-dichlorobenzo-nitrile; this is said to be particularly effective against seeds.

AS our recent special 'Transport and Containers' issue showed (25 March), there are plenty of new developments in this field, but nothing quite so revolutionary as the U.S. Southwest Research Institute proposes for sulphur shipment. Having decided that the handling of Frasch-process sulphur is inefficient, involving as is does movement in molten form and waste in solidifying the molten material and its later remelting, the institute has come up with the idea that molten sulphur could be cast into the shape of a submarine.

This sulphur submarine, cast at the point of production, would float semi-submerged, being provided with internal void spaces. Sulphur, which has a density of 2.07, could thus be towed to customers. Sulphur exhibits greater tensile strength (160 p.s.i.) and compressive strength (3,300 p.s.i.) than concrete. The S.W.R.I. believe that bulk fertilisers and salt cake could also be handled in this way.

Before the sulphur submarine becomes a reality, however, much design work remains to be done. Future of the project, apparently, depends on additional funds being made available.

NEW entrant to the detergent battle is Mr. Reg Slater—52-year-old head of three Bradford chemical and medicated products firms—who is preparing to launch on the market a new washing powder which he has made up himself and which he plans to sell at 1s 3d, or some 7d cheaper than well-known brands. Asked how he could do this, he replied: "I think most products could be cheaper. It is a matter of overheads. Ours are very low and it depends on how much profit you are going to be satisfied with and how much you're going to spend on publicity."

Head of Ulter (Bradford) Ltd., manufacturing chemists, the Teesdale Chlorodyne Co. Ltd. and F. N. Pollard (Stockinette) Ltd., Mr. Slater a year ago disposed of another company—Bradford Aerosols Ltd., formed to produce a fly spray—to Reckitt and Sons Ltd., a subsidiary of Reckitt and Colman Holdings. His new washing powder has already been produced in sample pack form but a snag has arisen over the brand name he chose, Brand X. He thought this name, which has often appeared in a television advertisement, would be a good one, but it seems as though somebody else beat him to it by a month and has already registered it.

DESIGNING and building a new chemical plant project is the intriguing theme of an afternoon symposium to be held in May by the S.C.I. Chemical Engineering Group. Three distinguished authors will discuss designing and building, site selection and project finance for a hypothetical medium-sized company that plans a new project costing between £5-to-£10 million on a new U.K. site.

The authors—T. T. Whipple (Lummus Co. Ltd.), Dr. L. J. Murdock (George Wimpey) and K. C. P. Barrington (Morgan Grenfell)—will assume that the company is well established, has had previous contact with the chemical industry but has only pilot plant experience in the field of the project. With a progressive board, the company has obtained from a small but efficient engineering department provisional estimates for the cost of the project and is satisfied that the development is a worthwhile investment, but has insufficient funds to finance it from its own resources.

In addition to the three distinguished speakers, an opening address will be given by Lord Fleck, S.C.I. president.

CHEMICAL market researchers working in Britain have always found it difficult to get reliable statistics; official sources are virtually non-existent, except for a few chemicals. Export and import figures are frequently published under general headings and to get breakdowns is not always possible as these are only made available providing none of the firms concerned objects.

Production censuses provide good bases, but by the time they are published they are largely of academic interest. There are no signs of any radical improvements on the statistical front and it looks as though intelligence departments will still have to rely on inside information, contacts with their opposite numbers in other companies and, frequently, on inspired hunches.

Despite the difficulties the system seems to work well, although I hasten to correct a slip that occurred in our leader of 1 April on phthalic anhydride. Relying on a number of 'guestimates' we placed U.K. consumption in 1960 at 35,000 tons, with a production of 34,100 tons. Since imports are known to have amounted to 10,500 tons in 1960, while exports are estimated to have totalled some 3,000 tons, U.K. phthalic consumption last year was probably around 40,000 to 42,000 tons.

Although Monsanto have never disclosed their phthalic anhydride capacity, they tell me it is well over double the 7,000 tons/year figure mentioned in 'Project News' last week.

AN original and valuable contribution by the chemical industry to the range of agricultural pesticides, was how Dr. Walter F. Jepson, Cyanamid International, and an authority on agrochemicals, described the new fungicide, Melprex, in his paper at the recent S.C.I. symposium in London.

Trials have established that dodine, the accepted generic name for n-dodecylguanidine acetate, showed excellent effectiveness in controlling certain fungus diseases attacking deciduous fruit. Dodine is a guanidine derivative, one of a number that has been the subject of trials over the past five years, and is now available commercially for the first time in this country under the name of Melprex. It has already been marketed for two years in the U.S.

Among the findings reported by Dr. Jepson were that the chemical has excellent spreading and adhesive properties, giving long persistence on foliage, and resistance to rain; and that it is outstanding against apple scab disease. It has a curative as well as a protectant action, does not encourage mildew, and has also shown 'outstanding' results in the U.S. in the control of black spot disease of roses.

A NEW use of plastics in bulk transport of liquids has made its debut recently. Giant polythene bags are now being used for the transport of edible liquids which must be kept free from contamination.

Developed by the U.S. Industrial Chemicals Co., the liners can be readily unrolled in any road or rail trailer or refrigerator van and inflated. After unloading the bag can be rolled up and is then ready for the transport of the next load, whether liquid or dry, within a matter of minutes. Lengthy cleaning operations are not necessary.

Alembic

THERMAL DIFFUSION PRODUCES TOP GRADE OILS FOR SOHIO

Highlights of A.C.S. National Meeting

ONE of the highlights of the 139th national meeting of the American Chemical Society was the process, described at a symposium on the less common separation methods used in the petroleum industry, by which, it is claimed, motor oils are produced which give 50% longer service than those currently available.

Standard Oil of Ohio have designed a commercial thermal diffusion, based on development studies, for the production of high quality oils. For their studies, Standard Oil prepared a series of oils by the thermal diffusion (which separates molecules according to their shape) of conventional lubricating oils. In laboratory tests these oils showed only small changes in their flow properties at the extremes of practical operation and did not alter in viscosity. They also exhibited a higher resistance to deterioration from contact with air.

Following the laboratory tests, road tests were carried out which confirmed the predictions from laboratory data.

Oils of the type used by Sohio for their tests can be made with a capital cost of $1,395 per bbl. of product at a heat consumption of 400,000 B.Th.U. per gall. Capital cost of the commercial plant designed by the company to produce 3,300 gall. per day would be $110,000.

Membrane Permeation

On the other hand, American Oil feel that, of the less common methods of separation, membrane permeation could be put to good use now in many refinery operations. This new method is versatile. It can be used to separate hydrocarbon products from soluble acid catalysts, separate isobutane-butylene alkylate into high and low octane fractions, and remove water formed so driving equilibrium reactions to completion.

New research indicates that motor oils may be ungraded by liquid-vapour permeation. In this type of separation, the mixture to be separated is maintained in the liquid phase on one side of a plastic film and the permeate, which has moved selectively through the film, is taken from the other side as a vapour and is later condensed.

The most significant advance in membrane separation, according to American Oil Co., is the controlling of operating variables to yield the high rate of throughput needed to operate a plant economically. American Oil have achieved an average rate of permeation equivalent to 600 gall. per hour per 1,000 sq. ft. of film surface in the separation of toluene from a naphtha fraction.

Operating costs of a plant based on membrane permeation are expected to be low because of the high thermal efficiency and simple operation.

Permeation separates refinery streams into very different fractions from those produced by distillation. Generally the two methods operate in such a way that they complement one another. A permeation and distillation combination should always be considered when a particular separation is being attempted.

Instruments and Controls Exhibition in Midlands

AN exhibition of instruments and controls for industry, education and research will be held at the Y.M.C.A., Snow Hill, Birmingham, 25-28 April. This annual exhibition, claimed to be the only one of its type to be held in the Midlands, will this year feature products of W. G. Pye and Co. Ltd., Philco Electronic Training Aids; Elcontrol; Southern Instruments; Evans Electroselenium and A. M. Lock and Co. Ltd., the last-mentioned firm being the W. G. Pye agents who are organising the exhibition. Details from A. M. Lock and Co. Ltd., Prudential Buildings, 79 Union Street, Oldham, Lancs.

New Work in Diboron Chemistry

PRACTICAL routes to boron monoxide and diboron tetrachloride, discovered by Dr. J. L. Boone, of U.S. Boron Research, may speed research in diboron chemistry.

Boron monoxide is a polymeric material that has been a laboratory curiosity up to now because it was difficult to make, and a great deal of confusion exists about the properties of the material.

Dr. Boone makes boron monoxide by a two-step method from tetra(dimethylamino)diboron. The first step is the production of tetrahydroxyboron by hydrolysis at 0°C followed by the second step of dehydration at 250°C giving a yield of boron monoxide greater than 99%.

This ready synthesis of boron monoxide has led to a practical—and potentially large-scale—method for the production of diboron tetrachloride. This synthesis is carried out by passing boron trichloride over boron monoxide at 200°C and 450 mm pressure. The gas is then passed over the boron monoxide twice more at 236°C. This produces a conversion of about 20% of the oxide. This new route to diboron tetrachloride will make the synthesis of other diboron compounds easier.

The structure of the boron monoxide polymer is not known, but the reactions of the compound point to a number of properties. There must be one boron-boron double bond for each two boron atoms and two bonds to oxygen from each boron. The results of a series of interconversions show the integrity of the covalent B-B bond throughout the series.

Column Analysis of Polymers

THE determination of the molecular weight distribution of linear polymers on a routine basis is essential to the understanding of the mechanisms of polymerisation with the newer catalyst systems.

A member of the U.S. Army research division, in his current status report on column methods of polymer fractionation, said that, of the newer methods, only the elution and the thermal gradient show real promise for a variety of polymers. These methods offer greater speed and ease of operation than batch fractionation particularly at the higher temperatures needed for crystalline polymers. They may give better reproducibility and resolution. Apart from an understanding of polymerisation mechanisms, such methods may shed new light on processes such as polymer degradation or ionising radiation effects, which lead to changes in molecular weight distribution.

Both methods are based on difference in polymer stability and not on absorption, and with both the sample is deposited in an inert support and selectively extracted with solvent/non-solvent mixtures of increasing concentration to elute the polymers of successively higher molecular weights.

The elution method has been used primarily to fractionate crystalline polymers such as polythene, isotactic polypropylene, and polycarbonate. In this method the polymer is precipitated on a sand column by pouring the solution on to the heated column and then cooling. It has been found by Monsanto chemists that fractionation takes place during the initial precipitation step. This selective deposition of the polymer on the support is a major factor in fractionation.

Although the elution method has been used primarily for linear polymers, it is believed that it should also work for the amorphous types if the selective deposition is carried out by adding non-solvent to the heated polymer solution to ensure complete precipitation on cooling.

Amorphous polymers—polystyrene, polymethyl methacrylate and polyiso-

butylene—have been principally fractionated by the thermal gradient method. In this method the sample is deposited randomly by drying on a portion of column support. This system appears to be more sensitive to elution conditions than the elution method. A major factor is the concentration of the polymer in the fractions. The permissible concentration depends on the molecular weight of the polymer fractions and the concentration of the fractions can be controlled by correct choice of solvent gradient. New work has also indicated that fractionation efficiency may depend on the choice of the solvent. Polystyrene fractionates much better with methyl ethyl ketone/ethanol as a solvent/non-solvent pair than with benzene/ethanol. This apparently stems from the increased swelling in benzene which increases any tendency of the sample to flow on the column.

Simple Polycondensation is Key to Newly Developed Nylon 7

A SIMPLE polycondensation process is the basis of the new route to Nylon-7 which has been developed by Union Carbide Chemicals. The process, now commercially feasible, yields both the monomer—7-aminoheptanoate—as well as the polymer with a molecular weight from 15,000 to 30,000.

Basically the process consists of synthesising the ethyl ester of 7-aminoheptanoic acid from ϵ-caprolactone. The ester is then heated at approximately 100°C in the presence of water, which is later removed together with some of the alcohol formed. The polymerisation is completed by raising the temperature to 270°C.

In developing the method, the synthesis of eight esters was carried out but, since the ethyl ester polymerises more readily and is one of the most stable esters, it was given more attention.

After heating the ethyl ester with deionised water at 90 to 100°C for several hours, a white wax-like, almost brittle, solid is obtained. This material was found to be a mixture of 7-aminoheptanoic acid with dimeric acid and ester, turned into a high molecular weight polymer after continuous heating for one to four hours.

In making Nylon-6 it is necessary to extract the monomer before melt extrusion. This process, however, lends itself very well to continuous operation. Another advantage is that the whole process operates under atmospheric conditions.

EUROPE'S BOOMING AROMATICS INDUSTRY

(*Continued from p. 617*)

million gall. by 1965. This year petroleum capacities for *o*-xylene are expected to total 682 million lb. (214 million lb. in 1960); this year's capacity of 206 million lb. for *p*-xylene is expected to near 300 million lb. by 1961 or 1962.

It will be some years before these capacities are fully taken up by demand. Compared with 1960, a *Chemical and Engineering News* survey (20 and 27 March 1961) shows that by 1965, demand for benzene is expected to increase by 56%, toluene by 84% and xylene by 60%.

While U.S. confidence in petroleum-based aromatics is reflected in Europe, much of the expansion in recent years on this side of the Atlantic has come from coke-oven plants. But in the past year, plans for major petroleum-based aromatics facilities have been announced by a number of companies.

In addition to their project in Holland, Esso also have under construction in France, plant for the production of 45,000 tonnes of aromatics a year. In France, too, Antar Petroles d'Atlantique are building plant at Donges, near Nantes, that is due for completion this year, while Soc. Californie-Atlantique have a *p*-xylene unit also under construction at Donges. The latter is a joint venture between California Chemical (a Standard Oil of California associate) and Progil.

California Chemical are also linked with British Petroleum in constructing aromatics plants at the Isle of Grain, Kent, and Dinslaken, West Germany. As stated last week, B.P.-California already have a major customer for *o*-xylene, for they will supply Britain's first phthalic anhydride-from-xylene project, which is scheduled for Grange Chemicals Ltd.

Shell Italiana will come on stream in Italy with their first chemical plant and Italy's first aromatics-from-petroleum unit later this year; production is scheduled at Rho, near Milan, with 100,000 tonnes/year. Mobil Chimica Italiana in February announced plans for 130,000 tonnes/year facilities for the production of benzene, ethyl-benzene, *o*-xylene and *p*-xylene; more than 75% of output will be represented by benzene and *o*-xylene.

In the U.K. aromatics field, British Celanese Ltd., of the Courtaulds Group, are due on stream this summer with nitration grades of benzene, toluene and 3° xylene, using cracked naphtha as feedstock. Capacity has not been disclosed, but it is believed that British Celanese will not figure as major producers, at least not at this stage. Shell Chemical have been making xylenes for some time at Stanlow, where they have a major unit supplying *p*-xylene to I.C.I. for Terylene manufacture.

U.K. production of chemical grade benzene in 1960 totalled some 180,000 tonnes, estimated to rise to 225,000 tonnes by 1962 and 275,000 tonnes by 1965.

Many Advantages Claimed for New Diversol Steriliser

SEVERAL groups of chemicals have been used from time to time, and are still being used for sterilisation purposes, but they all have certain disadvantages. The quaternary ammonium compounds give bad rinsing, leaving films on equipment which are difficult to remove. Sodium hypochlorite, the chemical most widely used and approved as a disinfecting agent in the food industry, is corrosive and will attack even stainless steel. Certain organic chlorides have neither the disadvantages of the quaternary ammonium compounds or sodium hypochlorite, but they are selective in their action.

A chemical preparation, which claims to overcome the disadvantages of other compounds and so fill the gap in this field, has been introduced by Diversey (U.K.) Ltd., 42-46 Weymouth Street, London W.1. This compound, known as Diversol BX, is a combination of an alkaline sodium phosphate/sodium hypochlorite complex and a soluble bromide. It is a stable, crystalline compound which readily dissolves in water, releasing as it does so hypobromite in solution. Hypobromite in solution has chemical characteristics different from those of sodium hypochlorite. A combination of the two compounds ensures improved antibacterial efficiency.

Diversol BX has cleaning properties as well as sterilising powers. The presence of the phosphate ion ensures a certain degree of water softening and also imparts detergency properties, although at the recommended concentration this is not very great. Another property claimed for Diversol BX is outstanding penetrating power, a factor also dependent on the presence of phosphate.

No Differential in Borax Freight Rates

IN our reference to the fact that, despite a further rise in freight rates, the prices of borax and boric acid would be maintained (C.A., 8 April, p. 579), it was stated that the new freight would create a steep differential for rates from the U.S. Pacific Coast to U.K. ports in comparison with shipment to the Continent.

This is not so. Towards the end of last year, a proposed differential in rates between the U.K. and Continental ports was put forward by the Pacific Coast European Shipping Conference. This proposal was fiercely contested by Borax and Chemicals Ltd. along with other interested parties and as a result the shipping companies concerned decided not to apply any such discrimination.

The recent 50 cents increase in ocean freight rates from the U.S. Pacific Coast and effective 1 April applies both to cargoes moving to the U.K. and to Continental ports; the rate to both destinations is now $28 per long ton. It has been indicated that this rate will be held at least until March 1962.

HEAT TRANSFER PROBLEMS IN ETHYLENE PROCESSING DISCUSSED

TEMPERATURE control of oxidation and polymerisation processes, particularly those concerning ethylene, was discussed by Mr. B. Street, at a meeting of the Institution of Chemical Engineers, North-Western Branch, at Manchester on 28 March. A fluidised bed can be used for the oxidation of naphthalene; for the oxidation of ethylene by air or by oxygen, a fixed bed catalyst is employed to direct the oxidation to ethylene oxide rather than to complete combustion. The former reaction proceeds at a lower temperature and it is less exothermic than combustion; the heat of reaction must be removed from the catalyst to ensure that the temperature is kept at the optimum for a maximum reaction rate and for the desired degree of oxidation.

Resistance to heat transfer on the coolant side of reactors usually is small compared with the resistance on the process side. The larger the scale of production the more severe is the heat transfer problem. The danger of 'hot spots' on catalyst tubes is reduced by good heat transfer on the coolant side supplemented by such techniques as staged reaction temperatures, stage dilution of the catalyst and dilution of the reactants with inert gases.

Heat from Catalysts

The heat liberated at the surface of the catalyst must be passed through the mass of catalyst and through the tube wall to its surface from which it may be removed by evaporation of a boiling liquid. A temperature controller controls the temperature of the boiling coolant by varying the pressure under which it boils. Nuclear boiling should occur throughout the length of the reactor, the vapour is condensed and returned as a liquid to the bulk of the coolant.

Heat removal from bulk polymerisation processes is hindered by the high viscosity of the products. Mechanical stirrers assist the strict control of process temperatures which is necessary to obtain a product of good quality and a reduced liability to depolymerisation of the product, although significant temperature gradients through the bulk cannot be prevented and they cause polymers having a large range of molecular weights to be formed. Polymerisation in solution is practised to diminish overheating of the polymer but the rate of the polymerisation is less than the rate of bulk polymerisation at the same temperature. Some solvents dissolve the monomer but leave the polymer insoluble. Emulsions of the monomer in water may improve the rate of polymerisation but difficulties of removal of emulsifiers, catalysts and stabilisers from the product arise. Pearl polymers are produced from an agitated suspension of monomer in a non-solvent.

Of the two common processes for polyethylene production the high pressure, oxygen catalysed process imposes more severe heat transfer conditions than the lower pressure, solution polymerisation. Ethylene is compressed to 1,000-3,000 atm., a catalyst is injected and the reaction mixture is heated to 80-300°C. Low conversions make necessary a re-cycle of part of the unconverted ethylene which is separated from the molten polymer. It is possible to remove only a small portion of the heat of reaction through the walls of the reactor to a circulating coolant, most of it is removed by the difference in enthalpy between the feed gas and the polymer and gaseous products.

U.S. Consultant Named in Merck Amprolium Receiving Suit

AN indictment charging Dr. Robert S. Aries, a U.S. chemical consultant, with receiving from an employee of Merck and Co. stolen samples of amprolium, has been filed in a New Jersey court. In June last year, Merck filed a civil suit in New Haven, Conn. against Dr. Aries and various associated companies and individuals seeking $7.8 million damages and a permanent injunction against further disclosure of data on Merck's amprolium.

Amprolium was introduced commercially by Merck and Co. in October 1960 to combat coccidiosis in poultry.

Successful Release of Wigner Energy on BEPO Reactor at Harwell

A SUCCESSFUL release of Wigner energy was carried out over the week-end beginning 7 April on the BEPO reactor at Harwell. The release was accomplished by externally heating the air stream which is normally used to cool the reactor.

Wigner energy is the latent energy stored in the crystal lattice of graphite by displacement of atoms during radiation bombardment. The stored energy is greatest when the temperature of the irradiated graphite is relatively low. The graphite moderator of BEPO is kept at comparatively low temperatures so that it is necessary to release the stored energy at regular intervals by controlled heat treatment of the graphite.

It was during the release of Wigner energy that the accident occurred in No. 1 pile at Windscale in 1957. Although the phenomenon of the storage of energy in graphite due to neutron bombardment has been known for some time, the knowledge was scanty when the Windscale pile was designed and built. On the occasion of the accident, the pile was heated for a second time because it was thought that the Wigner release was dying away. The instrumentation of the pile was not sufficient in quantity or in distribution throughout the pile to enable a reliable judgment to be made.

The recent energy release at Harwell is the third in the BEPO reactor. There have been two earlier successful releases, in 1954 and 1958. BEPO, which started up in 1948, is still in full use for research and for isotope production.

U.K. Export Missions See Scope for Big Expansion in Exports to Europe

THAT a substantial expansion of U.K. exports to Europe can be achieved if opportunities are seized promptly and full regard paid to the needs of each country, is the encouraging verdict of members of the Export Council for Europe on their return from the 'pathfinder' missions to Austria, Denmark, France, Italy, Norway, Portugal, Spain, Sweden and Switzerland.

Reports submitted by each team are now being studied and early next month a consolidated report will be published bringing out the findings of each mission and the recommendations of the Council for action. In order to complete these surveys on the spot further missions will now visit the remaining countries covered by the Council.

17-21 April, to Ireland (leader—Major A. Huskisson, deputy chairman S. Simpson Ltd.); 1-5 May, to Holland (leader—Mr. A. J. S. Brown, director, Stone-Platt Industries); 1-6 May, to Western Germany (leader—Sir William McFadzean, chairman of the Council); 1-5 May, to Belgium and Luxembourg (leader—Mr. A. Abel Smith, managing director, J. Henry Schroder and Co.); 7-10 May, to Turkey (leader—Dr. A. Caress, director, I.C.I.); 22-25 May, to Finland (leader—Sir Norman Kipping, director general, Federal of British Industries); 28 May-1 June, to Greece (leader—Captain A. R. Glen, R.N.R., joint managing director, H. Clarkson and Co.); between 21 and 29 August, to Yugoslavia (leader—Sir William McFadzean).

B.o.T. President Announces Better E.C.G.D. Facilities

Substantial improvements in the facilities of the Export Credits Guarantee Department were announced by Mr. R. Maudling, President, Board of Trade, late on Wednesday, after CHEMICAL AGE went to press.

New Chemical Apparatus and Instruments Exhibited

New items shown at the Annual Exhibition of Chemical Apparatus and Equipments, held at the College of Science and Technology, Manchester, recently included (left to right): a portable model of a gas chromatograph for the Janak method, shown by Baird and Tatlock Ltd.; Townson and Mercer's E250 circular viscosity testing bath with Thermistor bridge control; and a new chamber filter press, made by Ritterhaus and Blecher of Wuppertal, West Germany, seen here on the stand of John C. Carlson Ltd. The exhibition was organised by the Manchester and District Section, Royal Institute of Chemistry

Chemists Will Help to Solve Problems of Space Flight

SOME of the chemical problems of space flight were the subject of a paper presented to the London Section, Royal Institute of Chemistry recently by Mr. D. Hurden, Research Manager of the de Havilland Engine Co. Ltd.

There are three difficulties in interplanetary travel, said Mr. Hurden: one had, firstly, to escape from the earth's gravitational field; secondly, one had to travel, maybe for months, through airless space; and finally, one had to live, on arrival at one's destination, almost likely an alien environment.

For such a journey, one's vehicle must be some kind of rocket, the size of which depends mainly on two factors. The first factor is primarily an engineering problem, and is concerned with the design of the structure and with using methods which will keep the overall weight down. In the second factor, the jet velocity, the chemist comes into his own. The jet velocity depends on a suitable choice of chemical reactants. For example, the best possible liquid propellant now being used is a mixture of liquid hydrogen and fluorine. In considering the latter chemical it is not to be wondered at that other systems of propulsion are now being investigated. In any case, theoretical considerations suggest other methods may be more efficient.

Higher jet velocities can be achieved by passing suitable gases through the hot core of a nuclear reactor, although development of this idea is restricted by weight considerations. Another possible future development is to utilise the recombination of free radicals.

In the journey through space, a most difficult chemical problem is the provision of a suitable atmosphere in the rocket. Carbon dioxide must be kept to a minimum and sufficient oxygen must be available. Some 20 methods have been proposed, ranging from absorption of all carbon dioxide and the provision of oxygen from a liquid source, to the use of green algae.

The lecture was concluded by a description of the probable atmosphere of other planets in the solar system and the consideration of the possibility of life upon them.

In his final remarks, Mr. Hurden, underlined the particular importance of chemistry in training the engineers of the future.

Application for Drawback on Poly (11-aminoundecoic acid)

The Board of Trade are considering an application for the allowance of drawback of duty on imported poly (11-aminoundecoic acid) in the form of granules, containing fillers or plasticisers or both, when this material is used to make shuttlecocks and skirts for shuttlecocks for export.

Any representations by interested parties should be addressed in writing to the Tariff and Import Policy Division, Board of Trade, Horse Guards Avenue, London S.W.1, not later than 28 April.

Will

Dr. Roy Basil Waters, an associate manager of the polymer and chemicals service department of the I.C.I. Dyestuffs Division, who died on November 27, left £9,849 net.

Chemicals, Drugs Involved in U.K.—Hungary Trade Quotas

PROVISION for a two-way exchange of chemicals is included in lists of goods that have been drawn up covering trade between the U.K. and Hungary during the 12 months ending 26 January 1962, under the terms of the three-year trade agreement signed in January last year. These lists envisage quotas for U.K. exports to Hungary of about £5,870,000 and quotas for Hungarian imports into the U.K. of nearly £5,030,000 during the 12-month period.

This list of U.K. exports to Hungary includes various items of capital goods, machinery and equipment, chemicals basic materials and other goods. The list for imports from Hungary includes, among goods for which licences will be issued, textiles and manufactures, chemicals and pharmaceutical goods.

In addition, the U.K. market will remain open without restriction to Hungarian products such as vegetable oils and aluminium.

Development of Fluid Fuel Nuclear Reactors

AN objective of nuclear reactor development is a reactor which can be economical regardless of the cost of the raw material (uranium or thorium). Economical breeders would have this property. Fluid fuel reactors seek to avoid the central economic recycle. Considerable progress in developing a tenable aqueous homogeneous breeder has been achieved. Plans are also being made to build a molten salt version of a breeder.

These problems will be discussed by Dr. Alvin M. Weinberg, Oak Ridge National Laboratory, at a meeting of the Institution of Chemical Engineers on 24 April 1961. To be held under the auspices of the British Nuclear Energy Conference, the meeting will take place at the Federation of British Industries, Tothill Street, London S.W.1, at 5.30 p.m.

A film illustrating maintenance of the aqueous homogeneous reactor (HRE-2) will be shown. Non-members of the institution will be welcome; tickets will not be needed.

Overseas News

AGREEMENT WITH ALLIED CHEMICAL WILL MEAN EXPANSION FOR DUTCH COMPANY

AGREEMENT reached between N.V. Chemische Industrie Synres, Hook of Holland, and Allied Chemical Corporation, New York, will result in the expansion of Synres' activities. Allied will be investing in Synres, whose capital will be doubled.

Plans now being prepared will lead to a considerable expansion of the manufacturing facilities of the Netherlands company. The range of products will be increased and Synres will start the manufacture of several raw materials to be used for their finished products.

It is understood that projects involved will include the building of a phthalic anhydride plant.

Oil and Chemical Projects for Pakistan Approved

The Pakistan Government is taking steps to attract foreign interests to set up an oil refinery in East Pakistan with a capacity of 500,000 tons/year. A sum of Rs.165 million has been provided for this project

Chemicals figure high in the development programme and Rs.60 million has been set aside for a plant at Karachi to produce soda ash, caustic soda and by-products. Other projects approved are: acetate (Rs.100 million); industrial chemicals (Rs.11 million); carbon black (Rs.32 million); petrochemicals (Rs.20 million); and drugs and pharmaceuticals (Rs.32 million). Foreign exchange components in the cost of projects will be met from a number of sources.

Japanese/Bayer Polycarbonate Agreement Expected

The Japanese chemical company, Teijin Kasei, are to negotiate with Bayer for the acquisition of rights on patents held by Bayer in the polycarbonate resin processing field. Teijin Kasei have recently completed a polycarbonate plant, using their own process, with a capacity of 150 tonnes a month and are endeavouring to establish the market by assisting the resin-processing companies. They have, however, found that many restrictions exist in the processing field due to the Bayer patents.

Phosphorus Compounds for Flame-proofing Cotton

Work by the U.S. Department of Agriculture may be the answer to the knotty problem of flame-proofing cotton fabric. A flame-retardant based on a new thermo-setting resin, made by reacting two phosphorus-containing compounds, has been developed by the South Regional Research Laboratory of U.S.D.A.

The two compounds—tris-(1-aziridinyl) phosphine oxide (APO) and tetrakis (hydroxymethyl)-phosphonium chloride (THPC)—react to form an insoluble highly cross-linked condensation polymer.

THPC is commercially available from Hooker Chemical Corporation and some six U.S. concerns are reported by U.S.D.A to have pilot-plant methods for production of APO.

New French Company Formed to Make TDI

Europe will have its fourth producer of toluene di-isocyanates when plant to be built by Societe Toulousaine de Produits Chimiques (Tolochimie) comes on stream at Toulouse. Partners in this company, which has a Fr.6 million capital, are Rhône-Poulenc and Usines de Melle.

Europe's other producers are Farbenfabriken Bayer, I.C.I. and Progil-Ugine-Bayer who are now in production at Pont-de-Claix, near Grenoble.

New U.S.S.R. Trading Company for Pharmaceutical Exports

Medexport is the name of a new foreign trading concern formed in the Soviet Union to handle the export by Russia of medicinal and pharmaceutical products. Over the past three years this export has increased by 42.5%, the number of customer countries increasing from 21 to 51.

Expansion for Spanish Titanium Oxide Plant

Unión Química del Norte de España, Spain, have been granted authorisation to expand production capacity for titanium oxide at their plant at Axpe, in Bilbao. The work will be completed within two years.

Polyformaldehyde Pilot Plant Planned in Japan

(OSAKA) Nippon Shokubai Kagaku Kogyo Co. of Japan are to construct a one-tonne-per-month plant for the manufacture of polyformaldehyde resin. This pilot plant is intended to be a fore-runner of an intermediate plant to be built during this year and scheduled for completion in the spring of next year.

Shawinigan Plan Entry into Petrochemicals

Shawinigan Chemicals Ltd. have been studying for more than a year the establishment of a petrochemical industry which will provide certain raw materials for products they now manufacture and other products that they contemplate manufacturing. This was stated by Mr. J. A. Fuller, president, Shawinigan Water and Power Co., at the recent annual meeting. He added that in the operation of this plant large quantities of residual oil would be produced, which Shawinigan proposed to utilise as the fuel for a projected thermal generating station.

Mr. Fuller did not disclose where the petrochemical plant and power station would be located, but he expected that plans for the projects would be completed in the near future. Combined cost of these two plants is expected to be some $65 million.

European Aid for Indian Rayon Tyrecord Project

The two synthetic fibre producers Vereinigte Glanzstoff-Fabriken AG, Wuppertal, West Germany, and Algemene Kunstzijde Unie N.V., Arnhem, Holland, and the Swiss project firm Ingenieur-Büro Ing. A. Maurer S.A., Berne, have signed a contract with Century Rayon, Bombay, a member of the Birla Group, to aid in the erection and equipping of a rayon yarn plant in India. Glanzstoff and A.K.U. are to supply Century Rayon with plant and licences and have promised future technical support, while Maurer will undertake engineering planning of the new plant. The works, which will produce rayon tyrecord, will be sited at Kalyan, some 40 miles north-east of Bombay, and will come into operation in the second half of 1962.

Kerylobenzene from Poland

An intermediate chemical product used in the manufacture of synthetic detergents and known as kerylobenzene has now come into production at the Glinik Mariampolski mineral oil refinery in Poland. The refinery will supply the Oswiecim chemical combine with some 3,000 tonnes of the product annually for further processing.

Indian Plant Triples Output of Chlorine and Caustic

The Bombay, India, plant of Calico Chemical Division which opened three years ago with a production capacity of 3,500 tonnes of caustic soda and 3,000 tonnes of chlorine is expanding its capacity threefold. New plant required will be designed and delivered by Krebs and Co. AG, Zurich.

Four U.S. Firms Chosen for Helium Contracts

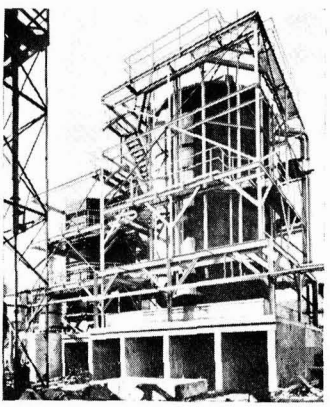
Contract negotiations for Federal purchase of helium for conservation will be undertaken by the U.S. Department of the Interior with four companies that contemplate entering the helium-production business, Chosen from a list of 14, the firms are: Cities Services Helium Inc., New York; Helium Conservation Corporation, Midland, Tex.; Northern Natural Gas Co., Omaha, Nebr.; and Panhandle Eastern Pipe Line Co., Kansas City, Mo.

More than half the helium the Government expects to purchase could be acquired from plants built by the four com-

panies, whose construction plans are well advanced. The helium conservation programme is aimed at storing for future use about 52,000 million cu. ft. that would otherwise be wasted in fuel gases. The programme envisages an investment of nearly $200 million in private helium plants, which will be built in the Texas, Oklahoma, Kansas area where the natural resources of helium-bearing gas are found.

The Department of the Interior hopes to acquire up to $60 million worth of helium a year from private companies; this could eventually involve 12 new plants and might involve other companies. Until needed the helium will be gathered in a State-operated pipeline system and stored in the cliffside near Amarillo, Tex.

Outsize Graphite Combustion Chamber



Seen here under construction by Union Carbide International Co., U.S., is a graphite combustion chamber claimed to have the largest diameter—20 ft. 4 in. i.d.—of any ever installed. It will be used for phosphoric acid production at American Agricultural Chemical Co.'s Carteret, N.J., plant; phosphorus burned with air within the 37 ft. high chamber is subsequently hydrated in the carbon tower shown on the left to produce phosphoric acid. This carbon hydrator is also the largest Union Carbide have ever built

Brazilian and U.S. Aid for Israeli Petrochemicals

Some 10,000 annual tonnes of carbon black, 15,000 annual tonnes of ethylene, 6,000 tonnes of polythene and 6,000 tonnes of DDB (dodecyl-benzene) are to be produced at four petrochemical plants to be erected on the Bay of Haifa, in Israel, as the result of an agreement now signed between the Israeli Ministries of Finance and Trade-and-Industry and a number of private investors.

Three main financial groups are interested in the petrochemical project. They are: Haifa Oil Refineries and Paz Petroleum, the U.S. industrialists Max Fisher, Detroit, and Ralph Wechsler, New York, together with Rudolph Sonneborn, proprietor of Israeli Sonol and Israel Investors' Corporation (a company which recently took up a large holding in Fertilizers and Chemicals), and Brazilian interests, including the industrialists Joel Ostrovitch and Max Pfeffer. Also interested are the local Development and Mortgage Bank and the Israel Discount Bank.

The first plant is due on stream in 1963.

More Methanol Planned for Du Pont in Ohio

Plans for a 30 million gall./year methanol plant near Huron, Ohio, hinge on E. I. du Pont de Nemours getting approval from the Federal Power Commission for a pipeline extension to provide the site with natural gas. It is hoped to start construction late this year, with completion by early 1963.

Italian/Indian Oil and Petrochemical Agreement

There is a possibility of the Italian State Oil Company, E.N.I., entering an agreement for the prospecting of oil in Kutch, India, according to official sources. The Italians will also develop petrochemicals. An Italian technical mission will go to India to carry out further investigations into the setting up of a petrochemical industry.

Austrian Methanol Plant Due On Stream in May

The new methanol plant of the Austrian company Oesterreichische HIAG-Werke AG at Fischamend, near Vienna, is to take up large-scale production at the end of May. The plant, which is already undergoing trial runs, is to produce some 10,000 tonnes of methanol over the first year of operation, this annual output expected to double over 1962/63. The plant uses Austrian natural gas as feedstock. Cost of the project, which has been raised by the operating company from its own funds and bank credits, is some Sch.40 million.

Japanese Plans for Synthetic Rubber Production in 1961

Announcing their plans for the production of synthetic rubber in 1961, the Japan Synthetic Rubber Co. revealed some details of plants which are to be constructed. These are: a carbon-masterbatch plant with a capacity of 13,000 tonnes a year involving a tie-up with the Columbian Carbon Co. of the U.S.; an additional butadiene extraction plant of 5,000 tonnes a year; and an isobutylene plant with a capacity of 30,000 tonnes a year, tying up with Esso Research. These plants together with the existing ones are to meet the planned 42,000 tonnes production target for 1961, an increase of 60% on 1960.

$2 Million Credit for Progil-Bayer-Ugine

The European Investment Bank has granted investment credit amounting to $2 million to the Franco-German chemical concern Progil-Bayer-Ugine for the building of their new plant at Pont-de-Claix, near Grenoble.

Better Yield and Chlorine Product Reported with Du Pont's Platinised Ti Anodes

HIGHER output and a significant improvement in product quality have been achieved by the use of platinised titanium anodes for electrolytic chlorine production in 15 months' plant-scale tests conducted by the Organic Chemicals Department of E.I. Du Pont de Nemours and Co., U.S., at their Deepwater, N.J., plant, which uses 4,000 amp. modified Wheeler diaphragm-type cells. Other advantages claimed are 100% increase in diaphragm life while there are good indications that there will be savings in power consumption.

This is the first time that full-scale results using platinum-plated titanium instead of graphite anodes have been revealed, although development work has been done in the U.K. for a number of years by I.C.I., who have patents pending, and who have published the results of laboratory experiments, summarised in CHEMICAL AGE, 3 January 1959, p. 9. I.C.I. started plant-scale tests using mercury-type cells some two years ago but have not so far published the results.

According to *Chemical Week*, Du Pont began working on the platinised-titanium anode in 1958, shortly after I.C.I.'s first publication of laboratory work. Du Pont produce chlorine for consumption in their own chemical plants. It is reported that, in the tests, direct substitution of platinised-titanium anodes for graphite has resulted in a 25% increase in output, due to the fact that the production rate remains constant at a high level because the small loss (less than 0.4 gramme/ton of chlorine) of the thin platinum coating on the anode does not appreciably change the anode-cathode gap. Also, the blinding or plugging of the diaphragm that occurs with graphite anodes is eliminated. Product quality improves because there is no formation of carbonaceous impurities due to the presence of graphite.

Against the increased yield, better quality product, and savings in power, diaphragm and electrode replacement costs must be set the initial cost of installing titanium anodes, probably involving modification of existing cells. However, the slow but steady reduction in titanium prices and the attractions of a more efficient, more easily maintained production unit seem to favour the further plant-scale development of titanium anodes in due course. Meanwhile, with the patents situation for platinised titanium anodes still unsettled, both chlorine manufacturers and titanium producers are likely to treat this promising development with some caution.

Bookshelf

Dutch Symposium Papers on Heterogeneous Catalysis

THE MECHANISM OF HETEROGENEOUS CATALYSIS. Edited by *J. H. de Boer*. Elsevier, Amsterdam, 1960. Pp. x + 180. 15s.

This excellent little monograph is a record of a symposium held in Amsterdam in November 1959 with the object of stimulating more interest in heterogeneous catalysis in the universities of the Netherlands. Twenty-seven Dutch scientists took part and the proceedings were in Dutch. They are well worth translating. The organising committee seem to have exercised a strict but very beneficial control over the papers. They have ensured that different topics of current interest are adequately covered. The result is a series of coherent reviews, greatly superior to those printed proceedings of conferences that are a hotch-potch ill-coordinated papers with which some scientific publishers are flooding the market today.

The stimulation that the organisers hoped for should reach far beyond the Netherlands. The authors have gone back to fundamentals so that the articles can be read by any well-grounded chemists. This would be a good book to put in the hands of an honours chemistry student. The price is so reasonable that the student might well be expected to buy a copy.

Modern Materials

MODERN MATERIALS: ADVANCES IN DEVELOPMENT AND APPLICATIONS. VOL. 2. Edited by *H. H. Hausner*. Academic Press, New York, 1960. Pp. xvi + 413. 89s 6d.

This series, the first volume of which was published in 1958, deals both with modern applications and adaptations of old materials and with materials that have not been extensively used in the past. Thus articles in this volume cover polymer modified papers (Jahn and Stannett), modern flame-sprayed ceramic coatings (Ault and Wheildon), borides; basic factors (Aronsson), borides; properties (Steinitz), titanium metallurgy (Margolin and Neilson), welding materials (Jackson) and soldering materials (Borcina). Most articles are of 50 pages though some are shorter and that on titanium is much longer. The chapter by Aronsson is the only one that attempts the fundamental discussion of a material, but it is necessarily very condensed. Throughout the book the full titles of papers referred to are listed, which makes the lists long as the references are generally very full.

Many of the chapters will be of interest to a wide range of readers interested in applied science. They would find it difficult to locate an equally convenient source of much of the information. In future the editor should avoid chapters like the one on soldering which is little more than a series of recipes.

Applied Chemistry

XVII INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY, VOL. II. BIOCHEMISTRY AND APPLIED CHEMISTRY. Edited by *Professors Lynen, Patat, Souci* and *Wieland*. Butterworths, London, 1960. Pp. 426. 75s.

Five of the symposia included in this congress held in Munich in September 1959 have provided the material for this book—at least the opening and main section lectures have been used. Though the absence of reports of the discussions is always to be regretted, the book is full of information and would have been unwieldly if any larger. The biochemical section covers biosynthesis of natural pigments (111 pages) and the structure, biogenesis and syntnesis of biologically important oligopeptides (47 pages). The applied chemistry section covers reactions at very high pressures, the disposal and utilisation of biogenic and industrial wastes, and the toxicological and analytical problems of food additives and pesticide residues in food.

The book is produced excellently with over 200 clear illustrations and 63 well set-out tables. Every lecture is supported by a list of references. Many applied chemists and biochemists could find it useful but 75s may daunt individual ownership of a book that includes material from three different fields. The printing and paper may be of too good a quality.

Electrophoresis

PAPER ELECTROPHORESIS. By *L. P. Ribeiro, E. Mitidieri* and *O. R. Affonso*. Elsevier, Amsterdam-London-New York-Princeton, 1961. Pp. 463. 72s.

After a short introduction, the theoretical considerations of electrophoresis are covered by 16 pages, methods and apparatus by 23 and protein determination by 21, before the authors consider the very extensive literature under specific headings. Proteins are covered by eight separate chapters: human and animal serum proteins, proteins in other biological fluids and cells, hemoglobins, lipoproteins, glyco- and muco-proteins, and enzymes. Then separate chapters are devoted to hormones and related compounds, vitamins and related compounds, carbohydrates and poly-alcohols, nucleic acids and their constituents, amino-acids and peptides, inorganic substances, and to immunochemistry with a final chapter on other applications which will be useful to a diverse range of people. The text is supported by a list (alphabetical by authors' names) of some 3,226 references, and 21 pages of subject index.

Most of the chapters read like reviews—the text almost overflows with information. The 140 illustrations are clear and useful and the printing and paper is of high quality. This book should provide a general reference for electrophoresis of interest to many.

Elementary Thermodynamics

APPLIED THERMODYNAMICS. By *S. H. Bransom*. D. Van Nostrand, London, 1961. Pp. vii+230. Cloth 30s, stiff paper 22s 6d.

"It would seem to be a tradition . . . to regard thermodynamics as a dull and difficult subject. It is, moreover, a tenet, held by certain otherwise scientific people, that the principles of thermodynamics can be evaded if one has sufficient experience. Both are false doctrines, and it is my belief that the second is a consequence of the first and that both arise from the method of presentation."

The author has fully justified his viewpoint in that he has provided an excellently clear, sound and useful survey of elementary thermodynamic principles. The majority of the applications relate to gases or vapour-liquid equilibria: the solid state is scarcely mentioned. However, such topics as fluid flow, gas liquefaction, chemical equilibria, solubility and distillation are dealt with in an illuminating fashion.

This volume can be very strongly recommended to anyone interested in acquiring a clear and useful appreciation of elementary thermodynamics and some related physio-chemical methods.

Crystallisation

CRYSTALLIZATION. By *J. W. Mullin*. Butterworths, London, 1961. Pp. ix+268. 60s.

This volume aims at presenting a systematic survey of the more important aspects of crystallisation theory and practice. The first 100 pages are devoted to fundamental physico-chemical aspects of crystals, solubility, properties of solutions and phase equilibria, the latter extending to four component systems. The chapter on mechanism of crystallisation (pp. 101-135) provides a clear account of essentials and is followed by a systematic assessment of various recrystallisation processes.

Industrial methods are analysed in the chapters on industrial crystallisation, equipment and size grading. There are six tables of basic data—four of them for aqueous solutions.

The whole of this volume is written from an admirably sound physico-chemical stand-point and it should materially assist the transformation of the art of crystallisation into a scientifically controlled process: it is a first-rate addition to the literature.

PEOPLE in the news

● **Mr. Geoffrey Hickson** and **Dr. F. S. Spring, F.R.S.**, who have been appointed directors of Howards and Sons Ltd., are both directors of Laporte Industries Ltd. Mr. Hickson is also managing director of Laporte Chemicals Ltd.

● **Dr. A. W. Henderson** has been appointed chief chemist/metallurgist of the Plessey Co. Ltd., Ilford. A graduate of Edinburgh University, he was previously with CIBA (A.R.L.) Ltd., and Ferranti Ltd.

● **Mr. K. H. L. Cooper,** commercial director of the I.C.I. Billingham Division, has been appointed commercial managing director, following the retirement of **Mr. J. W. Kerr** for health reasons. Mr. Cooper is succeeded by **Mr. R. W. Pennock,** deputy manager, southern sales region. With nearly 30 years I.C.I. service, Mr. Cooper was fertilisers sales control manager from 1951 to 1955 when he joined the division board as commercial director. Mr. Kerr was commercial manager since 1955.

Eric Lionel Bush, chairman of W. J. Bush and Co. Ltd., who as stated last week, has now also joined the board of Albright and Wilson Ltd.

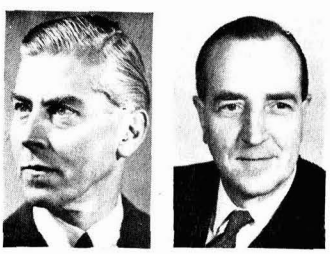
● **Lord Fleck, K.B.E., F.R.S.,** elected president last year, has been appointed president of the Society of Chemical Industry until the annual meeting in 1962. **Dr. J. Ferguson,** I.C.I. research director, has been re-elected hon. treasurer; **Dr. H. K. Cameron,** manager, G.E.C. Atomic Energy Division, has been re-elected hon. secretary for home affairs; **Mr. E. L. Streatfield,** technical director, Houseman and Thompson Ltd., has been re-appointed hon. foreign secretary; and **Professor W. G. Overend,** Professor of Chemistry, Birkbeck College, will continue as publications secretary.

● **Miss Philippa Lane,** 50, formerly group personnel controller, has been appointed to the board of the Beecham Group, thus becoming the group's first woman director.

● **Mr. D. E. Emmott** has joined the Technical Division of Process Plant Contractors (Campbell) Ltd. as a senior design chemical engineer. He was previously with British Titan Products Co. Ltd. at Billingham, where he was a plant manager.

● **Mr. S. E. Broadfield** has been appointed general works manager of H. J. Elliott Ltd., laboratory glassware makers, E-Mil Works, Treforest, Glam, under the company's expansion scheme. The works was badly damaged in recent floods, but development of the second factory will be completed by midsummer, when the re-equipped thermometer and hydrometer divisions will be in full production there. Expansion and development of the main factory will be carried out this year. Production is now restored and is in fact higher than ever before.

● **Dr. R. Thompson, F.R.I.C.,** has been appointed manager of the research department, Chessington, Surrey, of Borax Consolidated Ltd. Dr. Thompson, who joined the company in February 1957, and became assistant research manager in 1958, read chemistry at Nottingham University and the Royal College of Science. He was elected a Fellow of the Royal Institute of Chemistry in 1957.



Derrick H. Carter, left, and John L. Tedbury, who as stated last week have been appointed chairman and joint managing director (commercial) respectively of I.C.I.'s General Chemicals Division

● **Dr. James Craik** has retired as chairman of the I.C.I. Nobel Division and has been succeeded by **Dr. J. M. Holm,** a joint managing director since 1957. A wartime deputy director of explosives, Dr. Holm rejoined Nobel Divisioon in the research department. He joined the division board in 1952 as director in charge of special projects, later becoming production director. **Dr. A. D. Lees,** Nobel division production director since 1957, is now a managing director with **Mr. L. Hall.** On 1 May, **Dr. J. Bell,** Nobel Division engineering and technical director, becomes production director. Dr. Bell, who was manager of the silicones department from 1957 until he joined the division board last year, will be succeeded as engineering and technical director by **Mr. J. A. Lofthouse,** engineering manager since 1958 of the heavy organic chemicals engineering department at Billingham. From the same date, **Mr. A. D. McLean,** Nobel Division commercial, home sales and technical service director, becomes commercial director of Heavy Organic Chemicals Division; he will be succeeded at Nobel by **Dr. J. S. Flanders,** at present work study manager.

● **Mr. Vernon Watterson** has been appointed marketing manager, chemicals, and **Mr. John R. Smith** sales manager, chemicals, for British Celanese Ltd., Chemical Sales Department, Foleshill Road, Coventry. Mr. Watterson who served with Griffin and Tatlock and Laboratory Suppliers before joining British Celanese in 1952, has from 1958 been head of chemical sales development, while Mr. Smith, who joined B.C.L. as a polymer chemist in 1950, moved over to chemical sales in 1952, since when he has travelled widely.

● **Dr. D. E. Gatfield** has been appointed sales manager of Vinatex Ltd. A graduate of London University, he has been with Vinatex for four years.

● **Mr. P. A. Laurent** of Cie Française de Raffinage who was due to give a talk on present trends in French petrochemicals at a meeting of the S.C.I. Heavy Organic Chemicals Group on 7 April was unable to be present. In his stead, **Mr. Harold P. Hodge** of the Esso Petroleum's chemicals department, and group hon. secretary, repeated the paper on 'The heavy organic chemical industry in the U.K.' which he presented in New Orleans in February and which was extensively reported in CHEMICAL AGE, 4 and 11 March.

● **Mr. D. J. Flunder,** general purchasing manager of the Dunlop Group for the past two years, is to become general manager of the Chemical Products Division in Birmingham, from 1 August. Mr. Flunder will succeed **Mr. N. G. Bassett Smith,** who is to become general manager of Dunlop Footwear at Liverpool. Mr. Flunder, who is 38, joined Dunlop in 1946 as an assistant in the Plantations Company, becoming London manager, Dunlop Plantations in 1955 and joining the Materials Supply Division in August 1958. Mr. Bassett Smith, who is 50, is chairman of the British Rubber and Resin Adhesive Manufacturers' Association.

● **Mr. Michael Lewis,** chairman of De Vere Holdings Ltd. has been appointed chairman of Robert Dempster and Sons Ltd., Elland, Yorks, in place of **Mr. Charles Dempster,** who has retired from the board. **Mr. B. C. Morton,** managing director of Robert Dempster since 1942, has been appointed deputy chairman of that company, and **Sir Robert Dempster** has retired from the board. These changes follow the acquisition of Robert Dempster and Sons by De Vere Holdings.

Commercial News

- A.C.C. Group Trading Profit Up 9%
- B.D.H. Pay Same on Lower Profits
- Glaxo Half-year Profits Down, Sales Up
- New Indian Project Subsidiary for I.C.I.

Associated Chemical

Group trading profit of Associated Chemical Companies Ltd. for 1960 totalled £1,383,746, a 9.3% rise on the 1959 figure of £1,266,675. Depreciation accounted for £469,287 (£388,468) and pre-tax profit was £912,160 (£876,037). Tax took £312,568 (£355,166) leaving a net profit of £599,592, 10.5% up on the 1959 figure of £520,871. The benefit of investment allowances reduced charges for both income tax and profits tax.

A final dividend of 9¾% (8¾%) is proposed, making 16% (15%).

Baker Perkins

Group profit before tax for 1960 of Baker Perkins, food and chemical engineers, was £1,193,201 (£771,526). The net profit attributable to Baker Perkins was £530,042 (£417,924). A final dividend of 8¾%, making 11¼% for 1960 as forecast, has been declared. The directors recommend an increase of £2 million in the ordinary capital.

B.D.H.

A sharp drop in profits for 1960 is announced by British Drug Houses Ltd., although the dividend is being maintained at 16%. Group trading profit was £642,000 (£686,765) giving a net profit of £262,568 (£326,688), the parent net profit being £247,047 (£307,717).

Equity earnings are down from 27% to 21%, leaving dividend cover of only 1.3 times. Another feature of B.D.H.'s results is the sharp rise in bank and loan interest from £39,000 to £63,000.

Esso Petroleum

Total income last year of Esso Petroleum Co. Ltd., at £310 million, passed the £300 million mark for the first time. Net profits were £700,000 higher at £11,648,000. Volume of 1960 sales was 9% up on 1959, but the value of sales was only 6% higher. Dividend is halved at 1s. per share; nearly 80% of the 1960 profits are being retained in the business.

Simon Engineering

Simon Engineering are declaring a final dividend of 17½%, making a total of 27½% for the year. Profits, before depreciation, for the year ended 31 December 1960, were £3,428,000, just over 6% higher than the combined figures for the group in 1959.

Glaxo

Lower group trading profits are reported by Glaxo Laboratories for the half year ended 31 December 1960 £3,048,000 compared with £3,118,000 for the corresponding six months of 1959. Sales, however, have increased by 3% in value and by a greater extent in volume.

The half year's group net profit of £1,587,000 compares with £1,710,000 of the previous year and excludes that of Evans Medical which was acquired after 31 December. It is estimated that Evans Medical group net profits, before U.K. tax and excluding the Brazilian subsidiary, will be approximately £487,000 compared with £397,000 for 1959.

An interim dividend of 6%, as forecast at the time of the acquisition of Evans Medical, is announced.

Hickson-Alvin Morris

Hickson and Welch (Holdings) Ltd. have acquired by the issue in exchange of 125,000 fully paid ordinary shares of Hicksons the whole of the issued capital of Alvin, Morris and Co. (Timber) Ltd., Leeds, Manchester and Sheffield. The latter company have been established for many years as plywood, plastics, fibre building boards and timber importers and distributors; chemicals produced by the Hickson Group include some used in connection with the timber and building board industries.

Alvin, Morris and Co. (Timber) Limited will continue as a separate entity and its management and staff will remain unchanged.

American Cyanamid

American Cyanamid, who hope to have a methyl methacrylate monomer plant in production at Fortier, La. early in 1963, are seeking to acquire Wasco Chemical Co., Cambridge, Mass, producers and distributors of cast methyl methacrylate sheets and other cast plastics products for the building industry. Early this year, Cynamid purchased I.C.I. methyl methacrylate know-how for an undisclosed sum (C.A., 14 January, 98).

B.A.S.F.

Badische Anilin und Soda Fabrik are to raise their dividend from 16 to 18% for 1960. A one-for-seven rights issue at 300% is proposed to raise funds for further rationalisation and for plant extensions

I.C.I. India

Chemicals and Fibres of India Ltd. have been formed in Bombay as a subsidiary of Imperial Chemical Industries (India) Ltd., with an authorised share capital of Rs.10 crores. The Indian public will be invited to take part in the share capital. The company will be responsible for I.C.I. manufacturing projects for the west coast of India and will produce a wide variety of chemicals and related products for supply to Indian industries.

Monte Amiata

Monte Amiata S.A. Mineraria, of Rome, one of the world's major mercury producers, announce a dividend for 1960 of 5% (nil) on a net profit of Lire 183 million (Lire 218 million). Monte Amiata have a capital of Lire 3,280 million, of which 32.7% is held by the State concern I.R.I.

Nitroglycerin

Nitroglycerin A/B. Sweden, propose a 1960 dividend of Kr.9 (same). Although 1960 sales were, at Kr.54,400,000, below the 1959 level of Kr.56,100,000 net profit rose over the year from Kr.2,200,000 to Kr.2,700,000.

Market Reports

CHEMICAL EXPORT TRADE SHOWS INCREASE

LONDON Most sections of the industrial chemicals market have returned to normal activity, and contract deliveries have been fully resumed. Prices are steady. Export trade in chemicals continues to make a good showing, the figures for the first two months of the year being in excess of the corresponding period in 1960.

The demand for fertilisers is running at a high level and pressure for supplies is likely to be experienced for some weeks. Quotations are maintained throughout the coal tar products market and demand for most materials is fairly active.

MANCHESTER The Manchester market has now made a satisfactory resumption after the Easter holidays and a fair weight of additional business covering a wide range of both light and heavy chemicals has been reported on home and export accounts. In addition there has been a steady movement of supplies, including bleaching, dyeing and finishing materials. Prices generally are well maintained. Demand for the tar products with a few exceptions keeps up at a good level and seasonal activity in fertilisers is a continued feature.

SCOTLAND Trading conditions in the Scottish heavy chemical market did not show any appreciable improvement during the past week, particularly at the start. The spring holiday no doubt had some effect in certain areas; however, towards the end of the week there were signs of some improvement. Demands for the home market are mostly against basic requirements, with little change in quantities. The position in regard to the export market is still reasonably active.

NEW PATENTS

By permission of the Controller, H.M. 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 May

Process for the production of organic compounds of high molecular weight from an organic compound containing at least one linear or cyclic acetal group, an alkylene oxide and a compound containing at least one reactive carbon-to-carbon double bond. Farbenfabriken Bayer AG. **867 461**

Diazotype material. Chemische Fabriek L. Van Der Gunten N.V. **867 630**

Flame retardant and/or self-extinguishing polymers and method for their production. Dow Chemical Co. **867 468**

Two-component diazotype materials yielding prints with substantially no background discoloration and being free from sulphur stabilisers. General Aniline & Film Corporation. **867 432**

10-hydroxydec-2-enoic acid compounds and their method of preparation. Shell Research Ltd. **867 771**

Activated stannic chloride catalysts for polymerisation. Esso Research & Engineering Co. **867 636**

Photopolymerisation of vinyl monomers promoted by means of silver compounds as catalysts by oxides. General Aniline & Film Corporation. **867 980**

Substituted pyridones. Wallace & Tiernan Inc. **867 930**

Process for the preparation of hydrogen peroxide. Allied Chemical Corporation. **867 679**

Aqueous resin syrups and their manufacture and use. Monsanto Canada Ltd. **867 981**

Process for the preparation of cyanuric acid. Grace & Co., W. R. **867 982**

Photopolymerisable elements. Du Pont de Nemours & Co., E. I. **867 959**

Process for the manufacture of carotenoid compounds and carotenoid compounds obtained thereby. Hoffman-La Roche & Co., AG., F. **867 472**

Process for the preparation of 5 α-pregnane-3, 20-dione. Searle & Co., G. D. **867 984**

Inorganic polymers. Du Pont de Nemours & Co., E. I. **867 773**

Halogenation of synthetic rubber in the presence of oxidising substances. Esso Research & Engineering Co. **867 737**

Process for the preparation of organo-zinc and organo-cadmium compounds. Continental Oil Co. **867 986**

Method of halogenation of hydrocarbons. Esso Research & Engineering Co. **867 740**

Palladium catalysts. Rhone-Poulenc. **867 475**

Polymerisation of formaldehyde. Farbenfabriken Bayer AG. **867 967**

5-Methylene-1, 2, 3, 4, 7, 7-hexachlorbicyclo-(2, 2, l)-heptene-(2). Badische Anilin- & Soda-Fabrik AG. **867 565**

Low-pressure olefin polymerisation processes. Shell Research Ltd. **867 566**

Removal of acetylenes from butadiene. Esso Research & Engineering Co. **867 774**

Process for recovering polymers. Esso Research & Engineering Co. [Divided out of 867 995.] **867 996**

Graft polymerisation process. Shell Research Ltd. **867 822**

Disubstituted nitrosamines, disubstituted ammonium nitrites and process for their preparation. Du Pont de Nemours & Co., E. I. [Divided out of 867 992.] **867 993**

Open to public inspection 17 May

Silver halide emulsions containing mercapto-1: 3:4-oxadiazoles. Kodak Ltd. **868 242**

Process for making aluminium nitride. Pechiney. **868 301**

Imidazoline compounds. Farbenfabriken Bayer AG. **868 302**

Cyclopentanophenanthrene derivatives and process for the production thereof. Syntex S.A. **868 303**

Processes for the polymerisation of ethylene. Houilleres du Bassin du Nord et due Pas de Calais. **868 304**

Manufacture of 21-hydroxy-steroid compounds. Ciba Ltd. **868 132**

Process for making fluorinated organic compounds. Pennsalt Chemicals Corp. **868 494**

Unsaturated β-diketones. Despic, A., and Kosanovic, D. **868 106**

Process for manufacture of hardenable condensates from modified ureas and aldehydes. Farbwerke Hoechst AG. **868 080**

Synthetic polyesters and products formed therefrom. Du Pont de Nemours & Co., E. I. [Addition to 826 248.] **868 496**

Production of chloroprene. Distillers Co. Ltd. **868 281**

Amidines and the preparation thereof. Wellcome Foundation Ltd. **868 552**

Method of depositing titanium coatings. Union Carbide Corp. **868 011**

Steroids and the manufacture thereof. Upjohn Co. **868 374**

Hydroxy-ketones and process for their manufacture. Ciba Ltd. **868 333**

Reserpine derivatives. Laboratoires Francais de Chimiotherapie. **868 476**

Organosiloxane compositions. Midland Silicones Ltd. **868 377**

Perinone dyestuffs capable of being fixed on the fibre. Ciba Ltd. **868 470**

Reserpine compounds. Laboratoires Francais de Chimiotherapie. **868 477**

Production of boron iodine and boron compounds of group V elements of the periodic system. Siemens-Schuckertwerke. **868 555**

Water-insoluble benzene-mono-azo-benzene dyestuff and process for its manufacture. Ciba Ltd. **868 143**

Metal complex azomethine dyestuffs. Badische Anilin- & Soda-Fabrik AG. **868 284**

Pyridazine compound and process for its manufacture. Ciba Ltd. **868 462**

Analeptically active α-hydroxy- and -acyloxy-butyric acid alkyl-amides and a process for their manufacture. Farbwerke Hoechst AG. **868 556**

Synthesis of deserpidine. Laboratoires Francais de Chimiotherapie. **868 478**

Polymers. Minnesota Mining & Manufacturing Co. **868 463**

Heat interaction of chlorinated butyl rubber and carbon black. Esso Research & Engineering Co. [Addition to 849 007.] **868 108**

Process for the preparation of a reserpine intermediate. Laboratoires Francais de Chimiotherapie. [Addition to 868 475.] **868 479**

Manufacture of quinacridone pigments. Imperial Chemical Industries Ltd. **868 360**

Preparation of tetracycline-metaphosphate complexes. American Cyanamid Co. **868 558**

Mono- and dis-azo dyestuffs containing halogenoacylamino groups. Imperial Chemical Industries Ltd. **868 594**

Cobaltiferous azo-dyestuffs, and their manufacture and use. Ciba Ltd. **868 595**

Amorphous rubbery copolymers of ethylene and higher alpha olefins. Esso Research & Engineering Co. **868 022**

Production of condensation products of aliphatic alcohols. British Hydrocarbon Chemicals Ltd. **868 023, 868 024**

Water-soluble dyestuffs containing sulphuric ester groups. Imperial Chemical Industries Ltd. **868 285**

Disperse dyestuffs of the nitro series. Imperial Chemical Industries Ltd., McKnight, B., and Slinger, F. H. **868 471**

Polyester varnish resins. Schweizerische Isola-Werke. **868 465**

Process for hydrogenation of nitrosamines. Food Machinery & Chemical Corp. **868 147**

Reserpine and its derivatives. Laboratoires Francais de Chimiotherapie. [Addition to 868 475.] **868 480, 868 481**

Method for the production of 6-methyl-steroid derivatives. Abildgaard, K. **868 110**

Process for the production of mixtures of w-halogenocarboxylic acid nitriles. Deutsche Gold- Und Silber-Schiedeanstalt. **868 287**

Process for manufacture of intermediates for pigments and dyestuffs. Imperial Chemical Industries Ltd. **868 361**

Monoazo dyestuffs. Imperial Chemical Industries Ltd. **868 468**

Polyoxymethylene diethers. Du Pont de Nemours & Co., E. I. **868 365**

Thiolcarbamates. Stauffer Chemical Co. [Addition to 808 753.] **868 111**

Trimethylolalkane products. Heyden Newport Chemical Corp. **868 421**

Production of sorbic acid. Distillers Co. Ltd. **868 028**

Tetracycline antibiotic compositions. Spofa, Sdruzeni Podniku Pro Zdravotnickou Vyrobu. **868 601**

Process for the production of cross-linked polyurethane plastics of high molecular weight. Farbenfabriken Bayer AG. **868 604**

Omegahydroxypolyalkalene-oxybenzene sulphonates. Chemstrand Corp. **868 150**

Substituted 4-(5-nitrofuryl)-2-oxo-1:2:3:4-tetrahydropyrimidines. Imperial Chemical Industries Ltd. **868 030**

Pressure-sensitive adhesives. Union Carbide Corp. **868 157**

Process for the preparation of 8 β-hydroxy 2 α-methoxy 3 β, 5 β-epoxy 1,2,3,4,4 α α, 5,8,8 α α-octahydro naphthalene 1 β-carboxylic acid lactone and intermediates obtained therein. Laboratoires Francais de Chimiotherapie. **868 482**

Preparation of metaborate and polyborate esters. United States Borax & Chemical Corp. **868 289**

Treatment of films formed from highly crystalline polymers of alpha-olefins. Montecatini. **868 159**

Monoazo dysetuffs of the benzothiazol-azobenzene or azoquinoline series. Sandoz Ltd. **868 037**

Purification of titanium tetrachloride. Fabriques de Produits Chimiques de Thann et de Mulhouse. **868 038**

Fluorocarbons. Pennsalt Chemicals Corp. **868 495**

Process for the manufacture of pivalic acid. Imperial Chemical Industries Ltd. **868 573**

Continuous production of alkylbenzenes. Badische Anilin- & Soda-Fabrik AG. **868 163**

Trifluoromethyl-nitro-diphenyl-amines. Bayer. **868 165**

Intermediates in the synthesis of reserpine and their preparation. Laboratoires Francais de Chimiotherapie. [Divided out of 868 475.] **868 483**

Naphthalene derivatives, intermediates in the synthesis of reserpine. Laboratoires Francais de Chimiotherapie. [Divided out of 868 475.] **868 484**

Cyclohexane derivatives, intermediates for the synthesis of reserpine. Laboratoires de Chimiotherapie. [Divided out of 868 457.] **868 485**

Schiff's base intermediate in the synthesis of reserpine. Laboratoires Francais de Chimiotherapie. [Divided out of 868 475.] **868 486**

Polyepoxide compositions. Union Carbide Corp. **868 432**

Processes for the production of halogen-diphenyl-sulphones. Philips' Gloeilampenfabrieken. **868 323**

TRADE NOTES

Iodine Indicator

British Drug Houses Ltd., B.D.H. Laboratory Chemicals Division, Poole, Dorset, has available an iodine indicator which is a free-flowing, white, water-soluble powder instead of the usual starch paste. Unlike the starch paste, the B.D.H. indicator need not be freshly prepared but can be stored indefinitely without deterioration and is used straight from the container.

Radiation Protection

A new catalogue of radiation protection materials, equipment and accessories is now available from Research and Control Instruments Ltd., 207 Kings Cross Road, London W.C.1. Materials are listed suitable for every type of laboratory, production, or site work, and the advisory service offered by the firm is described.

New Telephone Number

Hickson and Welch Ltd.'s head office telephone number has been changed to Castleford 3841 (home sales department, extension 236, export sales department extension, 237).

Change of Address

Hughes and Hughes (Consultants) Ltd., who represent the Sulphur Export Corporation, New York, will be changing their address to 10 Stratton Street, London W.1 (telephone: Grosvenor 6191) as from 1 May.

Sulphur Inhibitor

The latest publication of Combustion Chemicals Ltd., 33 Dorset Square, London N.W.1, is a test data booklet on the results obtained from the use of Desulfurol, sulphur inhibitor and fuel oil improver, in hot water, central heating and steam raising boilers.

Ion Exchange Exhibitions

Exhibitions of ion exchange in action will be organised by Elga Products Ltd., Lane End, Bucks, at the Lion Hotel, Petty Cury, Cambridge, from 1 to 5 May and at the Mitre Hotel, High Street, Oxford, from 8 to 12 May. Ion exchange will be shown in use for a wide variety of applications. Admission is free.

Dewrance Metals Division

Dewrance and Co. Ltd. have formed the Dewrance Metals Division, which will consist of the foundry at Hillington and the Special Alloys Division in London. The new division will have its own board of management and will be responsible for the production and sales of high quality non-ferrous castings, nickel alloy castings, stainless steel castings, Endewrance hardening and high temperature brazing alloys. The production executive is Mr. J. B. Morton based at Hillington, and the sales and technical executive is Mr. E. Wallace, based in London.

N.B.A. Annual Meeting

Annual general meeting of the National Benzole and Allied Products Association will be held on Wednesday, 26 April at Granville House, 132-135 Sloane Street, London S.W.1, at 2.30 p.m.

DIARY DATES

MONDAY 17 APRIL

S.C.I.—London: 14 Belgrave Sq., S.W.1, 5.30 p.m. A.g.m. of Pesticides Group & 'The economics of crop protection', by G. Edmund-Jones.

TUESDAY 18 APRIL

I.Chem.E., I.Pet.—Manchester: 'Recent developments in the production of olefins and aromatics by petroleum cracking', by M. Ruhemann, D. R. Cummings & W. L. Seddon.

WEDNESDAY 19 APRIL

I.Chem.E.—Chester: Grosvenor Museum, 7.30 p.m. 'Some corrosion problems in the chemical industry', by D. Bennion.

R.I.C.—Luton: Coll. of Tech., 7.30 p.m. 'Chemotherapeutic research', by Dr. F. L. Rose.

THURSDAY 20 APRIL

S.C.I.—London: 14 Belgrave Sq., 6 p.m. A.g.m. of Road Building Materials Group & 'Some laboratory investigations in connection with the development of cationic emulsions', by C. H. Brown.

FRIDAY 21 APRIL

S.C.I.—London: 14 Belgrave Sq., S.W.1, at 6.30 p.m. A.g.m. of Fine Chemicals Group & 'Newer developments in carino-chemotherapy', by Prof. F. Bergel.

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Indian Manufacturers are interested in exporting Sodium Dichromate, Sodium Sulphide, Chromic Acid and Aluminium Sulphate and Ferric. Enquiries should be addressed to **The Cawnpore Chemical Works Private Limited, Post Box 27, Kanpur, U.P., India.**

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Further details and forms of application from Head of Department of Chemistry, Biology and Geology, Kingston Technical College, Fassett Road, Kingston upon Thames, Surrey.

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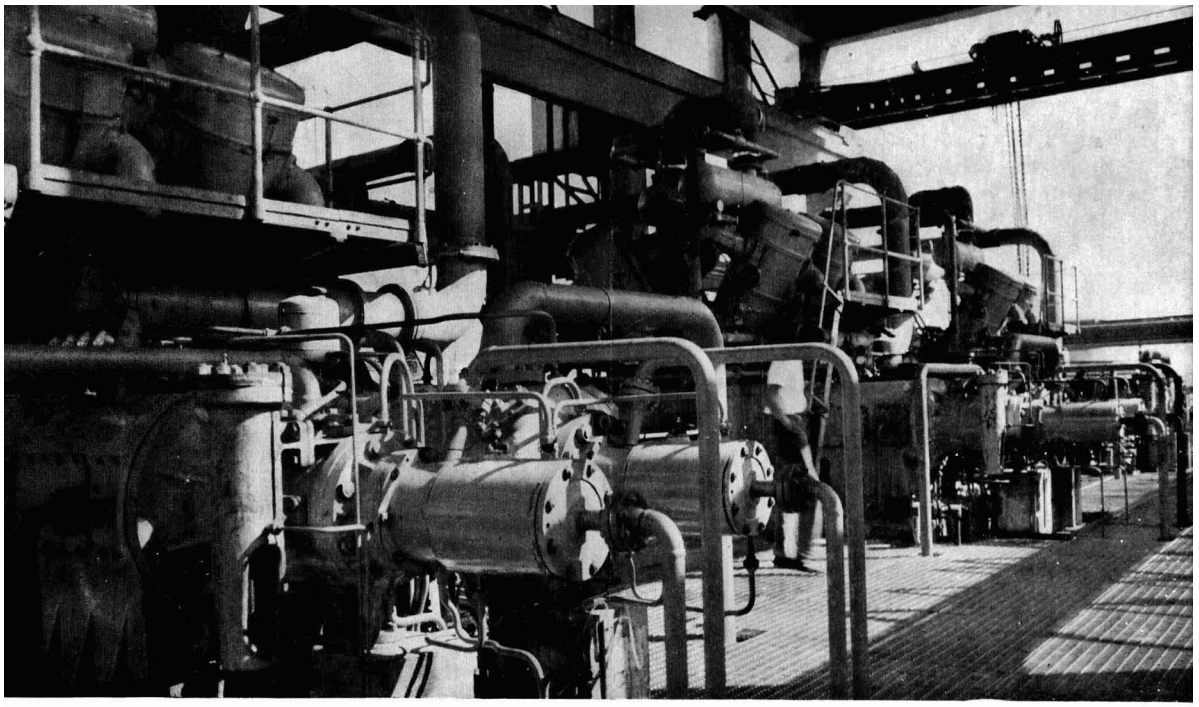

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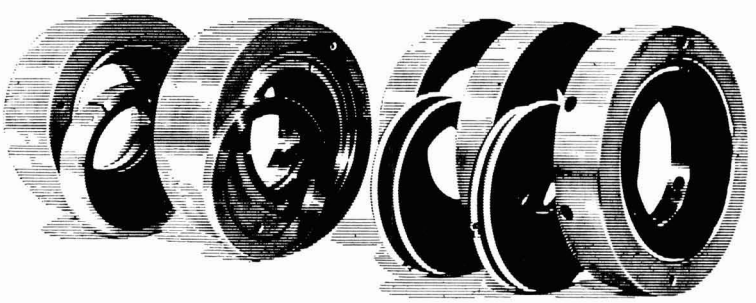

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