Chemical Age

National Chemical Laboratory Annual Report

(page 133)

VOL. 84 No. 2141

23 July 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

INDEX TO ADVERTISERS

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

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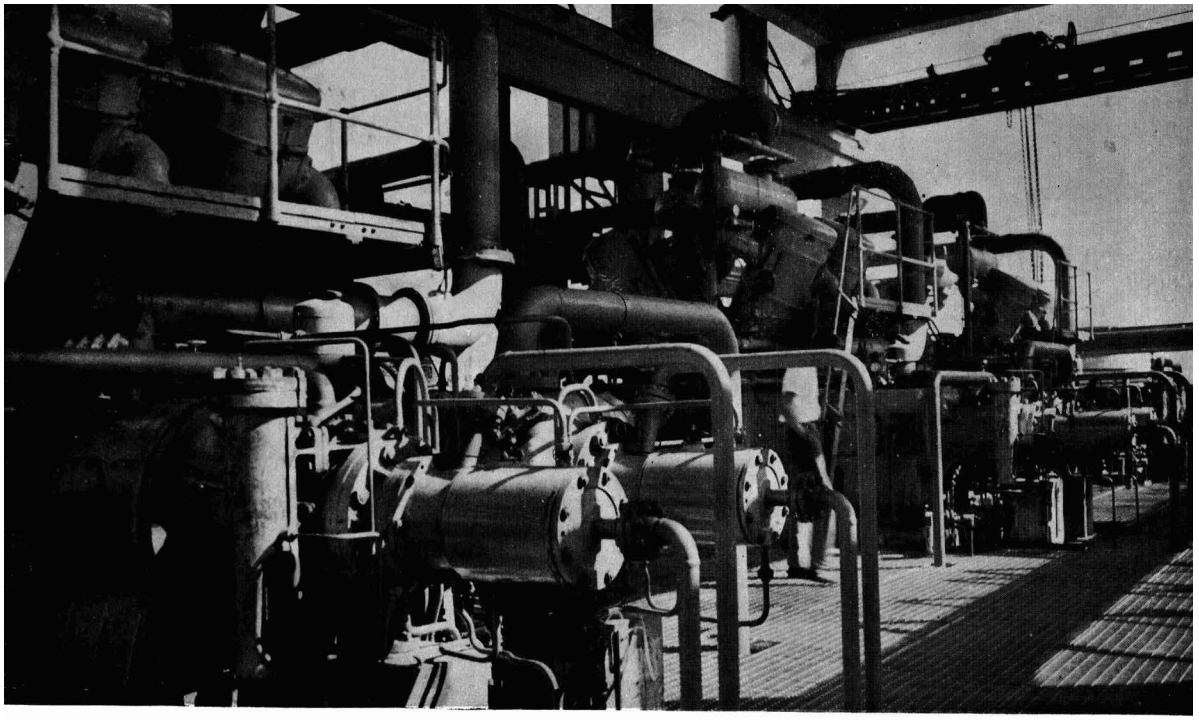
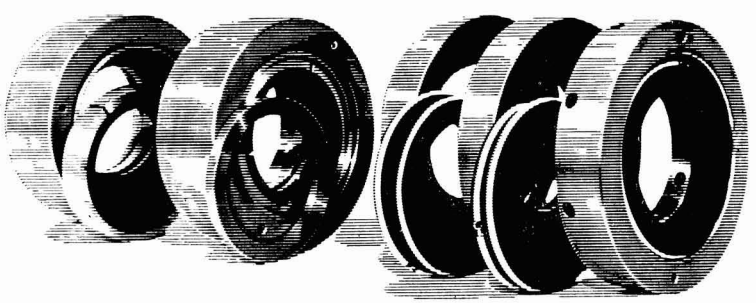


PIGNONE - THOMASSEN
type 4 Na/C 250
engine compressor units
of 600 HP each
with hydrogen-fuelled engines
and non-lubricated compressor
cylinders, installed in
Getty Oil's Refinery at Gaeta (Italy)

non-lubricated compressors

NUOVO PIGNONE *of the ENI Group*

INDUSTRIE MECCANICHE E FONDERIA
97, via Panciatichi, Florence, (Italy)



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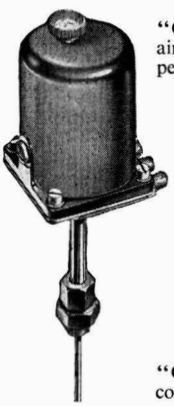
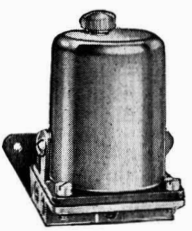
TRANSMISSION CONTROL



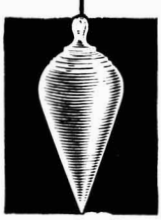
"On plant" mercury-in-steel air-operated proportional temperature controller. *Publication No. R39*



"On line" air-operated receiving controller. *Publication No. R31*

Mercury-in-steel air-operated temperature transmitter
with Polyester resin glass-fibre cover, stainless steel base, stem and bulb. *Publication No. T39.*

High thermal response. Wide range of temperatures.
Standard output air pressure, 3-15 p.s.i. Small and compact.



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The name that means precision all over the world

NEGRETTI & ZAMBRA LIMITED
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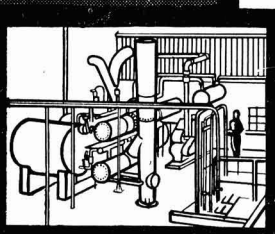

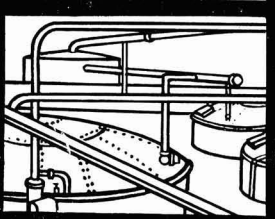

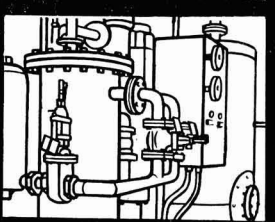

SOLVENT RECOVERY

We reclaim volatile solvents lost from industrial processes by adsorption or counter current washing. Solvent purchase costs usually reduced by up to 90%
Free technical survey and advice.

DUST AND MIST

Dust collection and filtration of air or gases. The CECAFILTER Continuous action at high efficiency improves performance of drying, grinding and pulverising applications.
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Adsorption systems for the purification and drying of CO_2 from fermentation processes.
Complete plant can be offered including alcohol recovery and CO_2 liquefaction with or without dry ice production.

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We design and build plant for all problems of moisture and contaminant removal by adsorption in the gaseous phase. Multi-adsorber units at a wide range of operating pressures. Low operating costs.
Methods include all types of solid desiccants.

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IN THIS ISSUE

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CHEMICAL AGE

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THE ROYAL SOCIETY

THE 300 years since the Royal Society was founded have in achievement exceeded all the infinite wastes of evolutionary time: by the scale of human events they are the fullest and longest in all existence. As Sir Cyril Hinshelwood, O.M., president of the Royal Society, and Dr. Lee's Professor of Chemistry, Oxford, said in his tercentenary address at the Royal Albert Hall, London, on Tuesday, these years have, by virtue of their scope, an almost epic grandeur.

The formal opening ceremony, of the tercentenary celebrations at which Sir Cyril gave his address, was a memorable occasion graced by the presence of the Queen and the Duke of Edinburgh and the King and Queen of Sweden and by distinguished scientists from all over the world.

Sir Cyril described the formation and history of the Royal Society; he also referred to some of the things that men of science had done in the past three centuries and their relation to the community. For the future, the task of scientists is clear. It is, Sir Cyril declared, to go ahead undeterred by any of the uncertainties that beset them. It is not the duty, however, of the Royal Society to predict, or to legislate, but to maintain within the larger community the smaller one in which creative activity can flourish.

The president aptly described the role of the Royal Society in the larger community. Scientific investigation needs material ways and means and the further knowledge advances, the more lavish becomes the scale. The individual scientist in isolation usually becomes correspondingly impotent. While the social and political community cannot be expected to possess the detailed understanding to support him, it cannot, with the tremendous issues at stake, remain indifferent.

What therefore must be created to mediate between the individual scientist and the general community, is a specialised minor community, large enough to command prestige and confidence, but with membership confined to those who place the claims of knowledge first.

Specialised organs of the Government are in themselves unsafe, being too exposed to the changing winds of expediency. Universities suffer from the disadvantage that on one hand a given branch of knowledge is divided and scattered among many of them and on the other, they have competing preoccupations of importance to them commensurate with that of learning.

An academy is therefore the natural body to provide several vital things: Non-commercial periodicals for the publication of discoveries, financial support for ideas still too embryonic to be of immediately obvious practical application, the mutual stimulus of association and discussion and the immaterial reward of honour for intellectual achievement.

This is the conception of the Royal Society. By maintaining high standards of unquestioned impartiality, the society sets the tone throughout the scientific community and its influence is felt in every quarter. Because leaders of industry and Government esteem it an honour to be elected into fellowship, the academy exerts its influence far beyond the confines of the learned world.

Of the 616 Fellows and 63 foreign members, 250 and 37 respectively

took part in the opening ceremony on Tuesday; powerful testimony to the honour which acceptance and election by his peers holds for the scientist who is designated 'F.R.S.' There are 25 elections to fellowship each year; this year there were 300 applications from candidates, who have to be British subjects or citizens of Eire. The Society is jealous of its standing and each application has to be proposed by at least six Fellows of whom three must have personal knowledge of the candidate.

With a growth rate of 25 Fellows a year, about half the total fellowship changes every 12 years. The regeneration of the fellowship is the most important annual activity of the Fellows and the 300 candidates this year are scrutinised by the Society's eight sectional committees for a first assessment. Special consideration is given to candidates whose work lies in border-line subjects. When it receives the recommendations of the various committees, the council then holds several further meetings. Finally the council's recommendations in favour of those considered the best from the whole list are made to the fellowship which elects the new Fellows.

Most of the 534 U.K. Fellows are to be found in the Universities but similarly honoured are 45 in Government Departments and 35 in industrial organisations. With most of the best scientific brains within the Society, it is hardly surprising that it is constantly consulted by a variety of official bodies. It administers Parliamentary Grant-in-aids for a number of purposes; it nominates representatives to 80 institutions and other organisations; the P.R.S. is *ex officio* a trustee of the British Museum, *The Times* Publishing Co., the *Spectator* committee; the president, by Acts of Parliament, is consulted on all appointments to the Agricultural, Medical and the Scientific and Industrial Research Councils, as well as some Government research committees; although the R.S. is no longer responsible for financial control of the National Physical Laboratory, it appoints the N.P.L. general board and executive committee and is still responsible for its scientific programme.

There is not space here to describe the many other activities of the Royal Society or the contributions it has made and is still making to the furtherance of independent research. In the advancement of science—in university, Government and industry—the Fellows have played a unique part for 300 years. Whatever advances science may hold in the future, there is no doubt that the R.S. will continue in the forefront, encouraging others by the achievements of its Fellows and the wisdom of their counsel.

RISING NITROGEN CONSUMPTION

WARNINGS made last year by West German nitrogen producers that the many large-scale extensions to world capacity were not warranted (C.A., 20 June 1959, p. 1027) have not been fully justified. The half-yearly Aikman report (see p. 131) shows that in 1959 total world consumption, excluding the U.S.S.R., at 10,848,000 tonnes of N, kept pace with the production of 11,332,000 tonnes. In fact for the first time fertiliser consumption exceeded the 10 million tonnes level.

Aikman point out that their figures for production include stocks carried forward from the previous year. If this were not the case, the additive excess of production over consumption since their reports were first written in 1830 would amount to astronomical figures.

The buoyant fertiliser market is expected to show further increases next year, when Aikman estimate a 657,000 tonnes increase in consumption. Some 350,000 tonnes of new capacity is expected to become operational during the year, but to meet the anticipated higher level of usage (some 11.5 million tonnes), existing plants will have to raise their outputs. It is thought, however, that there will still be a substantial excess that will continue to affect price levels (*Nitrogen*, June, p. 13).

In the first three months of this year, U.K. production of nitrogenous fertilisers, expressed in terms of nitrogen, averaged 35,600 tons a month (30,700 tons/month in January-March 1950). U.K. deliveries, including imports, of nitrogenous fertilisers in the first three months of this year averaged 48,300 tons of nitrogen a month (42,600 tons).

One of the significant trends of 1959-60 has been the disappearance of the wide price discrepancies in various world markets. This is a healthy sign and Aikman believe that a logical sequel will be the sale of nitrogen products on an exchange market, as is the case for most other commodities. The company intends to elaborate on this idea at a later date.

The British Sulphur Corporation, in their journal *Nitrogen*, state that the determining factor in the coming months is likely to be the prices at which sales are made to China. Buyers there are thought to be awaiting current tender prices, notably those for India and South Korea. In a recent sale, China appears to have conceded a slight increase on previous contract prices.

Disturbing features are seen in the appearance of a low-priced U.S. coke-oven ammonium sulphate, currently quoted at $32 in bulk per ton, and the likely impact of Japanese urea supplies on world export markets.

POLYVINYL BENZOATE MONOLAYERS

SOME unusual features are displayed by monolayers of polyvinyl benzoate which show strong film properties strikingly similar to those of vertically orientated fatty acids and unlike those of horizontally orientated polyvinyl acetate. This was reported in *Nature* (11 June, p. 883), by Reis, Beredjick and Gabor, of the Research and Development Department of Standard Oil Company (Indiana), who prepared the polymer by free-radical bulk polymerisation at 82°C. The monolayers were studied at 25°C and the spreading solvent was twice distilled benzene.

Compressibility of the polyvinyl benzoate film is not much greater than that for octadecylphosphonic acid, whereas polyvinyl acetate, typical of many horizontally orientated polar polymers, is highly compressible. Most unexpected, is the high collapse pressure of polyvinyl benzoate film, which at 53 dynes/cm equals that for octadecylphosphonic acid and is somewhat greater than that for stearic acid. Collapse of polyvinyl acetate takes place gradually at 25 dynes/cm, a pressure which has hitherto been considered high for a film of horizontally orientated molecules.

The strong film properties of polyvinyl benzoate and the marked difference between the benzoate and the acetate films is difficult to explain. It would be expected that the aromatic rings would interfere with the formation of strong film, as they do in tri-*p*-cresyl phosphate and related compounds. Two possibilities suggest themselves; large cohesive forces between coplaner rings—the possibility of close packing of rings is indicated by the molecular model—or the tight packing of rigid coils or folds rising from the surface.

The high collapse pressure is probably not accounted for by any branching in polyvinyl benzoate since any polar branches would tend to orientate horizontally as does the backbone chain and, furthermore, a copolymer of vinyl benzoate and vinyl acetate, which presumably has less branching than the homopolymer, gives films that collapse at similar high pressures.

There are many complex problems associated with polymer structure and behaviour which need to be solved. Further monolayer studies of polar polymers and mixtures should shed some light on many of them.

Project News

I.C.I. TO MAKE POLYVINYLIDENE CHLORIDE COPOLYMERS IN U.K.

THE I.C.I. Plastics Division is installing a plant to manufacture polyvinylidene chlorine copolymers and expects the first members of a range of products to be available in production quantities early in 1961. In the past U.K. demand has been met almost entirely by imports. There is a considerable demand for these resins in solvent solution and as aqueous dispersions for coating purposes. They have a high degree of impermeability to moisture, grease, odours and gases and can provide heat sealing properties. I.C.I. anticipate that considerable interest will be shown in them by trades using paper cellulosic and thermoplastic films for packaging.

Chemico Will Build New Fertiliser Plant in India

● CONTRACT to build a sulphuric acid and single superphosphate plant for Adarsh Chemicals and Fertilizers Ltd. at Bombay, India, has been awarded to Chemical Construction (G.B.) Ltd. The sulphuric acid plant will utilise sulphur as raw material and will have a capacity of 50 tons/day. The single superphosphate plant will have a capacity of 6-10 tons/hr. Storage and handling facilities will also be supplied by Chemico. The foreign exchange for the plant purchase will be provided by the Indian Credit and Investment Corporation of India. The complete plant will commence production in 1961.

C.J.B. Get British Celanese Acid Plant Contract

● BRITISH CELANESE LTD. have awarded a contract to Constructors John Brown for an acid concentration plant to be built at Spondon. The value of the contract is not revealed.

£10 Million Nylon-6 Expansion at Wilton

● EXTENSION of nylon polymer capacity at Wilton, at a cost of some £10 million, is planned by Imperial Chemical Industries Ltd., who say this decision has been taken to meet the expected increase in demand from the textile and plastics industries. With a capacity of about 15,000 tons/year, the new extension will produce caprolactam, the monomer for nylon 6 polymer, not hitherto produced in Britain. Existing I.C.I. plants, and one at present under construction, are designed for the production of nylon 66 polymer.

● CONSTRUCTION work has started on the titanium oxide plant being built at Umbogintwini on the Natal Coast, South Africa, by South African Titan Products (Pty.) Ltd., a company formed by British Titan Products Co. Ltd., and African Explosives and Chemical Industries Ltd. This plant is expected to be completed by the beginning of 1962, will have a capacity of 10,000 tons/year and will cost some £3 million. The contract for detailed design, procurement and construction of the complete factory has been entrusted to W. J. Fraser and Co. Ltd., of Romford, Essex, and of Johannesburg, who will build in accordance with process designs and layouts supplied by South African Titan Products. A pipeline is being laid along the sea-bed by Collins Submarine Pipelines Overseas Ltd., to discharge the factory effluent a mile out to sea at a depth of some 110 ft.

● A CONTRACT valued at £5,480 has been awarded by Hickson and Welch, Castleford, Yorks, to William Boby and Co. Ltd., Rickmansworth, for a base exchange plant and deaerator for their new boilers.

● BECAUSE of the increase in demand for Courtolan bulked nylon yarns, Courtaulds are installing additional plant, probably as an extension to their existing plant at Deeside, to increase the production capacity from September.

● THE 10,000 tons/year Propathene (polypropylene) plant at I.C.I.'s Wilton works is nearing completion and sections are being commissioned. Propathene manufacture is expected to begin later this year. This confirms the report in CHEMICAL AGE, 23 Jan., that the plant would be on stream in the latter part of 1960, instead of in 1961 as originally planned. Site work began in June last year. Constructors John Brown and other contractors have worked with I.C.I. in the design and construction work.

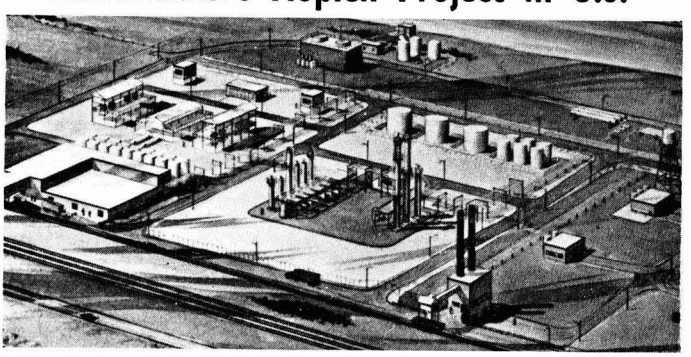
The plant has been built in a way that will allow for rapid expansion. It will bring I.C.I.'s polyolefins capacity for Alkathene (polythene) and Propathene to more than 100,000 tons/year. Alongside the polymer plant, Plastics Division will produce organo-aluminium compounds in bulk for use as catalysts in the process.

● A LARGE order for Fin-Fan air cooled heat exchangers has been received by Head Wrightson Processes Ltd., a subsidiary of Head Wrightson and Co. Ltd., from Iraq Petroleum. The units are to be used to cool lubricating oil from gas turbines at two pumping stations in Syria. Five large coolers will be supplied to each station. The oil outlet temperature will be kept constant automatically with varying heat load and ambient conditions. The total installation is worth about £55,000.

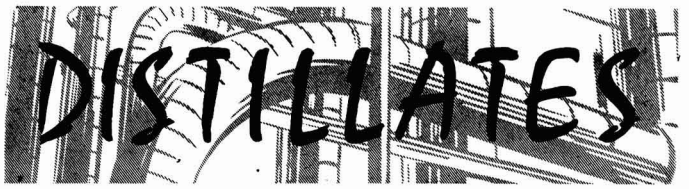
● WHAT is probably the largest silicon rectifier equipment to be made in the U.K., rated at 50,000 A at 200 V, is now being manufactured at the Chippenham Works of Westinghouse Brake and Signal Co. Ltd. for Murgatroyd's Salt and Chemical Co. Ltd., Sandbach. This equipment will be used for the production of chlorine and caustic soda by the electrolysis of brine derived from underground salt beds. The silicon rectifier diodes will be mounted on water-cooled bus bars in four separate cubicles, a principle which Westinghouse have already widely used. The transformers stepping down from 11 kV, and the tap changing equipment and bridging regulators to provide continuity of current control, are being supplied by the General Electric Co.

Westinghouse have already secured another order for a smaller silicon rectifier equipment rated at 25,000 A at 40 V for chlorine production for water purification in Kuwait, where the air temperature may reach 126°F. The electrolytic cells and other chemical equipment are provided by Krebs of Switzerland.

Montecatini's Moplen Project in U.S.



Artist's drawing of the Neal, W. Va., plant of Novamont Corp., wholly-owned American subsidiary of Montecatini Soc. Gen., Milan, Italy. The plant, scheduled to go on stream early in 1961, will produce 25 million lb./year of Moplen isotactic polypropylene for moulding powders. The Neal plant is Montecatini's first American manufacturing facility and marks the company's official entry into the U.S. industrial field of chemicals production



★ ON Tuesday, I was present at the most distinguished gathering of scientists in history. Never have so many of the world's most eminent scientists met under the one roof. They came from all over the world—the Nobel Laureates, the Fellows and Foreign Members of the Royal Society and the leaders of science in nearly 50 countries, resplendent in their academic robes—to honour the oldest of the scientific societies, the R.S. Eminent men in all walks of life were present—near me were Earl Mountbatten, Viscount Hailsham and Sir Miles Thomas.

This vast gathering in the Albert Hall, London, was present for the ceremonial opening of the Royal Society's Tercentenary celebrations by its patron, the Queen. A fanfare of trumpets heralded a colourful procession of about 250 Fellows, who were followed by 37 Foreign Members, hundreds of representatives of national academies of science, universities and international scientific organisations, the council members, and finally by the Queen, the Duke of Edinburgh, the King and Queen of Sweden and Sir Cyril Hinshelwood, the president.

The Queen recalled their original charter granted by Charles II, and said the fact that it had been little changed in 300 years bore testimony to the soundness on which the Royal Society was founded. She presented the Society with a silver bell "to ring in the fourth century," which Sir Cyril said would be used at every meeting. Then followed the noble 'Salute to the Royal Society on the Occasion of its Tercentenary', played by the Royal Military School of Music, conducted by Sir Arthur Bliss, Master of the Queen's Musick, the composer. The King of Sweden was formally admitted a Fellow and when the Queen and her party had taken their places in the Royal Box, Sir Cyril delivered the Tercentenary address.

★ SOME people might think that Esso are primarily devoted to serving U.S. interests, but last year the dividend paid to the parent company was £4.9 million, or 1.6% of trading receipts. On the other hand the company paid more than £100 million in U.K. customs and excise duties and nearly £5 million in income taxes. I was interested to learn this from the statement made by Mr. F. Lawrence, Q.C., to the select committee of the House of Commons, which considered the Esso Petroleum Bill last week. (See also p. 134.)

Mr. Lawrence pointed out that a pipeline was the only economical way of supplying ethylene gas to I.C.I. at Avonmouth. The alternative is specially built, refrigerated and pressurised road vehicles. The other pipeline, covered by the new Bill, is planned from Fawley to London Airport and will reduce the length of the delivery chain from 220 miles round the coast to 75 miles. It will also abolish the need for a depot at Fulham from which 185 journeys a day are now made.

Assurances were given to the committee that Esso, if granted the power to acquire land compulsorily, will use it as little as possible. Neither does the company intend to go in for "wholesale acquisition of freehold". All it wants, said Mr. Lawrence, is an easement or the right to put the pipe in the ground, restore the ground and leave it exactly as it was before.

★ To meet rising demand for nitrogen for industrial purposes, which this year will, it is estimated, total some 160,000 tons, I.C.I. may soon extend their cyanide unit at Cassel Works. Last year's output at this plant is said to show that average weekly production throughout the year was slightly above the plant's rated capacity (*Nitrogen*, June, p. 15).

So great has been the rise in demand that last year, the plant made as much in a month as it did in a year at the beginning of the century. Cyanide is being used in the production of acrylonitrile at Cassel Works, where a new unit—the first in the U.K.—came on stream last December.

At Ardeer I.C.I.'s new nitric acid plant, which produces nitric acid by the intermediate pressure ammonia oxidation (I.O.P.) process came on stream two weeks ago (see p. 136).

★ EXPANSION in the group trading profits of the Distillers Company by 20% to another record level (see 'Commercial News', p. 141), and the effective 2½% increase in the ordinary dividend, which is coupled with a further scrip issue, must be partly due to expansion of the group's chemical and plastics interests. If the chairman follows his usual custom, he will give some details of the contribution made by the Chemicals and Plastics Divisions in his annual report.

In the meantime, income from investments rose from £1,788,997 in 1959 to £2,373,590, in spite of the fact that in the first half of the year it was lower by about £300,000. The group's most important investment income is British Hydrocarbon Chemicals Ltd., who this year have brought a cumene-phenol plant and a third ethylene unit on stream and have announced plans for new plant for ethylene dichloride and methanol plus extensions to the butadiene unit. Other D.C.L. plans are for a major extension to the Barry p.v.c. plant and a £2 million acetic acid plant at Hull.

★ AFTER a varied career in industry, university and Government service, Dr. P. H. Calderbank has been appointed to the Chair of Chemical Technology at Edinburgh University (see p. 138). In the past five years he has introduced chemical engineering research into the D.S.I.R. and will be leaving a team of about 40 workers engaged in basic research and process development problems.

Major contribution of the basic chemical engineering research team in the past 5 years has been that of devising means for measuring gas-liquid interfacial areas in dispersions and foams. These techniques have made it possible to throw light on mass-transfer phenomenon in gas-liquid contacting in a way that would not have been possible in the absence of such techniques.

★ THE Maydown neoprene plant of Du Pont (United Kingdom) Ltd., to be formally opened by Lord Wakehurst, Governor of Northern Ireland, next week, has a capacity about one-quarter of the largest U.S. neoprene plant. It can produce some 50 million lb. of neoprene a year, and is capable of extension.

Output of the plant is scheduled for distribution in the U.K., Europe, South Africa, Australia and other Commonwealth markets. In the U.S., neoprene is said to account for about 4 or 5% of total rubber sales. In the U.K. and Europe, the comparable figure is about 2%—which gives a potential market twice as much. In view of the favourable production costs in Ulster, this should enable sales to be doubled.

★ Two ventures announced last week are taking I.C.I. into fields outside the chemical industry. The first is a link between Pension Fund Securities, owned by I.C.I. Pensions Funds Trustees, and City Centre Properties to form City Centre Properties (P.F.S.). Representing I.C.I. Trustees are Mr. N. J. Freeman, head of the insurance and investments departments, Mr. F. Hill, head of pension funds departments, and Mr. R. A. Lynex, I.C.I. secretary. Among the property company representatives is Mr. Jack Cotton.

Earlier this year City Centre set up two companies, one with Shell Mex and B.P., the other with F. W. Woolworth. In each of these, City Centre holds 80% of the capital and their partner the remaining 20%.

The other venture, an offer of 25s 6d a share for the 800,000 ordinary 2s 6d shares of Withins Papers Staining, will take I.C.I. into the wallpaper field. The directors recommend acceptance and I.C.I. say their intention is to continue the business as before, with management and staff continuing as at present.

Alembic

U.K. to Import More Plastics from Japan

UNDER a new trade agreement between the U.K. and Japan, higher U.K. import quotas have been set for a number of commodities, including one of £450,000 (subject to type) for polyvinyl alcohol resin, including solutions and dispersions; sheet, rod, tube, film, foil or profiles. Of this quota, not more than £75,000 is for polyvinyl alcohol.

The quota for imports from Japan of oleyl cetyl alcohol is set at £60,000. These quotas operate until 31 March.

Goods that have been freed from control for import from Japan include: synthetic corundum in the form of boule, rod or rondelle; titanium hydride; industrial instruments; and cocks, taps, traps and valves for the control of gases, liquids and vapours.

A.E.A. Declassify More Publications

BELOW is a list of recent U.K. Atomic Energy Authority unclassified publications, obtainable from H.M. Stationery Office.

"The determination of chromium in zirconium metal and zircaloy II," AERE-AM63, 1s 2d net; "Experimental techniques in the study of the reaction between carbon dioxide and graphite under radiation", AERE-M667, 2s 6d; "Radiation decomposition effects in aqueous solutions of carrier-free sodium iodide I-131", AERE RCC/R98, 1s 9d; "Irradiation studies on anhydride cured epoxy resin", AERE-R3339, 1s 9d; "The estimation of hydrogen fluoride in mixed gas systems by infra-red spectroscopy", AERE-R3261, 4s 6d; "The oxidation and corrosion of zirconium and its alloys", AERE-M621, 3s.

Full-time Course on Statistical Quality Control

The College of Advanced Technology, Birmingham, is offering a full-time course of three weeks' duration on 'Statistical quality control and acceptance sampling' starting on Monday, 5 September. The course, primarily intended as an introduction to the subject, will also provide the basic training necessary for quality control engineers. Application forms can be obtained from the Bursar, College of Advanced Technology, Gosta Green, Birmingham 4.

World Instrumentation Meeting at Stockholm

Fifth international conference on instruments and measurement will be held at Stockholm from 13 to 16 September. Among the 130 lectures will be 30 from the U.K. Papers will be given in these sections: automatic process control, physical methods for chemical analysis, nuclear instrumentation, measurement of electric and magnetic quantities, and reactor control. Details are available from Mr. Helge von Koch, Royal Institute of Technology, Stockholm 70.

UNIFORM PRICES SHOULD LEAD TO SALE OF NITROGEN ON EXCHANGE MARKET—AIKMAN

SALE of nitrogen products on an exchange market, as was the case for most other commodities, would be the logical sequel to the establishment of uniform market prices. This belief is expressed by Aikman (London) Ltd., 49 Egerton Gardens, London S.W.3, in their half-yearly report on the nitrogen industry (*Nitrogen,* June, p. 22). Aikman "will have more to say on this subject at a later date".

World market prices had again fallen during the last six months and at one time reached a rock bottom price for sulphate of ammonia at £10 per tonne, bulk f.o.b. and trimmed. There had recently been a definite trend towards firmer prices. The stock position was satisfactory and material was not at present available for bulk exports. Prices throughout the world had evened out and some importing countries were no longer paying substantially more than others. That was a healthy sign because in the past prices had leapfrogged downwards as one consumer had seen his neighbour getting a better bargain.

There had been no cause to make other than minor alterations to the estimates of production and consumption of nitrogen that were made in the annual report (CHEMICAL AGE, 2 January, p. 7). These had been made in the light of more up-to-date statistics. Estimates for 1960-61 had been added and showed a rise over 1959-60 of 5% in production and consumption for all purposes. Aikman point out that their production figures include stocks carried forward from the previous year and might more correctly be described as availability.

Fall in Spanish prices of ammonium sulphate had resulted in the raising of import duties to 15% *ad valorem,* plus Pesetas 420 per ton as an anti-dumping measure. If no new cut-price rates were made in the next two or three months, the duty might be restored. Seasonal consumption had probably cut Spanish stocks of ammonium sulphate to 350,000 tonnes.

In Greece, the agricultural Bank purchased by tender 40,000 tonnes of pure N and, in the form of sulphate of ammonia the lowest price delivered cost and freight in bags was $40.20 and for calcium ammonium nitrate, $38.60. Pakistan had taken sulphate of ammonia from East Germany at $44.27 per tonne for material in bags on a cost and freight landed basis.

Indian authorities have recently called for tenders to supply 80,000 tonnes of ammonium sulphate and 24,000 tons of urea. China is expected to watch this tender closely and any further reduction in price will be reflected in her next season's purchases.

The following are Aikman's revised estimates (in thousands of tonnes of pure N) for production and consumption in the world, excluding the U.S.S.R. from 1955 to 1961.

	Production (Availability)		Consumption	
	Agric.	Industry	Agric.	Industry
	'000 Tonnes of N.		'000 Tonnes of N.	
1955-56 ...	6,852	1,245	6,327	1,245
1956-57 ...	7,288	1,370	6,977	1,370
1957-58 ...	8,107	1,446	7,660	1,446
1958-59 ...	8,811	1,511	8,358	1,511
1959-60 ...	9,757	1,575	9,273	1,575
1960-61 ...	10,383	1,693	9,812	1,693

	1959-60		1960-61	
	Prod.	Con.	Prod.	Con.
	'000 Tonnes of N.		'000 Tonnes of N.	
Europe & Egypt	5,300	4,400	5,600	4,650
U.S.	3,550	3,500	3,700	3,600
Canada & Rest of America	405	409	426	461
Chile ...	205	15	205	15
Asia	1,736	2,157	2,005	2,379
Other countries...	136	367	140	400
Grand Total	11,332	10,848	12,076	11,505

Tar Products Tests Committee Issue New Standard Tests

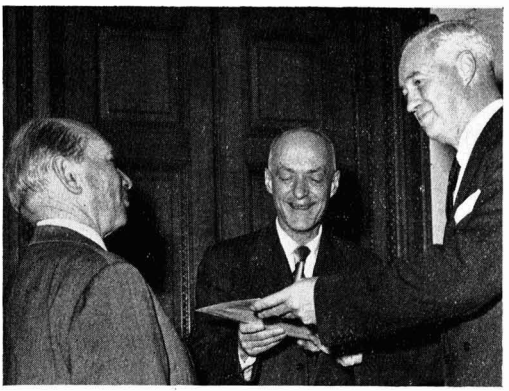
THE following tests have been issued by the Standardisation of Tar Products Tests Committee: Polymerisable hydrocarbons in naphtha fractions LB23-59; Crystallising point of pure benzene LB24-59; Corrosive sulphur-mercury test LB25-59; Hydrogen sulphide LB26-59. The first of these tests, intended primarily for the evalution of naphtha fractions for resin manufacture, is a refinement of the McIlhiney test, in which the sample is brominated at 0°C with a solution of bromine in carbon tetrachloride, the excess of bromine being estimated idiometrically.

A new test for the determination of crystalling points is necessary because of the increasing purity of benzene now required for synthetic processes. The present test controls the initial cooling of the sample, eliminates many of the errors due to radiation and uses a thermometer that can read to 0.005°C. The repeatability of the test is 0.01°C and the reproducibility 0.035°C.

The revised test for corrosive sulphur is quicker and more reproducible than the copper strip test. The test consists of reacting the sample with mercury and filtering off under standard conditions the sulphide formed and determining its quantity by comparison of the stain with standards. Any peroxides in the sample, which also react with mercury, are eliminated immediately before the test by the addition of a small quantity of a solution of hydroquinone.

Quantities of hydrogen sulphide that are less than the limits of sensitivity of both the new mercury test and the doctor test are sufficient to cause corrosion of copper. A more sensitive test for hydrogen sulphide has, therefore, been introduced.

The Queen Opens Royal Society Tercentenary Celebrations



Sir Cyril Hinshelwood, P.R.S. (centre), and Sir Gerard Thornton, R.S. foreign secretary (left), greet Sir Alexander Todd, president, Chemical Society, right, when those participating in the celebrations registered at Burlington House

TERCENTENARY celebrations of the Royal Society were formally opened at a State ceremony attended by the Queen and the Duke of Edinburgh in the Royal Albert Hall on Tuesday. The previous day those taking part registered at Burlington House, while in the evening Lord Hailsham, Minister for Science, received overseas visitors at a Government reception in Lancaster House.

The King of Sweden, elected a Royal Fellow in 1959, attended the opening ceremony with the Queen of Sweden, and signed the Charter Book presented by Charles II and which bears the signature of nearly every Fellow since its foundation (see 'Distillates', p. 130).

Among the tercentenary lectures given this week were those by Sir Alexander Todd, F.R.S., Professor of Chemistry, Cambridge, on 'New horizons in organic chemistry', held on Wednesday at the Royal Institution, and 'Molecules in crystals', by Dr. Dorothy Hodgkin, F.R.S., reader in X-ray crystallography, Oxford, on 23 July at Beveridge Hall, London University.

Oxford, London and Cambridge Universities held a number of honorary degree ceremonies to confer Hon. D.Sc. degrees on a number of official participants. These included: Oxford, 21 July, Prof. N. N. Semenov, Foreign Member, R.S., Nobel Laureate in Chemistry, member of the Praesidium of the U.S.S.R. Academy of Sciences; Dr. E. W. N. Steacie, F.R.S., president, National Research Council of Canada, London, 22 July, Prof. G. C. de Hevesy, Foreign Member, R.S., Nobel Laureate in Chemistry, Institut för Organ-kemisk Forskning, Sweden; Sir Thomas Merton, K.B.E., F.R.S., formerly Professor of Spectroscopy, Oxford.

Those taking part in the celebrations will be able to visit a number of Government and industrial research institutions in London and the Home Counties. In addition an exhibition—open to the public on 28 and 29 July from 10.30 a.m. to 6 p.m.—will be held at Burlington House. Among themes to be represented are: Fundamental particles; solvent extraction of plutonium; refined chemical separation; metals; antibiotics; and vitamins.

On Tuesday, 26 July, the celebrations will close with a banquet at Grosvenor House, London, when the Prime Minister will propose the toast of the Royal Society and Sir Cyril Hinshelwood will reply.

Commonwealth Scientists Wind up U.K. Tour

THE importance of developing and expanding pure and applied research on the exploitation of mineral resources was one of the matters on which unanimous agreement was reached by the British Commonwealth Scientific Committee, which last week concluded its two-weeks' tour of U.K. research establishments, industry and Government organisations, during which several formal and informal meetings were held. Chairman of the committee is Sir Harry Melville, K.C.B., F.R.S., secretary of the Department of Scientific and Industrial Research.

The question of travel grants for fellowships with the Commonwealth Education Liaison Committee is to be taken up by a working party; it was felt that help of this kind is especially important to assist research workers to be exchanged between countries outside the U.K., and also for travel from the U.K. to the other Commonwealth countries. There will also be close collaboration in the translation of foreign-language scientific and technical literature, especially from Russia and other Eastern countries.

The British Commonwealth Scientific Committee's U.K. tour included a visit to I.C.I.'s works at Billingham and Wilton and to British Hydrocarbon Chemicals at Grangemouth.

Solving Chemical Plant Operating Problems by Computer

AN attractive means of studying the performance of an existing chemical plant so that its efficiency can be increased is by simulating the plant's operations on an electronic computer, since, in this way, experiments can be conducted without interfering with production. The computer is able to show the plant manager any undesirable features in the design or operation of the plant and enables him to see what steps are required to remove bottlenecks. Thus, planned improvement of the plant and its operations becomes possible. The plant designer, too, is able to calculate the change in plant performance involved in adding or removing units of the plant, and the planning of plant extensions is made easier.

A procedure for carrying out such a simulation was described at the annual conference of the British Computer Society, held at Harrogate earlier this month, by Dr. P. V. Youle, M.Sc., Ph.D., assistant research manager of I.C.I. Fibres Division. He outlined a stage-by-stage simulation of a hypothetical chemical plant, this being a typical batch plant with four chemical stages between starting material and product, and employing 17 reaction vessels.

The simulation procedure is divided into two main parts, Part A involving the following stages: (1) gaining the co-operation of the plant manager and his staff; (2) setting up a line diagram of the plant; (3) plotting the plant behaviour; (4) and (5) carrying out a complete logical analysis of the plant and the transfer routines for the transmission of batches from stage to stage in the plant; and (6) reducing these two sets of logical analyses to a actual computer programme. In the example discussed, the logic is reduced to autocode on the Ferranti 'Mercury' computer. This is done in such a way as to make the computer create and keep a continuous activity chart for the plant as a whole.

Part B of the procedure yields additional information relating to plant cycle times. This involves two further stages; (7) obtaining complete sets of plant record sheets and (8) analysing the cycle times revealed by the record sheets.

By means of all these stages, a programme is built up and 'run' so that a week's plant output is simulated in, say, five minutes.

Looking towards the future, Dr. Youle felt that a general simulation programme for all batch chemical plants was within reach, while, for continuous processes, the reactor may be represented mathematically more rigorously.

Worker Dies in I.C.I. Explosion

An explosion in the nylon section of I.C.I.'s dyestuffs factory at Huddersfield resulted in the death of a 36-year-old employee, Mr. Kenneth Ellis.

NATIONAL CHEMICAL LABORATORY REPORT

Organoboron Compounds of Great Potential Commercial Importance

THE 1959 Report of the National Chemical Laboratory, published by the Department of Scientific and Industrial Research and obtainable from H.M.S.O., price 4s 6d, again shows the wide range of activity of the Laboratory. The work of six research groups are reported under the headings: Provision of standard materials; extraction of metals; chemical thermodynamics; corrosion of metals; development and application of new materials; and analytical research and services.

Uranium Extraction. The work on various aspects of the extraction of uranium, described in the 1958 Report, has continued. New resins have been synthesised and special attention given to the avoidance of silica poisoning of resins. The theory that silica poisoning of anion-exchange resins is due to the formation of silica acid polymers in the resin structure is supported by the further results obtained from the study of the absorption of silica from acid sulphate solutions.

It is suggested, and experimental evidence is in agreement, that silica absorption can best be explained on the basis of complex anion formation between silicic acids and the anions in the resin, and possibly also in the solution. The absorbed silica is present in two forms—one which appears to be held by an anion-exchange mechanism, which is readily eluted, and the other in a condensed form which is not readily removed and gives rise to resin poisoning, the degree of silica absorbed depending upon the degree of condensation of the polysilicic acids present in solution. One possible method of overcoming silica poisoning is to condense the silicic acid in the leach liquor to a sufficient degree so that the molecules are prevented from entering the resin matrix. Of the methods so far examined heating the leach liquor appears to be the best means of inducing condensation.

Animated P.V.C.

The use of animated polyvinyl chloride as an ion exchange material for the recovery of uranium from leach liquors and pulps has been investigated. The most promising use appears to be as a granular exchanger which could be used as a possible alternative to polystyrene-based ion-exchange resins. Animated p.v.c. may offer a solution to the problem of silica poisoning.

Trinonylamine [tri(3:5:5-trimethylhexyl)amine] has been investigated as a possible extractant for the recovery of uranium from sulphate leach liquors by solvent extraction. Continuous countercurrent solvent extraction of a typical uranium-bearing leach liquor, by means of the dilute solution of the amine in kerosene, has shown that this solvent is satisfactory with respect to selectivity, loading capacity and rapid complex formation and that solubility and entrainment losses to the aqueous phase are low.

Extraction of Gold. Considerable improvements have been made in the ion-exchange process for the recovery of gold from cyanide solutions. A marked increase in gold capacity and selectivity has been obtained by using resins containing longer-chain alkyl-amines. The improvement is probably due to increased steric hindrance, in that the proximity of the charged site makes the approach of all but linear ions difficult.

Separation of Rare Earths. Work has continued on the isolation of rare earth oxides of 99.9% purity, and effort is now concentrated on building up stocks of the less accessible middle earths (Ho, Dy, Tb) and europium.

Mixed Load Technique

The separation of gadolinium and yttrium by the mixed load technique using a buffered ethylenediamine tetracetic acid (EDTA) eluant, reported in 1958, on a large scale readily gave >95% pure concentrates of gadolinia and yttria but it proved tedious for the further purifications of yttria to >99.9%. Possible eluting agents for this purification were then compared and hydroxyethylethylenediamine triacetic acid (HEEDTA) proved most effective giving a purity of greater than 99.9% and nitriloacetic acid (TRILO) gave a similar purity. Unfortunately, HEEDTA is not available in large quantities in the U.K. and TRILO was used on a large scale.

The Marsh amalgam process has been used for the separation of isolation of samarium, europium and ytterbium. It involves the extraction of a lanthanon solution, usually the acetate, with a fluid sodium amalgam. There is an anology between this method and the solvent extraction and the possibility of developing a continuous extraction is being studied.

Purification of Elements. Interest continues in zone melting as a purification technique and technical advice has been given to a firm of equipment makers regarding the design of a semi-micro zone-melting apparatus. However, more attention is being paid to those impurities which cannot be removed by zone-refining. The removal of arsenic from antimony, for instance, is an old problem and various methods have been proposed. An antimony compound very low in arsenic was prepared by the hydrolysis of the trichloride with cold water.

Theoretically, elements which form sodium salts should be removed by fusion with caustic soda from their association with elements not appreciably attacked by alkali. A number of common impurities associated with indium come into this category including aluminium and silicon which are probably the most difficult to remove by zone-refining. This point was investigated with reference to indium containing added radioactive gallium, zinc and tin as tracers. On fusion with caustic soda for 10 mins., the impurities were considerably reduced. By anology, the concentrations of a number of other elements, e.g. aluminium, silicon, germanium, phosphorus, sulphur and halogens, should be reduced.

Chemical Thermodynamic Measurements. As part of its revised research programme, the Laboratory has undertaken work on the fundamental thermochemical and thermodynamic properties of both organic and inorganic compounds. A bomb calorimeter for the measurement of heats of combustion has been transferred from the National Physical Laboratory. A rotating bomb calorimeter is being constructed for those materials, halogen compounds, etc., which cannot be satisfactorily burned in the ordinary bomb. A low temperature calorimeter for the determination of entropies from 4°K upwards, is in the stage of design and construction.

Corrosion Costs

Corrosion of Metals. The annual cost of corrosion in the U.K. has been estimated at £600 million. Even a relatively small improvement in preventive measures would therefore effect a considerable saving in resources of raw materials and man-power. Since the development of preventive measures must largely depend upon the knowledge of corrosion mechanism, as much attention as possible is being given to fundamental research. At the same time, close co-operation is maintained with industry, local authorities and other organisations.

Development and Applications of New Materials. Work has been continued on the development of polymers displaying a high degree of selectivity in ion-exchange equilibria and transport processes. In addition to work on new materials, basic physiochemical studies have been extended in order to provide a better understanding of the fundamental mechanism of ion-exchange.

In the 1958 Report it was stated that the 8-hydroxyquinoline chelating group can be chemically bound to cellulose by the condensation of 5-chloromethyl-8-hydroxyquinoline with soda-cellulose in dioxane. This polymer has, however, proved unstable towards repeated cycling with aqueous acid and alkaline solutions. In this respect analogous polymers derived from polyvinyl alcohol shows greater stability. Polyvinyl alcohol reacts directly with sodium and the resulting sodium-polyvinyl alcohol may be con-

densed with chloromethyl oxine hydrochloride.

The object of an ion fractionation project is to develop methods for the continuous separation of a series of similar ions of like sign, using ion-exchange membranes. The most promising means of obtaining a clear cut separation of this kind, involving three or more ions, appeared to be some form of continuous electrochromatography, and a consideration of the method suggested that improvements might be introduced using ion-exchange membranes instead of paper. A method was devised using an interleaved membrane-paper back. This work forms the subject of British Patent Application 39033/58.

Hydrazine Polymers. The work on the reactions between bifunctional compounds and hydrazine or its derivatives has been extended, and some aspects of the chemistry of hydrazine derivatives have been clarified. This work has now been terminated.

Organoboron Compounds. These compounds are potentially of great technicological importance and consequently the Laboratory has undertaken a programme of research on substances in which the −B−N− linkage replaces the −C=C− linkage. The immediate objective has been the study of borazoles, and the factors that determine their stability and reactivity.

Failure to Lay Ethylene Line Would Hit Growing Market for Ethylene Glycol Exports

IF the pipeline planned to carry ethylene from Esso's Fawley refinery to the plant I.C.I. are building at Severnside were not laid the growth of exports by Britain's "only large exporter of petrochemicals" could be seriously inhibited, particularly the market in Scandinavia for ethylene glycol. This was stated by Mr. D. M. Bell, managing director of the I.C.I. Heavy Organic Chemicals Division, at the meeting on Tuesday of the Select Committee of the House of Commons who are considering the Esso Petroleum Bill.

Esso seek compulsory purchase powers over land through which they plan to lay pipelines from Fawley to Avonmouth and to west London (see also "Distillates", page 130).

Mr. John Arbuthnot, chairman of the committee, asked what would be the effect on the company if the Bill were thrown out to enable a public inquiry to be held on the course of the pipeline, a procedure that would take perhaps a year.

Mr. Bell said I.C.I. estimated the value of their exports at £11.5 million a year —a figure that could be much higher because it did not take account of the value of finished products—and that soon after the Avonmouth plant began production their exports of ethylene glycol would be worth £500,000.

If ethylene gas were piped from Fawley the company could make ethylene glycol and win a share of the growing market, particularly in the important Scandinavian countries where the U.K. was favouraably placed because of the free trade association.

The company could import this chemical for their own use, at a cost of about £4 million a year in dollars, with little difference in profitability but it would be impossible to re-export it economically. If the market were lost now it might never be recovered.

Earlier in the hearing Mr. Geoffrey Lawrence, Q.C., for Esso, read a draft of a clause it was proposed to insert into the deed of grant of land by an owner to the company.

It provides that if within 15 years of the grant the owner is refused planning permission for the land solely because of the pipeline the company shall, at their own option, either move the pipeline to other land of the owner or pay compensation for the value lost because planning permission had been refused. The owner's right in this respect may be exercised once.

The hearing will continue this week and probably next week.

In Parliament

Future of the A.R.D.E. at Woolwich

The 1960 plan for the redevelopment of the Woolwich Arsenal drawn up by the Hutchinson committee was described in a written answer last week by Mr. C. Soames, Secretary of State for War. Under this plan the Armament Research and Development Establishment that occupies 90 acres is to remain "until such time as the facilities can be much reduced or even dispensed with".

Sale of Gas Liquor as Fertiliser

Replying to a written question last week, Mr. John Hare, Minister of Agriculture, said that farmers received contributions towards the cost of acquiring crude retort-house gas liquor at the same rate per unit of nitrogen as for other inorganic fertilisers.

In reply to another question, he said that local authorities requesting extension of subsidies to organic fertilisers, such as those produced at sewage works, had been informed that he did not feel justified in including such materials in the subsidy scheme (see also CHEMICAL AGE, 16 July, p. 104).

U.K. Not to Follow U.S. on Food Additives Law

Mr. John Hare, Minister of Agriculture, said last week that he had considered recent U.S. legislation that banned the use of additives in food other than those specifically approved, but that he did not contemplate similar legislation in this country.

Letter to the Editor

Closure of Microbiological Unit a "Dead Loss" to British Science

SIR,—My attention has been directed to the leading article in your issue of 2 July in which you refer to the report and claims of the Water Pollution Laboratory. Unhappily it is not the fact that the work of the microbiological section of D.S.I.R. closed down at the end of 1958 is really being continued at the Water Pollution Research Laboratory. A small corner of that work is being continued but it is no more than that. Nor, I regret to say, is it true that many of the N.C.L. are already working at the Stevenage Laboratory.

I very much wish that we could share your optimistic feelings, but unhappily the fact is that at the time of its break-up there were 20 scientists in the microbiology group at Teddington. These are now scattered to the four points of the compass. Apart from very small sections of the work that it has attempted to carry on at Stevenage it can be said that the various fields of effort of those 20 scientists have been let go.

I write without knowledge of what has been approved for the forthcoming scholastic year, but insofar as the past scholastic year is concerned I can say quite categorically that no work has been developed in university laboratories of the comprehensive nature that was in progress and in plan in the microbiological unit. Universities went on with work of the type and character which they had been carrying on for some considerable time.

The simple and inescapable and most regrettable fact is that the closing down of the microbiological unit has been a sheer dead loss to the scientific effort of the country. What a pity the Research Council will not even now recognise that it was wrong and take steps to retrace its steps.

Yours, etc.,

STANLEY MAYNE,
General Secretary,
Institution of Professional Civil Servants,
London S.W.1.

First Neoprene Ship Returns With Liquid Chlorine

Arrangements have been made for regular cargoes of neoprene, made by Du Pont at Maydown, Londonderry, to be discharged at the Fenton Dock, Runcorn. The first arrival was by a Dutch motorship, which took back a cargo of liquid chlorine from the Costner Kellner Works, Weston Point. This ship has been specially constructed to carry palletised cargoes.

Paper Firm Opens Cast Polythene Plant

Peter Dixon and Son, papermakers, have opened a plastics department for the production of cast polythene film. Commercial quantities are expected to be available in September.

S.B.A. Processes for Production of Granular Ammonium Nitrate

ONE of the first concerns in the world to produce synthetic ammonia, the Soc. de l'Azote et des Produits Chimiques du Marly (S.B.A.), now make their process experience and know-how available throughout the world by licences.

The processes are for the production of concentrated solutions of ammonium nitrate by neutralisation of nitric acid with ammonia; and the conversion of this solution into a granular product that is dry and of known size. Granule size is generally between 2 and 4.5 mm., but equipment can be regulated to produce granules of different sizes from 1.5 to 2.5 mm. Interest in the S.B.A. processes lies in their versatility; with the same equipment, it is possible to make a whole range of products containing from 16 to 34.5% N.

The techniques and processes are now being used under licence in many countries, including Formosa, France, U.K., Iran, Netherlands, etc.

Neutralisation. This is effected at about atmospheric pressure (a pressure of 4 kg/cm²). Economic or local conditions will govern this factor.

Steam Economy

Effecting the process under pressure has the advantage of steam economy, the heat of reaction being utilised to reheat the nitric acid and ammonia as well as for concentration of the ammonium nitrate solution so produced. With more concentrated nitric acid, the unit produces an excess of steam under pressure which can be utilised in other sections of the plant. For example, with 54% acid, steam is produced ton for ton of ammonia used.

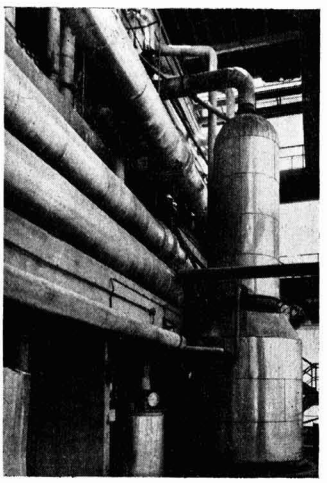
Such a process is recommended for disposal of ammonia under pressure. However, the atmospheric pressure process is designed for use when the cost of steam does not predominate.

Ammonia in gaseous form and under 1 kg/cm² pressure is introduced at the same time as nitric acid into the neutraliser. These two materials are preheated in two heat exchangers, which also circulate steam given off by the neutraliser. The nitric acid feed is assured by use of a reservoir, allowing a constant flow to enter the neutraliser. If ammonia is delivered in liquid form, the installation is fitted with a gasifier which utilises the hot water as the source of heat.

The neutraliser is a simple apparatus in stainless steel in which a stirring device produces an intense circulating movement of the solutions, assuring rapid distribution of ammonia and nitric acid.

Heat escaping from the top of the neutraliser and the solution of ammonium nitrate produced are given off simultaneously so that a constant level is maintained in the neutraliser.

The solution at this stage has a concentration of 83%. The pH of the solution is regulated in a correcting vessel in which the necessary quantity of ammonia is injected to produce a perfectly neutral solution. This is then recollected in a further vessel and pumped to the concentrator, which is composed of two pipes, one inside the other, with steam



Saturator under pressure at the ammonium nitrate plant of O.N.I.A., Toulouse, which has a capacity of 500 tons/day

in the outer. A separator eliminates water vapour and separates the concentrated solution.

The degree of concentration is regulated by the rate of admission of steam. Steam that is emitted by the neutraliser and the concentrator are condensed in the tubular system, through which the hot water runs. Condensates recovered are added to the tank for reheating nitric acid and ammonia.

In using the condensates in place of water for the production of nitric acid, the small quantities of ammonium nitrate contained in the vapours are recovered at the same time. The overall content of nitrogen available is of the order of 98.7%.

Consumption of steam for concentration of the solution to 83% depends on the strength of nitric acid used. Thus, if the acid is of 54% concentration, it will take about 250 kg of steam per ton of solution containing 95% of ammonium nitrate.

Neutralisation Under Pressure. The reaction in the neutraliser is effected under pressure of 3.5 to 4 kg/cm². This is done by feeding in ammonia and nitric acid at a slightly higher pressure. After controlling and correcting the pH, the solution leaving the neutraliser is concentrated in the concentrator where the hot liquid is formed by the reaction steam given out by the neutraliser. A vacuum is obtained by a water ejector and ensures that the solution boils at a relatively low temperature and uses the steam produced by reaction under pressure.

50% Acid

Reheating of the ammonia and acid is effected in the heat exchangers, which use as heating medium the steam produced in the concentrators. The amount of water evaporated depends on the titre of nitric acid, the installation having a surplus steam up to a certain concentration of acid. This produces an acid of about 50% HNO_3. If the acid does not reach this concentration, it can be obtained by using a heating vessel, excess steam passing to the neutraliser to give steam at 3 atm. After passing to the collecting tank, the ammonium nitrate solution is generally reheated in an exchanger at a temperature sufficient to avoid risk of crystallisation.

Condensates containing small quantities of the salts are collected in a vessel to await utilisation. The nitrogen content is of the order of 98.7%. Production of steam is a function of the nitric acid and concentration of the solution obtained is as follows:

Nitric acid conc.	Conc. solution NH_4NO_3	Production of steam in tonnes*
50%	95%	0
54%	95%	1
57%	95%	1.6

* per tonne of ammonia used

Granulation. The process for granulating ammonium nitrate is based on the utilisation of the heat of crystallisation of nitrate to ensure evaporation of water present in the solution. The S.B.A. granulation process does not need outside heat, the final product being almost dry. The nitrate solution and the diluent are mixed in a vessel fitted with an agitator.

The amount of solution is measured by a gauge that is fed by a charged

	Per tonne of ammonium nitrate at 20.5% N		Per tonne of ammonium nitrate at 33.5% N	
	Neutralisation at atm. pressure	Neutralisation under pressure	Neutralisation at atm. pressure	Neutralisation under pressure
Ammonia (kg)	128	128	209	209
Nitric acid (100% HNO_3) (kg)	470	470	772	772
Diluent, dry (kg)	375	375	—	—
Coating material (kg)	40	40	30	30
Electricity (kWh)	22	22	30	30
Cooling water (m³)	8	8	13	13
Steam at 14 kg/cm²	150	—	245	—
Production of steam (kg)	—	125	—	205

reservoir, which is furnished with a device allowing recycling towards neutralisation of a part of the solution.

The regular flow of diluent is assured by a band conveyor, fed directly by the silo which receives the product at the grinding section. Granulation starts in the pregranulator, consisting of a container in which two sets of special blades turn counterwise to ensure intensive mixing with recycled fines from the sieving plant.

During the first stage of granulation, some water evaporates, the product becoming paste-like. This is then introduced into a rotating drum through which passes a current of cold air. In this operation, the remaining water is evaporated and the granules take shape and harden in crystallising. At the end of this stage, the product is passed to the sieving section which separates the product for commercial sale of granules between 2 and 4.5 mm. Granules larger than 4 mm are crushed in a grinding mill, where they are recycled to the pregranulation and then to the sieve. Smaller granules are also recycled.

The proportion of product recycled depends on a number of reactors, particularly on the quality of the diluent and the quality of the commercial product. As a general rule, recycling is done two or three times.

Before sale, the product is coated using a rotating drum, into which is fed the coating powder (chalk, kieselguhr or talc). Also, to stabilise the final product and ensure its storage qualities, calcium is used as diluent, and a final passage in air cools the temperature 10 to 15°C.

The S.B.A. process gives ammonium nitrates containing 26.5% to 34.5% N, the latter corresponding to nitrate free from diluent. Granules are spheroidal and regular. The product is white and dry (0.25% of H_2O maximum).

The diluent regulates the nitrogen content of the finished product and is mixed into the solution in the form of dry powder. Calcium carbonate, chalk or marl can be used; the diluent should be free of impurity. The nature of the diluent and the fineness of grinding have a considerable effect on the final ammonium nitrate granule and storage.

F. W. Berk Now Producing Lithium Hydride of at Least 99% Purity

LITHIUM hydride of at least 99% purity is now being produced by F. W. Berk and Co. Ltd., Portman Square, London W.1. Apart from its well-known use as a compact source of hydrogen, lithium hydride has a number of other applications which spring from its thermal stability (which makes it unique among the alkali metal hydrides), its powerful reducing properties, and its solubility in polar organic solvents, such as ethers. Many interesting reactions may be carried out such as the preparation of silanes and borane; for instance, diborane may be prepared by reaction of lithium hydride with boron trifluoride-ether complex or other boron halides in tetrahydrofuran.

The compound is often used in the form of lithium aluminium hydride ($LiAlH_4$) which is derived from it by reaction with anhydrous aluminium chloride or bromide in dry ether. The double hydride is used in a large number of specific organic reductions, such as reduction of esters, carboxylic acids, acid anhydrides and acid chlorides to primary alcohols. Reaction of lithium aluminium hydride with carbon dioxide produces methanol, formaldehyde and formic acid, dependent on the ratios used; these reactions are useful in synthesis of C_{14}— labelled organic compounds.

More recently it has been found that the presence of a little lithium aluminium hydride greatly accelerates the reducing action of lithium hydride by a mechanism of continuous formation and decomposition of the double hydride. Use of this property can greatly reduce the cost of these specific reactions. Another interesting use for lithium aluminium hydride is in the purification of silicon for use in transistors; the action of the hydride on the nearly pure silicon produces silicon hydrides of high purity which are decomposed to give transistor grade silicon. The impurities are left behind as less volatile derivatives. The synthesis of the analogous compounds lithium borohydride and lithium gallium hydride has been reported.

Fall in Gas Works Tar and Benzole Output

For the 12 months ended 31 March, the gas industry's production of crude tar totalled 1,720 tons (1,838 tons) a drop of 6.4%. In the same period production of crude benzole totalled 24.4 million gall. (25.3 million gall.) a fall of 3.6%

Polarographic Society

The Polarographic Society now has a permanent postal address to which all enquiries should be sent. It is care of Lloyds Bank Ltd., 36 High Street, Wealdstone, Middx.

Esso Aids to Education

A gift of £50,000 has been made by Esso Petroleum Company to the Southampton University Centenary Appeal Fund. This follows a number of other donations to education made by the company, including over £80,000 to St. Catherine's College, Oxford; £35,000 to Churchill College, Cambridge; £13,000 to Manchester College of Science.

In addition to direct financial aid to universities and colleges, Esso finance up to 15 post graduate studentships for research in chemical engineering or chemistry, at five universities and colleges.

I.C.I. I.O.P. Nitric Acid Plant on Stream

PRODUCTION of nitric acid by the intermediate pressure ammonia oxidation process has now been started at the Ardeer works of I.C.I. Nobel Division. This process replaces the atmospheric pressure oxidation plant and also the two Dupont high-pressure oxidation plants at Ardeer, which have now ceased operation. In the new process, known as the I.O.P., ammonia is converted to oxides of nitrogen at atmospheric pressure but the gases, when passed to the 60-ft.-high absorption towers, are pressurised up to 42 p.s.i. An economical feature of the plant is that heat generated by the reaction is utilised to raise steam for the process.

Liquefied ammonia for use in the plant is brought from the Billingham Division's Mossend works and is stored in heavily insulated spheres at 0°C before being pumped, still in the liquid state, into an evaporator. At this point the temperature is reduced to −30°C. The ammonia, in the gaseous state, is mixed with washed air and the mixture is filtered through stoneware tubes as it passes to the convertors. There are three of these, each 9 ft. in diameter and using platinum-rhodium gauze as catalyst. The reaction is carried out at 850°C. In the next stage of the process the reaction gases are passed through a 2,000-h.p. centrifugal six-stage compressor, which is Swiss made and of stainless steel.

Beneath each convertor is a boiler which utilises the heat of the reaction to raise about 8,000 lb./hr. of steam at 270 lb. pressure. Steam from the waste-heat boilers operates a turbine which drives the compressor. Further energy for the compressor comes from a gas turbine utilising waste gases from the absorption system.

L.R.C. Sponsors Oral Contraceptive Research

The London Rubber Company are sponsoring research into possible new developments in the oral contraceptive field at the London Hospital. This step is being taken so that, in the event of this method becoming generally accepted, the company, makers of Durex, will be able to take advantage of the situation. The U.S. Food and Drug Association has already approved the sale of Enovid, 17-α-ethynyl-17-hydroxy-5(10)-estren-3-one, as an oral contraceptive (see CHEMICAL AGE, 21 May p. 853).

International Lactic Acid Research Association

The International Lactic Acid Research Association has been incorporated as a foundation under the law of the Netherlands as Stitchting I.L.R.A. (International Research Association). The board of Stitchting I.L.R.A. consists of Mr. M. H. M. Arnold, chairman; Mr. Dirk Stapel and Mr. Knud Thomsen. The secretary is Mr. Edward Glimsholt whose office will be at 39 Overgaden neden Vandet, Copenhagen, Denmark.

Atomic Power Slow-down Causes Uranium Surplus—A.E.A. Report

THE Government's recent decision to extend the period previously allocated for the full commercial development of nuclear power does not signify any diminishing of the production, research and development activities of the United Kingdom Atomic Energy Authority. This is evident from the Authority's sixth annual report, published last week (H.M.S.O., 5s) and covering the period 1 April 1959 to 31 March 1960, which, while revealing no outstanding developments that have not previously been reported, records steady progress in work ranging from the development of reactors and the production of reactor fuels to research and development over a wide field. It is also significant that the Authority's estimates for 1960-61 provide for a net expenditure of some £93.3 million, compared with £92.4 million for 1959-60.

Uranium Stocks

However, one important effect of the slowing down of the nuclear power programme is that the Authority will for some years hold larger uranium stocks than they need. Reductions in initial uranium loadings which have followed from design improvements in the magnox reactor have also contributed to this situation. Pointing out that the change from uranium scarcity to surplus is world-wide, the report states that it is improbable that uranium producers outside the U.S. will make any substantial new sales of uranium for the next decade.

The year saw the completion of the expanded capacity for the production of fissile material under the increased defence programme authorised in 1955. This included bringing up to full power the last three Chapelcross reactors and completing the planned expansion of the Capenhurst isotope separation plant.

Uranium Production. Dealing with the new uranium production plant at Springfields (described in CHEMICAL AGE, 31 January 1959, p. 199) the report recalls the problems of stability, of corrosion, and of the efficient recovery of some of the reagents, which occurred in the operation of the prototype unit for converting uranium nitrate into tetrafluoride using fluidisation techniques. The majority of these problems have now been overcome and the prototype is operating as a production unit yielding uranium tetrafluoride of good quality at the design throughput.

Uranium cartridges for the Calder and Chapelcross reactors are now being manufactured at the new Springfields factory. The new fuel element production lines have been designed to meet the requirements of the nuclear power programme and of the Authority's reactors and will, when running at full capacity, be capable of producing more than 300,000 uranium metal fuel elements a year.

The report reveals that negotiations are proceeding with various foreign organisations regarding the possible grant of licences by the Authority for the manufacture overseas of natural uranium fuel elements by the Springfields process. At a Press conference held last Thursday in connection with the report Sir Roger Makins, U.K.A.E.A. chairman, mentioned that approaches had come from Germany and Belgium, but the particular organisations concerned are not revealed.

Chemical Plants

Chemical Extraction. At Windscale, where there are chemical extraction plants for processing irradiated fuel, a new primary separation plant, due to be in operation in 1963, is under construction. Pilot-plant and laboratory studies have allowed the broad principles of design to be established and considerable work has been carried out in the instrumentation of the plant.

Isotope Separation. The major construction programme at Capenhurst was completed last November, when the last of the planned extensions to the diffusion plant was brought into operation. Intensive studies to improve efficiency and economy are being carried out. Automatic data processing equipment has been used to study the performance of the numerous stages of the isotope enrichment process.

Reactor Development. The Authority have given the highest priority to their work in support of the civil power programme. The development of reactors beyond the present type falls into stages, for which the Authority have concentrated on (1) the advanced gas-cooled reactor and (2) the fast breeder and high-temperature gas-cooled types. Recent studies have confirmed that the A.G.R. system offers the best prospect for the early achievement of competitive nuclear power in the U.K. Construction work on the prototype A.G.R. at Windscale should be completed by the spring of 1961 as planned.

Radiation Chemistry. Typical of the general research and development work being carried out in the Authority's laboratories is a study of the gamma-radiolysis of a simple oxygenated solvent, methyl acetate, which has shown how complicated the degradation of a simple ester can be. Twenty-three products were characterised and their radiation yields were determined. Their nature suggests that, with the exception of the carbonyl bond, every bond in the molecule may break on exposure to ionising radiations. The observed products are largely formed by combination or disproportionation of the eight possible radicals arising from the primary disruptions. The related symmetrical ketone acetone gives fewer products but a similar pattern of disruption seems to be indicated.

Radioisotopes Applications. Progress is reported in work on the application of radioisotopes, especially in industry. Thus, the method of fluorescence spectroscopy using radioactive sources has been applied to measuring very thin surface coatings. Instruments based on this and a related technique have been used industrially to measure metal coatings about 1/10,000 cm. thick, and also the thickness of ink on paper. By tracer methods, the rate of flow of liquid in closed channels can now be measured with an error of less than one part in 200. In industrial chemical applications of radiation, the method of coating synthetic fibres by gamma-ray induced graft polymerisation has been extended to give coatings capable of absorbing dyes.

Dungeness Atomic Power Contract Goes to Nuclear Power Group

BRITAIN'S sixth commercial nuclear power station—at Dungeness, Kent—is to be designed, constructed and commissioned by the Nuclear Power Group, the partnership formed last January between the Nuclear Power Plant Co. Ltd. and A.E.I.-John Thompson Nuclear Energy Co. Ltd. This £50-£60 million contract is the first to be obtained by the combined group, although A.E.I.-John Thompson were awarded the contract for the first commercial station, at Berkeley, while N.P.P.C. obtained the contract for Bradwell and are also concerned in the Latina nuclear power project in Italy.

Work on the Dungeness site will begin in August and the station will be completed in 1965. Like those of the earlier stations, the reactors will be of the gas-cooled, graphite-moderated type, using natural uranium fuel clad in magnox sheaths, but will incorporate the latest developments in reactor and heat transfer technology. Designed for a net electrical output of 550 Mw., the station will have two identical reactor units of some 840 Mw. thermal output each.

Each reactor will have a prism-shaped, graphite core, made up of large octagonal and small square bricks, enclosed in a spherical steel pressure vessel. The vessel will be surrounded by a primary biological shield of concrete through which will pass the gas ducts to four boilers. Dry carbon dioxide at a pressure of 283 p.s.i.a. will be circulated between the reactor core and the boilers by four blowers driven by back pressure steam turbines. Each reactor unit will have its own control system, fuel store, on-load fuelling equipment and also its own fuel cooling pond.

PEOPLE in the news

● **Dr. E. G. Cox, T.D., D.Sc., F.Inst.P., F.R.I.C., F.R.S.,** resigned the Chair of Inorganic and Structural Chemistry at Leeds University on 30 June on assuming the secretaryship of the Agricultural Research Council. **Professor A. Robertson,** formerly senior Professor of Organic Chemistry, Liverpool, has been appointed to the A.R.C.

● **Mr. J. A. Eggleston, B.Sc.(Lond.), F.R.I.C.,** formerly divisional analyst of the standards department of Boots Pure Drug Co., Airdrie, and formerly hon. secretary and treasurer of the Scottish Section, Society for Analytical Chemistry, will in September become chemistry master at the Methodist Boys' High School, Oron, Eastern Nigeria.

● **Dr. Alfred Caress, B.A., Ph.D.,** chairman of the I.C.I. Fibres Division, Harrogate, has been apointed a director of Imperial Chemical Industries Ltd. **Mr. G. F. Whitby, O.B.E., M.A., M.I.Mech.E.,** joint managing director of the division, has been appointed chairman. **Dr. E. B. Abbot** has been appointed a managing director.

In 1951 Dr. Caress became the first chairman of I.C.I.'s newly formed 'Terylene' council, charged with the task of commercial production and development. In 1956 this council was absorbed into the new Fibres Division,

Dr. A. Caress

G. F. Whitby

of which Dr. Caress was appointed chairman. He is also a director of Fiber Industries Inc., the joint I.C.I./American Celanese company for the production and sale of polyester fibre in the U.S. During the war Mr. Whitby was responsible for rockets and guided missiles at the Ministry of Supply Armaments Design Department. He became joint managing director of the Terylene council in 1954 and later a managing director of Fibres Division. With I.C.I. Dyestuffs Division from 1936 to 1951, Dr. Abbott became technical service member of the Terylene council in 1951 and technical service director of Fibres Division in 1956. In 1958 he also assumed the responsibilities of development director.

● **Dr. Gordon D. Rosen, B.Sc., Ph.D., F.R.I.C.,** formerly nutrition adviser to Pfizer Ltd., has been appointed general manager of International Protein Products Ltd., a subsidiary of British Glues and Chemicals.

● **Sir Henry Dale, O.M., G.B.E., M.D., F.R.C.P., F.R.S.,** senior trustee who has served as chairman of the Wellcome Trust for the last 22 years, has retired from the trusteeship having now reached the age of 85. He has accepted the invitation of the Wellcome trustees to retain his connection with their activities in an advisory capacity. **Lord Piercy, C.B.E., B.Sc.,** has succeeded him as chairman.

● **Mr. J. G. M. Thorne,** acting editor of *Chemistry and Industry* since the death of Mr. W. E. Dick in January, and who as stated in CHEMICAL AGE, 9 July, p. 69 is resigning at the end of September, has been appointed assistant editor of *The Industrial Chemist*. He takes up his new duties on 1 October. Mr. Thorne was with I.C.I.'s Dyestuffs Division for 30 years and was engaged in the research, development and plant manufacture of dyestuffs and intermediates.

● **Dr. Walter F. Jepson,** reader in tropical applied entomology, Imperial College, has been appointed by Cyanamid International as a regional scientific co-ordinator for agricultural chemicals in Europe. Dr. Jepson will be based at Cyanamid of Great Britain Ltd., Bush House, Aldwych, London W.C.2, but will travel throughout Europe to give on-the-spot scientific and technical advice to agriculturists on the control of plant pests and diseases. He will be a colleague to **Dr. W. M. McKay,** a prominent British veterinarian and animal nutrition expert who has been regional scientific co-ordinator in Europe for animal feed and health products.

● **Mr. P. F. Dale Rees, B.Sc., D.I.C., A.M.I.Chem.E.,** has been appointed a senior chemical engineer in the Chemical Plant Department of Simon-Carves Ltd., Cheadle Heath, Stockport, Ches., and not 'senior chemical engineer' as stated in 'People in the News', 9 July.

● **Dr. K. W. Gee,** oil works manager at I.C.I. Billingham Division since April this year, has been appointed deputy head of the company's central work study department in London. He will be succeeded as oil works manager by **Mr. E. J. Challis,** assistant olefin works manager.

● **Mr. G. C. Ottway** (W. Ottway and Co. Ltd., Ealing, London W.13) has been elected president of the Scientific Instruments Manufacturers' Association for 1960-61. **Mr. A. W. Jones** (Fleming Radio (Developments) Ltd.) is vice-president, **Mr. A. W. A. Rundle** (A. Gallenkamp and Co. Ltd., London E.C.2) is hon. treasurer and **Mr. E. R. Ponsford** (Solartron Electronic Group Ltd., Thames Ditton, Surrey) is hon. secretary. **Mr. L. A. Woodhead** (Cossor Instruments), the retiring president, became a vice-president. New council members are: **Mr. S. T. Pickering** (Chance Pilkington Optical Works, St. Asaph, Flintshire); **Mr. G. M. Sisson, O.B.E.** (Sir Howard Grubb, Parsons and Co. Ltd., Newcastle upon Tyne); **Mr. G. S. Sturrock** (Kelvin and Hughes Ltd., Barkingside); **Mr. R. Foxwell** (Wayne Kerr Laboratories Ltd., Chessington). Northern area representative is **Mr. A. W. Burrell** (Cambridge Instruments) who, with **Mr. Peter Schilling** (Stanton Instruments) representing the exports committee, was co-opted on to the council.

● **Dr. P. H. Calderbank, B.Sc., Ph.D., A.M.I.Chem.E.,** appointed Professor of Chemical Technology, at Edinburgh University, at the age of 41, has since 1955 been head of the D.S.I.R. Chemical Engineering Research and Process Development Division and is now at the Warren Spring Laboratory. He introduced chemical engineering research into

Dr. P. H. Calderbank

D.S.I.R. and he will be leaving a division of about 40 research workers. During the first three years of the war Dr. Calderbank worked at Royal Ordnance Factories and from 1943 to 1946 worked in the Bakelite research and development department on high polymers. He obtained a Ph.D. while a lecturer at University College, London, from 1946-52, for his work on kinetics in fluidised beds of catalyst. From 1952 to 1955 Dr. Calderbank was a professor in the Chemical Engineering Department at Toronto University and in 1955 on behalf of D.S.I.R. he undertook a study tour of chemical engineering research and teaching establishments in the U.S. He holds the John Millar-Thomson Medal for chemistry and the Senior Moulton Medal for chemical engineering (see also 'Distillates,' p. 130).

● **Mr. Ralph J. Assheton,** who has been appointed to the board of Borax Consolidated Ltd., the operating subsidiary of Borax (Holdings), is the son of Lord Clitheroe, chairman of the parent company. He is also a director of another Borax subsidiary, Theodore St. Just and Co. Ltd.

● **Mr. E. G. C. Mardall** has been appointed a director of Manchester Oil Refinery (Holdings) Ltd.

Overseas News

7,000 M.-LIRE INITIAL INVESTMENT FOR ITALIAN PETROCHEMICAL COMPLEX

IN its initial phase the construction of the Gela petrochemical complex will require an investment of Lire 7,000 million. The Anic-Gela Company, established in December to handle construction and administration, has an initial capital of Lire 10 million (to be raised gradually to Lire 10,000 million), subscribed by Anic and Soris. It is foreseen that in future share capital will be more widely distributed, with Anic holding a majority. Completion of the complex, which will be fully operative in about two years, will require a total investment of more than Lire 100,000 million.

The Gela oil that will be the principal raw material is characterised by high density and sulphur content. The deposit yields 3 million tonnes a year, and is Italy's most important oil field. Economics of recovering the crude are governed by the fact that the deposit is at a considerable depth, has a density of 8° A.P.I. and sulphur content of about 7-8% by weight.

The liquid hydrocarbons will yield diesel oil, fuel oil, gasoline, kerosene and other products. The hydrogen sulphide present in the gaseous fractions will be used for the production of sulphuric acid, while the desulphurised hydrocarbon gases will be used for the production of polythene and other products and a considerable volume of liquefied petroleum gases.

The facilities will have plants for the production of hydrogen for the desulphurising processes and for the synthesis of ammonia, which will be used for urea and ammonium sulphate. A steam generating station will use petroleum coke.

Titanium Oxide in Holland

Two Dutch companies—Billiton Maatschappij and Albatros Superfosfaatfabrieken N.V.—are in 1962 to open a plant for the production of titanium oxide in the Botlek area of Rotterdam. The Billiton concern will have a 55% holding in the plant.

W. German Chemical Exports Increase, Imports Too

West Germany's chemical exports are running 24% higher than last year's, it is reported from Frankfurt-on-Main. This percentage is the difference between the exports for the first quarter of the current year (some £125 million) and those for the same period of 1959. Over the same period, however, the country's imports of chemicals went up by nearly 50% to over £53 million in the first quarter of 1960. The share of chemical products in total West German exports fell, despite the increase in volume, from 14.1% in the 1959 period to 13.2% in the first 1960 quarter, the proportion of chemicals in total imports rising from 5.6% to 6.4%.

26% Fall in Italian Output of Sulphur

During the period from 1 July 1959 to 29 February 1960, Italian sulphur mines turned over to the Italian Sulphur Board (E.Z.I.) 68,986 tons of raw sulphur, of which 22,968 tons were produced in Italy and 46,018 tons in Sicily. This is about 26% less than the total recorded during the previous period. Sales totalled 86,453 tons (55,062 tons in Italy and 31,391 tons exported) or about the same as during the period 1 July 1958 to 28 February 1959.

Hoechst Shelve Austrian Polythene Plan ?

Last year Austria had a record output of 22,900 tonnes of plastics materials, including synthetic resins. This was 49% more than the 1958 figure. Leading producers are the Halvic concern (p.v.c.), Vedepha, a Hoechst subsidiary, and the Vereinigte Chemische Fabriken (both polyvinyl acetate). At the end of the current year or the start of 1961 the production of polypropylene will be started in Austria by Danubia-Petrochemie-AG. A Hoechst project to produce low-pressure polythene in Austria at Schwechat appears to have been shelved due to market conditions.

Sulphuric Acid from Indian Steelworks

The production of sulphuric acid has started at the Bhilai steelworks in India. Initial annual capacity is 18,000 tonnes of 98% concentrated acid. Most of the acid will be used with coke oven gases to produce ammonium sulphate fertilisers.

Polystyrene Plant for Poland

Poland is to build its first plant for the production of polystyrene fibres at Torun. The plant, construction of which will be started this year and completed in 1963, will by 1965 be producing 5,500 tonnes/year. This capacity is later to be increased to some 21,000 tonnes/year.

Union Carbide Plan World's Largest Polythene Plant in P.R.

A Union Carbide polythene plant in Puerto Rico is to be constructed and operated by Union Carbide Caribe, Inc., a wholly-owned subsidiary. The new facility will be adjacent to the existing chemicals plant of Union Carbide Caribe, near Ponce, which went on stream in mid-1959. The plant will have an initial capacity of 110 million lb./year of polythene. It is expected that the new production unit, which will serve all world markets, will begin operation during the second half of 1962. Plans for the next phase of additional petrochemical production units for Union Carbide Caribe will be announced in the near future.

The new plant will have the largest initial production capacity of any polythene plant in the world.

Union Carbide in Joint Japanese H.P. Polythene Venture

The Nitto Chemical Industry Co. of Japan are negotiating with the Hanover Bank, U.S., for the taking up of a $9.2 million loan to finance the formation of a company for the production of high-pressure polythene. The company would be formed in conjunction with Union Carbide Corporation, under the name of Nitto-Unicar, and would have a capital of Yen3,600 million. A 27,000 tons/year plant is planned near Kawasaki, at a cost of Yen5,800 million.

W. German Bill for Compulsory Desulphurisation

A Bill at present lying before the West German Parliament provides for statutory desulphurisation to a set sulphur content of liquid gas, natural gas, mineral oil products and other hydrocarbons imported into or produced in Federal Germany. This obligation would come into force on 31 March 1963. Maximum sulphur contents would be fixed by an Act by 31 December 1961.

Buna-Werke Expansion on Stream Ahead of Schedule

The first expansion stage of the East German chemical combine Buna-Werke has come into operation before the projected opening date. This will result in an increase for this year of 6,500 tonnes of chlorine and 7,500 tonnes of sodium lye to total East German production and a greater increase in coming years.

Fertiliser and Calcium Carbonate Plants for S. Vietnam

A decision has been reached in Saigon with regard to the use to which a loan of NF70 million made by France and repayable in 15 years should be put. The decision, which has been made the basis of a contract, is that the money should finance the building of a nitrogenous fertiliser plant and a production unit for calcium carbonate near the South Vietnamese town of Tourane. Imports of nitrogenous fertilisers last year doubled over the previous 12 months to reach a total of over 82,000 tonnes.

Spain Approves First Petrochemicals Project

The Spanish Government has approved plans of Calvo Sotelo, part of the country's I.N.I. group, to build an oil refinery and petrochemical plant. This is the first instance of Government permission being granted in Spain for the building of a petrochemical production unit. The grant

allows the use of foreign capital for the erection of the new mineral oil complex. Also granted is the permission to lay an oil pipeline from the port of Malaga to Puertollano, where processing plant will be located. Rumours that West German interests are connected with this project have as yet not been confirmed.

Deutsche Shell Open Godorf Refinery

Deutsche Shell AG, the West German subsidiary of the Royal-Dutch-Shell group, on 15 July opened a new oil refinery at Godorf, near Cologne. Initial throughput will be 2.5 million tonnes, this figure later to be increased to 4 million tonnes a year. Of the Godorf plant's output, some 8% will consist of benzene and gases for petrochemical processing at the nearby works of Rheinische Olefin-Werke. A further small share of the refinery's production programme will consist of liquid gas.

U.K. was Biggest Customer for Lacq Sulphur

In 1959, the U.K., taking 48,000 tonnes, was the chief foreign customer for Lacq sulphur, followed by West Germany (28,000 tonnes). This is stated in the annual report of the Soc. Nationale des Pétroles d'Aquitaine. Sales of sulphur in France last year totalled 180,000 tonnes, while exports totalled 200,000 tonnes. All sulphur produced up to 1958 was derived from pyrites and annual production totalled 150,000 tonnes. French needs had to be covered by imports which totalled 450,000 tonnes a year. Current consumption in France is put at 300,000 tonnes a year of sulphur. The Lacq natural gas installations will shortly be able to produce more than sufficient to supply domestic demands.

U.S. Aid for Yugoslav Production of Polythene, Polystyrene, etc.

Yugoslavia has obtained from the U.S. a loan of $23 million which will be used for the construction of plant to produce 15,000 tons a year of polythene and polystyrene, as well as 15,000 tons of other chemical products (raw materials for the production of synthetic rubber, Perlon, detergents, pesticides, synthetic tannins, etc.).

The plant will utilise natural gas produced at Klostar and Struzec, while benzole will be received probably from coke ovens at Zenica. Some of the equipment is being ordered in the U.K.

Soviet-financed Chemical Projects in Indonesia

The second Soviet loan of $250 million, granted to Indonesia, under an agreement signed during Kruschev's visit last February, will be used to establish chemical and metallurgical industries and textile plants, and to finance agricultural projects, according to the Soviet Embassy in Djakarta.

Australia Seeks New Uses for Big Sugar Cane Surplus

Following discussions with representatives of the Australian sugar industry anxious to find new uses for the present surplus of about 1 million tons of sugar cane a year, the Commonwealth Scientific and Industrial Research Organisation is to set up a Sugar Research Laboratory in Melbourne. Colonial Sugar Refining Co. are to contribute £A2,500 a year towards running costs. Dr. H. H. Hatt. to become leader of research, has left on a four months' world tour to learn of sugar research in other countries.

E.N.I. Plan Petrochemical Units in South Italy

E.N.I. are to build a Lire 40,000 million petrochemical facility at Ferrandina in Southern Italy, to utilise large natural gas beds discovered there recently. The new plant will use a little over one-third of the gas available. Another third will be sold to companies which are expected to build industrial plants in the neighbourhood of Ferrandina. To attract private investors the Government is to exempt the local gas from royalties and other duties.

Two pipelines will be built to carry the remainder of the gas to Matera and Bari where it will be used for domestic purposes.

Japan to Import Liquid Petroleum Gas ?

The General Bussan Trading Co. of Japan have sought permission from the Government to import liquid petroleum gas from the Middle East. The company plans to place an order with the local Mitsui Shipbuilding and Engineering Co. for a tanker designed to carry the gas and intends to build a tank storage farm. The company will, if permission is granted, import 32,000 tonnes of liquid gas in 1961, 37,000 tonnes in 1962 and 44,000 tonnes in 1963.

U.S. Firm Set Up Research Centre for Gas Chromatography

Barber-Colman Co. have established a gas chromatography research centre at Houston, Texas, believed to be the first of its kind ever to be established in this field by an industrial concern.

Main function of the centre will be new instrument development and evaluation of component parts and accessories. This will include the development of laboratory chromatographs, portable chromatographs, process monitors and custom instruments, as well as refinement of argon and flame ionisation detectors, sample injection devices and other accessory designs. Director of the research centre will be Mr. M. Simmons, formerly senior research chemist of Shell Oil Co.

Israeli Firm Gain Cathodic Protection Contract

Oraga Shipping Company have signed a $450,000 contract with Dov Spector of Tel Aviv whereby the Israeli company will provide cathodic protection for their ships. All the necessary equipment will be supplied by Dov Spector. The contract will remain in force for five years.

D.S.M. to Use New Process in Phthalic Anhydride Project

TO meet growing demand, Staatsmijnen in Limburg are to double the capacity of their existing phthalic anhydride unit. Part of the production will be carried out by a new process which will lead to better yields, it is stated in the company's annual report. Urea production is also to be extended, while capacity for caprolactam, as already announced, is to be doubled.

The polythene plant, producing Stamylan for sale by Verenigd Plastic Verkoopkantoor NV, Zeist, started up during the year with relatively little trouble. Capacity of the plant is to be increased considerably, making possible the production of several grades of Stamylan. More ethylene will be needed, and until now this has been obtained from coke oven gas. Since this supply is no longer sufficient for the growing polythene production, a cracking plant for oil products is being constructed.

Nitrogen output was about 6% up and totalled 217,000 tons of N, from which some 942,000 tons of fertilisers were produced. This represents about 52% of the three Dutch nitrogen plants. The rise was due to higher yields and throughputs. The nitrogen fixation works has started a unit for the cracking of methane which is recovered from coke oven gas. This permits a better utilisation of the various gases and enables the various sections of the ammonia plant "to be better attuned to each other" resulting in a higher nitrogen output.

Production of urea was stepped up from 53,000 tons to about 681,000 tons, part of the new extensions having been brought into operation. Nitrolime is now being delivered as prills and in the near future nitrolime will be made with 23% N, thereby cutting down the cost of transport per ton of nitrogen.

Sulphur has replaced pyrites as a basic material for sulphuric acid and two combustion plants have been brought into operation. The lead chamber plant and pyrites roasting installations have ceased operations.

Over the season September-September, consumption of pure nitrogen in the Netherlands totalled about 199,000 tons; exports during the same period exceeded the 200,000-ton level for the first time. Increasing competition is reported from U.S. and Japanese nitrogen producers and price cuts were inevitable.

Production of benzene for synthesis purposes has been further increased, and the average price realised by benzene products was higher than in 1958. The price of creosote oil declined, but proceeds from the sale of naphthalene were higher.

Commercial News

- D.C.L.'s Trading Group Profit Up By 20%
- Laporte Issue to Finance Spence Purchase
- Record Profits and Sales for Allied Chem.
- Bayer May Seek London Share Dealings

Ashe Chemical

Consolidated net profit of Ashe Chemical Ltd. for 1959 was £78,637 (£77,950). A final dividend of 11%, making 16%, has been declared. Development in overseas markets has met with continuing success, says Mr. F. T. Wright, chairman, with one exception. Owing to the complex trade marks situation in Germany, it has been necessary for the German subsidiary to cease to trade.

Commercial Plastics

Commercial Plastics Ltd., London, have with N.V. Boekelosche Stoomblekerij, Boekelo, set up a new company for the production, processing and marketing of plastics in the Netherlands. The new company, N.V. Boekelo-Plastics, also based in Boekelo, has a share capital of Fl.1 million (about £95,000).

Distillers Company

Group trading profit of the Distillers Company Ltd. for the year ended 31 March before depreciation of £2,486,476 (£2,269,019) was £32,906,234 (£27,259,010), an increase of 20%. Profit before tax of £14,743,700 (£12,521,683) was £31,610,124 (£25,693,778). Net profit attributable to Distillers Company was £16,866,424 (£13,172,095), an increase of 28%. To this must be added tax adjustments not applicable to the year's profits of £1,299,436 (£295,704).

Dividend on ordinary capital as increased by an 87½ capitalisation is increased with a final of 10%, making 15% (against an equivalent of 12½%). A further scrip issue on a one-for-five basis is proposed.

Hickson and Welch

The new shares to be issued by Hickson and Welch (Holdings) on a rights basis of one-for-four will have a price of 40s. Arrangements are in hand for underwriting the issue of the 500,000 10s. ordinary shares.

Laporte Industries

Laporte Industries Ltd. are to issue 2,627,280 10s. ordinary shares at 21s each on a one-for-eight basis, thereby raising some £2.7 million, after expenses, to finance the £2.6 million cost of acquiring the Widnes business of Peter Spence and Sons Ltd. The board expects to pay dividends of not less than 10% for the year ending 31 March next on the increased capital, of which 3% will be paid as an interim in December.

I.C.I. Loan Stock

Imperial Chemical Industries Ltd. announce that so far during July—the period for the third and final conversion of the company's 5½% convertible unsecured loan stock—£3,845,900 loan stock has been converted into 2,538,294 I.C.I. ordinary shares of £1 each. The total loan stock outstanding at the beginning of July this year was £5,641,100 and the amount so far converted represents only 68% of this. Conversion rights expire on 31 July.

Of the original issue of £40m. loan stock, £24,382,700 was converted in July 1958 and £9,976,200 in 1959, making a total of £34,358,900, representing approximately 86% of the original issue.

Allied Chemical Corporation

The Allied Chemical Corp., U.S., expect a record per-share profit of over $1.50 for the first half of 1960. Taking into account the split-up as of 1 January 1960, the company recorded a profit of $1.40 per share for the corresponding period of 1959. Turnover over the first five months of 1960 was the highest ever though below expectations. For 1960 as a whole estimates of a record turnover of $800 million ($719.7 million) and a profit per share of $3 are made.

B.A.S.F.

Badische Anilin- und Soda-Fabrik AG Ludwigshafen, have raised their capital from DM612 million (some £51 million) to DM700 million (about £59 million). The company states that investments for 1960 will exceed the 1959 record of DM304.52 million (some £25.4 million).

Bayer Shares

Farbenfabriken Bayer AG, are considering applying for a London quotation for their shares. The present level of the Bayer share has a gross dividend yield of just above 2%.

Chemische Fabrik von Heyden

The Munich chemical company, Chemische Fabrik von Heyden AG, are to pay a dividend of 10% plus 2% bonus (8%). Gross profit for 1959 totalled DM7,970,000 (DM5,790,000). Capacities for phthalic anhydride and softening agents were used to the full last year and both exports and licence fees for phthalic anhydride processes were up on 1958 levels.

Deutsche Solvay-Werke GmbH

The West German subsidiary of the Solvay Group, Deutsche Solvay-Werke GmbH, Solingen, is to raise its capital from DM75 million (about £6.25 million) to DM100 million (some £8.35 million).

Dutch State Mines

"Strong development" of chemical plants contributed to the favourable trading results, it is stated in the annual report for 1959 of Staatsmijnen in Limburg. Turnover totalled Fl.1,058 million (Fl.1,087 million) a fall of 3%. Profit before taxes was Fl.58.5 million (Fl.55.9 million) and represented 6.5% (5.1%) of turnover. Dividend is 13% (11%).

Fertiliser sales amounted to 942,000 tons (919,000), while sales of plastics materials totalled 21,300 tons (13,800). (See also p. 140.)

East India Distillers

East India Distilleries and Sugar Factories Ltd. are to make a rights issue of 550,000 £1 ordinary shares at a premium of 10s. a share, partly to finance their new fertiliser plant at Enmore.

Hooker Chemical

Hooker Chemical Corp., of New York City, U.S., have acquired Butler Chemical Co., Galena Park, Texas (near Houston). Butler manufacture defluorinated phosphate rock for use as animal and poultry feed supplement. The price and terms of the acquisition were not disclosed. For the present the plant will be operated as a separate unit of Hooker under the Butler Chemical name.

Standard Oil (N.J.)

Standard Oil Co. (New Jersey), last year sold a total of $256 million worth of petrochemical products. This figure was, like general figures for the year, an all-time record. Sales value rose by 5.5% over 1958 figures and sales volume by 8%. Total turnover was $8,710 million for the year. Net profit, although at $630 million, considerably up on the previous year's total of $562 million, was below the records set up in 1956 and 1957. Dividend for the year is $2.25 per share (same).

Wasag-Chemie AG

The Essen, West Germany, chemical producers Wasag-Chemie AG announced a suggested 1959 dividend of 12% (same) on a share capital of DM10,680,000 (DM10,000,000).

INCREASE OF CAPITAL

FISONS HORTICULTURE LTD., Harvest House, Felixstowe. Increased on 31 December, by £599,900 beyond the registered capital of £100.

LONDON GAZETTE

Partnership Dissolved

K.D. PRODUCTS (Keith Illingworth and Dennis Pedder), chemical manufacturers, 103 Caledonian Road, Leeds. Partnership dissolved by mutual consent as from 31 May so far as concerns K. Illingworth who retires from the firm.

TRADE NOTES

Agents for Italian Firm

Exsud, South American Minerals and Products Co. Ltd., 27 Cowcross Street, London E.C.1, have been appointed sole importers for the U.K. and Ireland of the fungicides and insecticides produced by the Societa Italiana Resine, S.p.A., Milan. The range includes zineb, maneb, ferbam, thiram, malathion, parathion, and related products.

Rexco Bulletin

Rexco Research and Development Co. Ltd., 34 Smith Square, London S.W.1, the research organisation for the Rexco group, have published the first of a series of information bulletins. By-products of Rexco solid smokeless fuel are a potential source of chemicals, notably the full range of phenols and the more complex high boiling phenols. The neutral oil contains paraffinic, the higher boiling aromatic and naphthenic hydrocarbons, etc.

Triphenyl Phosphate Price Cut

The Geigy Co. Ltd., Rhodes, Middleton, Manchester, have reduced the price of triphenyl phosphate by £13 a ton. The new price in 10-ton lots is £366. The reduction reflects a cut in the price of phenol.

Change of Name

Antigen Laboratories Ltd., chemical manufacturers, etc., 96-100 New Cavendish Street, London W.1, have changed their name to Anely Ltd.

Cyanuric Acid Technical

There are three additions to the B.D.H. range of chemicals. They are bis-salicylidene-diamino-ethane, flavin adenine dinucleotide, and cyanuric acid technical. The last chemical is thought to be of interest to some laboratories in view of the high price of pure cyanuric acid. It is a fine crystalline powder, assaying at about 99% and giving a satisfactory low figure of sulphated ash.

Porous Plastics Ltd.

A new company, Porous Plastics Ltd., has been formed to handle the manufacture and marketing of Vyon, the microporous plastics material introduced by Pritchett and Gold and E.P.S. Co. Ltd. last year. Made from high-density polythene of the Zielger type, Vyon is used in applications including air and liquid filtration, air-fluidised powder conveying, electrolytic diaphragms, orthopaedic splints and appliances, powder aeration pads for silos and bunkers, deionising equipment and for filters and silencers on pneumatic equipment. The address of the new company is: Dagenham Dock, Essex.

New Arca Catalogues

Three new catalogues available from British Arca Regulators Ltd., Sisson Road, Gloucester, deal with the Arca pressure regulator designed for the control of steam, liquids or gases, the double beat DB/15 control valve developed in France and now available in this country, and a temperature controller that is designed for the accurate control of temperature by regulating the flow of a heating or cooling agent in accordance with process demands.

Emulsion-bound Duramat

To meet demand for specialised glass-fibre reinforcement materials, Turner Brothers Asbestos Co. Ltd., Rochdale, will shortly start production of a new emulsion bound 'A' glass mat, for contact moulding. The material will be available from 1 August, and will be closely followed by the introduction of an 'E' glass emulsion Duramat. For compression moulding, Turners will continue to supply the specially formulated powder-bound Duramat in alkali and 'E' glass.

Change of Address

Address of the Scottish Association of Paint Manufacturers has been changed to 128 Hope Street, Glasgow C.2 (Central 6434).

B.T.P. Weathering Station

The Carlton Weathering Test Station of British Titan Products Co. Ltd., 10 Stratton Street, London, which has facilities to test, observe, evaluate and compare the performance of specimens under many conditions, is the subject of a new booklet.

Corrosion-resistant Coatings

Successful applications of Epiglo coatings described in 'Corrosion Commentary' No. 17—a broadsheet issued by Corrosion Ltd., 16 Gloucester Place, Portman Square, London W.1—include the protection of storage tanks in a chemical works, where the atmosphere is polluted with corrosive fumes and the tanks are subjected to continuous spraying with water, for cooling, during summer months. A three-coat Epiglo system was applied and is stated to have been still in good condition nearly two years later. The same publication discusses the use of Epiglo to protect a 24-in. gas main in an extremely sulphurous atmosphere, and for the inside of concrete tanks used for sludge settlement in a sewage works.

M. and B. Laboratory Chemicals

The sixth edition of the May and Baker 'Analytical standards for laboratory chemicals and reagents' is available. The catalogue lists close on 700 chemicals, each designated with a reference number for the purpose of ordering, an innovation in this edition. Other new features are the changeover to metric volume packs for all liquids, and the adoption in the main of the British Standard 2474 'Recommended Names for Chemicals used in Industry.'

Instruments and Controls

A range of air-operated regulating units, including valves, servo motors and valve positioners, is described in publication No. R30/RU published by Negretti and Zambra Ltd. Other recent publications include No. H23, on Gregory type electrolytic differential humidity indicators; R/43, electrical contact controllers (indicating and recording types); R/42, Gas-Stat controllers; and T/48, describing general-purpose Mersteel rigid stem dial thermometers.

Titanium Weight Tables

Latest I.C.I. titanium publication, No. 5, deals with weight tables. Covering plate and sheet, bar, rod, bar and billet, wire and tube, copies are available from the I.C.I. Metals Division, P.O. Box 216, Birmingham 6.

Market Reports

STEADY DEMAND FOR INDUSTRIAL CHEMICALS

LONDON Most sections of the chemicals market have experienced a good flow of new inquiry from home using industries, while the intake against contracts has covered reasonably good volumes, bearing in mind the proximity of the holiday period. Among the soda products there has been a fair demand for hyposulphite of soda, chlorate of soda and nitrate of soda. There has been a steady call for hydrogen peroxide and available supplies of oxalic acid are under pressure. Business in the fertilisers market continues to be fairly active.

Demand for the coal tar products has been sustained with creosote oil, cresylic acid and the light distillates in active request.

The price of copper sulphate has been reduced by £2 a ton to £83 a ton, less 2% f.o.b. Liverpool.

MANCHESTER With the holiday season approaching its height a large number of textile and other consuming outlets in Lancashire are closed down, with the usual seasonal effect on the Manchester market for chemical products. On the whole, however, the movement against contracts during the past week has been on a satisfactory scale, both on home and export accounts, and a fair number of fresh inquiries have been dealt with. In the tar products section, the movement of refined tar has been affected to some extent by the weather conditions but a steady demand has been reported for creosote oil and carbolic and cresylic acids.

SCOTLAND Although a fairly active position has been maintained during the past week in the Scottish heavy chemical market, there has been a slight easing off due to the approaching holiday period, particularly in the Glasgow area. From those areas not yet affected, business has been brisk, and both enquiries and demands have been varied. As already reported, considerable interest is still being shown in regard to agricultural chemicals. Prices on the whole have continued steady with little variation.

NEW PATENTS

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

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

ACCEPTANCES

Open to public inspection 17 August

Process for polymerisation of isoprene and polymers so produced. Phillips Petroleum Co. **845 200**

Polyglycol ether derivatives and process for their manufacture. Ciba Ltd. **845 286**

Process for the production of chlorinated phenols with recovery of hydrochloric acid. Reichhold Chemicals Inc. **245 287**

Polymerisation process. Distillers Co. Ltd. [Divided out of 801 401.] **844 769**

Process for the polymerisation of olefins. Ruhrchemie AG. **844 864**

Steroid compounds. Merck & Co. Inc. [Addition to 830 921.] **845 295**

Production of petroleum coke. British Petroleum Co. Ltd., and Knight, W. N. N. **844 698**

Steroid compounds and their preparation. Merck & Co. Inc. **845 116**

Process for the manufacture of partially acylated polyvinyl alcohol. Consortium Für Elektrochemische Industrie GmbH. **844 866**

Linear polymers of vinyl hydrocarbons and process for their preparation. Montecatini Societa Generale per L'Industria Mineraria E. Chemica. **844 944**

2-(N-substituted)-acylamino-1, 3, 4-thiadiazole-5 sulphonamides. American Cyanamid Co. **844 946**

Sulphonium compounds. Beecham Research Laboratories Ltd. [Addition to 800 963.] **845 021**

Manufacture of combustible gases. Power-Gas Corporation Ltd. **844 775**

Methods of bonding metals to organic fluorocarbon plastic materials and articles made thereby. International Resistance Co. **844 776**

Water-insoluble monoazo-dyestuffs of the benzene-azo-aceto-acetylamino benzene series. Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius, & Brüning. **844 777**

Process for resolution of glutamic acid. Ajinomoto Co. Inc. **844 952**

Preparation of eta alumina. Esso Research & Engineering Co. **844 637**

Synthetic lubricants. British Petroleum Co. Ltd., Pethrick, S. R., and Sparke, M. B. [Addition to 824 249.] **844 778 & 844 779**

Polyepoxide heat hardenable and heat hardened compositions and a process for their preparation. Union Carbide Corporation. **845 121**

Monoazo triazine dyestuffs. Imperial Chemical Industries Ltd. **844 869**

Organopolysiloxane compositions. Imperial Chemical Industries Ltd. **844 780**

Method of purifying barium oxide. Columbia-Southern Chemical Corp. **845 122**

Cobaltiferous mono-azo dyestuffs of the benzene azo pyrazolone series. Holliday & Co. Ltd., L. B. **844 873**

Fungicidal compositions containing triacetin. Wisconsin Alumni Research Foundation. **845 029**

Processes of preparing pigmented coating products and pigment dispersions in resins and other binders and/or solutions of these. Sonsthagen L.A. **844 786**

Water-insoluble tertiary amines. Sandoz Ltd. **845 220**

Olefin separation recovery. Esso Research & Engineering Co. **845 312**

Chlorine manufacture. Imperial Chemical Industries Ltd. **844 789**

Separation of metal salts from aqueous solutions. Rohm & Haas GmbH. **845 124**

9-α-halo-16α, 17-α, 21-triol-4-pregene-3, 11, 20, trione and 21-esters thereof. American Cyanamid Co. **844 790**

Process for the purification or separation of terephthalic and isophthalic acids, and the monoesters and polyesters thereof. Union Rheinische Braunkohlen Kraftstoff AG. **844 957**

Production of polymer-compositions. British Rubber Producers' Research Association, and United Kingdom Atomic Energy Authority. **844 791**

Purification of pyridoxine-yielding materials. Vitamins Ltd. **844 883**

Acid amide dis azo-pigment-dyestuffs and process for their manufacture. Ciba Ltd. **844 794**

5:5 - disubstituted - 1:3 - diformylhexahydropyrimidine - 4:6 - diones. Imperial Chemical Industries Ltd. **845 235**

Purification of gases or gaseous mixtures. Johnson, Matthey & Co. Ltd. **844 971**

Production of hydrogen. Hydrocarbon Research Inc. **844 797**

Production of heterocyclic compounds. May & Baker Ltd. **845 034**

Derivatives of hexachlorotoluene. Velsicol Chemical Corporation. **845 036**

Prestressed polytetrafluoroethylene tube and method of making same. Resistoflex Corporation **844 895**

Oxidation of organic compounds. Imperial Chemical Industries Ltd. **845 038**

Stabilised giberellic acid compositions and their preparation. Imperial Chemical Industries Ltd. **844 549**

Ethylene polymerisation. Imperial Chemical Industries Ltd. **844 656**

Processes of preparing pigmented coating products and pigment dispersions in resins and other binders and/or solutions of these. Songsthagen, L. A. [Addition to 844 786.] **845 045**

Process for the purification of polymerisable heterocyclic nitrogen compounds. Phillips Petroleum Co. **844 981**

Molybdenum blue complexes and lubricating compositions containing same. Institut Francais Du Petrole, Des Carburants Et Lubrifiants. **844 811**

Thiazolidine derivatives. Imperial Chemical Industries Ltd. **845 248**

Sulphur compounds and bactericidal and fungicidal compositions. Du Pont De Nemours & Co., E.I. **844 816**

Process for preparing L-glutamic acid. International Minerals & Chemical Corporation. **844 910**

Sulphonium anion exchange resin. Dow Chemical Co. **845 055**

Alkyloxy-and alkenedioxy-benz[c] acridine derivatives and methods for preparing the same. Parke, Davis & Co. **844 818**

Treatment of poly(ethylene) oxide. Union Carbide Corporation. **844 820**

Anhydride hardeners for polyepoxides. Du Pont De Nemours & Co., E.I. **845 057**

Process for the recovery of manganese from solutions of manganese salts. Israel, State of, Block, R., and Perlmutter, S. **845 058**

Process for preparing additive compounds. Esso Research & Engineering Co. **844 984**

Preparation of oxygenated products from cyclic mono-olefins by ionisation and oxidation. Esso Research & Engineering Co. **844 825**

Nuclearly fluorinated M-meterocyclic compounds and a process for their production. Farbenfabriken Bayer AG. **845 062**

Linear polyesters. Union Carbide Corporation. **844 826**

Amine compounds and a process for the manufacture thereof. Hoffmann-La Roche & Co., AG, F. **844 827**

Method for preparing succinaldehyde bisulphite compounds. Boehme, W. R., and Tobkes, M. **844 830**

Aliphatic dicarbamates. Farbenfabriken Bayer AG. **844 831**

Method for decolorisation and stabilisation of benzyl chloride. Sicedison S.p.a. **845 072**

Catalytic polymerisation of olefins, the resulting polyolefins; and reaction media for the catalytic polymerisation of olefins. Bataafsche Petroleum Maatschappij N.V., De. **845 073**

Manufacture of thermoplastic fibres. Compagnie De Saint Gobain formerly Manufactures Des Glaces Et Produits Chimiques De Saint-Gobain, Chauny & Cerey S.A., Des **844 991**

Making cyclo-pentadienyl manganese compounds electrolytically. Ethyl Corporation. **845 074**

Working up of low pressure polyolefines. Chemische Werke Hüls AG. **844 832**

Soap composition. Unilever Ltd. **844 918**

Production of boron. American Potash & Chemical Corporation. **844 587**

Production of organic nitriles. Du Pont De Nemours & Co., E.I. **845 086**

Preparation of aluminium trialkyls. Esso Research & Engineering Co. **844 590**

Process for the polymerisation of chloroprene stabilised with phenthiazine. Farbenfabriken Bayer AG. **844 592**

Process for the preparation of perchloroethylene. Columbia-Southern. Chemical Corporation [Addition to 811 833.] **844 595**

Preparation of 3,3,3-trifluoropropene. Abbey, A. (Dow Chemical Co.). **844 597**

Addition polymers of monomeric vinyl compounds and unsaturated linear polyester resins and a process for their production. Herberts, K. (trading as Herberts & Co. Vorm. O. L. Herberts, D. K.). **844 739**

Process for the catalytic and selective decomposition of formic acid in carboxylic acid mixtures. Bataafsche Petroleum Maatschappij N.V., De. **844 598**

Process for the isomerisation of saturated hydrocarbons. Universal Oil Products Co. **844 837**

Thermoplastic resins. Union Carbide Corporation. **845 099**

Steroid compounds and their preparation. Merck & Co. Inc. [Divided out of 845 116.] **845 117**

Benzoquinolizine derivatives and a process for the manufacture thereof. Hoffmann-La Roche & Co. AG, F. [Divided out of 843 310.] **845 098**

Monoazo triazine dyestuffs. Imperial Chemical Industries Ltd. [Divided out of 844 869.] **844 870**

Catalytic polymerisation of olefins. Esso Research & Engineering Co. [Divided out of 841 638.] **845 100**

Open to public inspection 31 August*

Process of recovering uranium. Price, T. D., and Jeung, N. M. **846 861**

Preparation of tetrahalomethanes. Haszeldine, R. N., and Iserson, H. **846 869**

Zinc pigment production. Marx, W. [Divided out of 846 902.] **846 903**

Metallic pigments. Marx, W. [Divided out of 846 902.] **846 904**

Process for the manufacture of polyethylene. Farbwerke Hoechst Aktiengesellschaft Vorm Meister Lucius & Brüning. **846 893**

Epoxide resins. Yarsley Research Laboratories Ltd., formerly Dr. V. E. Yarsley (Research Laboratories) Ltd. **846 706**

Production of acetals and dibasic acids therefrom. Boake, Roberts & Co. Ltd., A. **846 906**

Polyamide moulding compositions. Chemstrand Corporation. **846 907**

Method of converting a solution of radioactive salt into compact solid form. United Kingdom Atomic Energy Authority. **846 281**

**N.B. Acceptances open to public inspection on 24 August were published in C.A., 16 July, p.114, under the date of 10 August.*

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Classified Advertisements can be accepted for insertion up to 10 a.m. Tuesday for insertion in the same week.

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KINGS PATENT AGENCY, LTD. (B. T. King, A.I.Mech.E., Patent Agent), 146a Queen Victoria Street, London, E.C.4. City 6161. Booklet on request.

The Proprietors of British Patents Nos. 770, 624 for "SUBSTITUTED ENDOXY-PERHYDROISOINDOLINES" and 770, 625 for "SUBSTITUTED ENDOXY-PERHYDROPHTHALIMIDES", desire to enter into negotiations with a firm or firms for the sale of the Patents or for the grant of Licences thereunder. Further particulars may be obtained from MARKS & CLERK, 57/58 LINCOLN'S INN FIELDS, LONDON, W.C.2.

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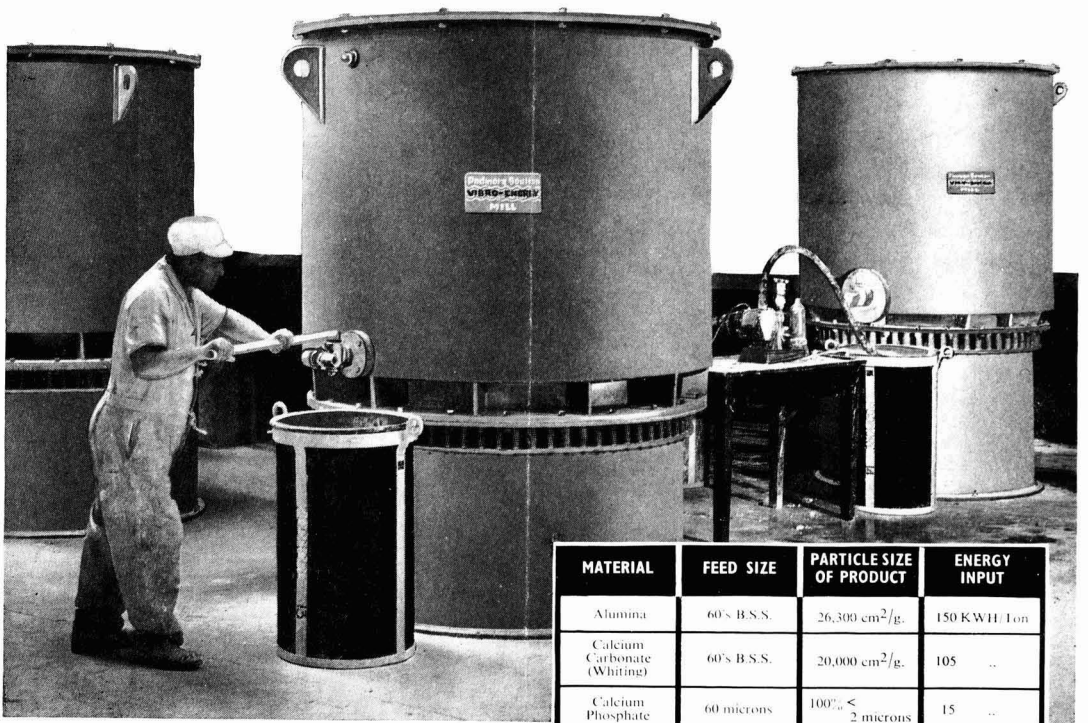

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