Chemical Age

SYNTHETIC RUBBER DEVELOPMENTS
(page 597)

VOL. 77 No. 1969

6 April 1957

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

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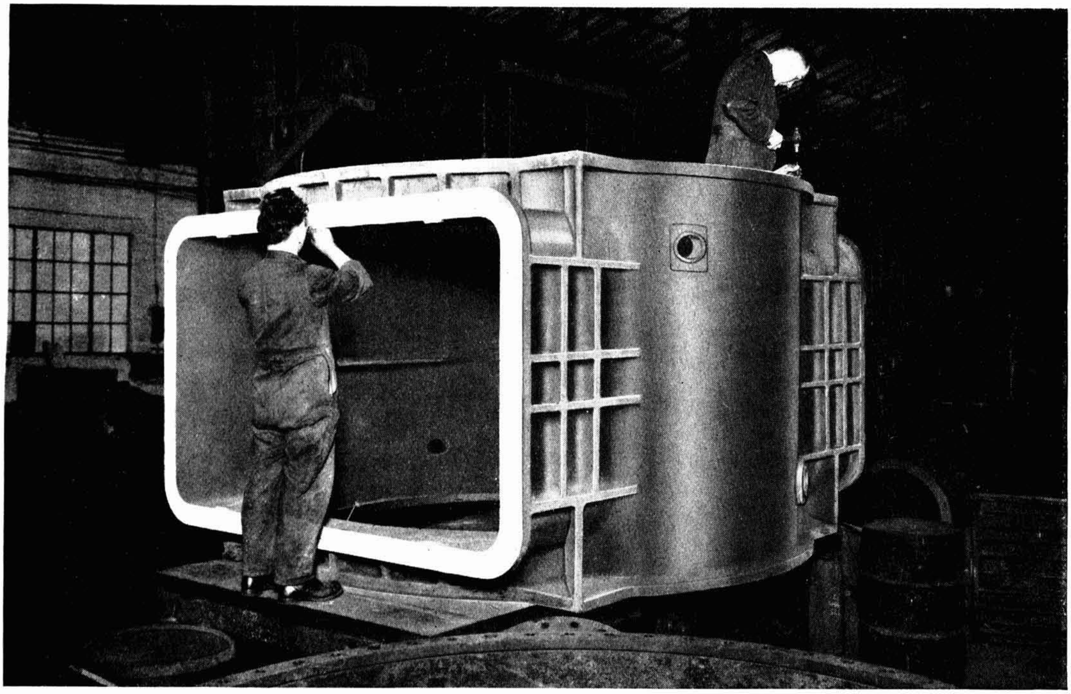

Marking out a cast iron cylinder 9′ 0″ internal diameter by 6′ 0″ deep. Length over rectangular branches 10′ 3″.

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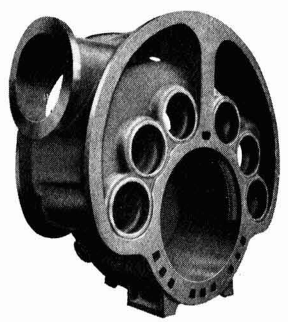
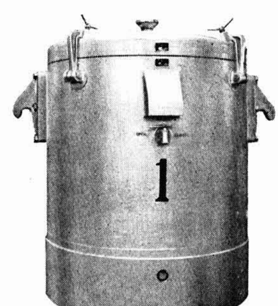


Compressor cylinder casting, 7′ 1¼″ high × 6′ 8″ wide × 2′ 7½″ deep. Weight 98 cwts.



Special cast iron vessel supplied to Atomic Energy Authority. 5′ 8″ outside diameter × 6′ 3″ high. Weight 30 tons.

W 42

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CHEMICAL AGE

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IN THIS ISSUE

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URANIUM OUTLOOK

IN THE NEXT FIVE YEARS Great Britain is to buy 115 million dollars' worth of uranium from Canada for the expanded UK nuclear power programme. This announcement was made last week after the Prime Ministers of Britain and Canada met in Bermuda for joint talks. At the same time the Atomic Energy Authority in London announced its readiness to buy annually in the Rhodesian Federation chemical concentrates containing 500 tons of uranium oxide.

Contracts are to be offered covering a ten-year period from the coming into production of a mine, provided that the end date of the period does not extend beyond 1972. It is also expected that the Authority will undertake to purchase in any one year uranium-bearing ores containing up to a total of 100 tons of uranium oxide from small producers. Rhodesia in return has agreed that the Authority shall have a first option on any supplies of uranium which are available for export.

The importance of the Canadian-UK uranium agreement is that it will allow the UK to develop her nuclear programme to the fullest possible extent. Prior to this the US had first call on almost all Canada's uranium production, which prevented the UK coming to any arrangements with Canada.

This deal is also important for the uranium producers since it will permit them to go ahead with expansion schemes for production and treatment plants. US contracts with Canada expire in 1962. However, the UK supply position after 1962 has already been mentioned and further discussions are to take place.

Of significance is the fact that the agreement not only means the UK will receive an average of between 700 to 1,000 tons of uranium metal a year from Canada during the years 1957 to 1962, but the UK will be a contractual customer in the control of the world's largest source of uranium.

Estimated production of uranium oxide by 1958 from the main sources is as follows:

	Short tons
Canada	14,500
US	10,000
South Africa and Belgian Congo	5,500
Australia and others	3,000
Total	33,000

No lack of demand for uranium is expected. Indeed, it has recently been estimated that 50,000 tons of the metal will be required to supply the 27-megawatt capacity nuclear power programmes of the UK, the Euratom countries, Japan and the US alone, which covers periods ranging from eight to ten years as from this year. The expanded UK nuclear programme alone will require the use of between 7,000 and 10,000 tons of uranium metal for the initial charges of uranium fuel for the reactors of the 19 nuclear power stations. Altogether it is estimated that UK uranium fuel requirements for peaceful purposes will be at least 13,000 to 14,000 tons of the metal during the next eight years up to 1965.

NEW INDUSTRIAL CHEMICALS

INVESTIGATIONS by the chemistry department of Birmingham University on fluorine compounds may well provide the chemical industry with new raw materials for producing fibres, plastics, lubricants and dryers.

It has been revealed that the department has been able to substitute fluorine for hydrogen in benzene, to give fluorobenzene, and using this raw material almost all coal-tar chemistry can be repeated with the production of substances having possibly outstanding characteristics. Chief attraction of the fluorine compounds is their great chemical stability.

The new products have been made possible by the development of a gas chromatography apparatus. This employs a new technique which is considered to have very useful applications in small-scale commercial production of specialised products and in the recovery of low-boiling liquids, such as solvents and blending agents used in a number of industries.

These research investigations, which are assisted by Government subsidies, are of considerable interest to industry. The department, however, is unable, through lack of money, to provide sufficient quantities of the new compounds for industry to carry out adequate tests, but it is hoping the Government will assist by providing money for establishing pilot plant production.

At present, the department is investigating non-inflammable anaesthetics and new drugs. Utilisation of sugar and the resulting production of a wide range of fibres, dyes, drugs, rayon and acetate plastics have been studied by the department with consequent stimulation of interest in sugar cane as a raw material of the future (see CHEMICAL AGE, 15 December 1956, pages 441 and 443).

Fibre from sugar has already been investigated by one industrial concern with favourable results. Economic evaluation, however, has not been possible as means of producing sufficient quantities are lacking.

Stimulation of nature's photosynthesis techniques which has been included in the Department's research programme has resulted in a greatly increased rate of production of large, tough carbohydrate molecules, required by industry for factory production.

FOOD DYES IN THE US

IN CHEMICAL AGE of 29 September 1956 (p. 574) it was reported that the US Food and Drug Administration had prohibited the use of the coal-tar dyes FD & C Orange 1 and 2 and FD & C Red 32. Now it is likely that four more dyes used in food, FD & C Yellow Nos. 1, 2, 3 and 4, will be banned from use if the Food and Drug Administration's proposed rule goes into effect.

From 1950 FDA has been investigating certified food colours. The four yellow dyes in question have not produced harmful effects in humans, but certain animal test findings have led the FDA to propose that their use in foods should be prohibited. The dyes, however, will still be permitted in drugs and cosmetics for external use.

US law (i.e. Food, Drug and Cosmetic Act) regarding colouring agents added to food, states that these must be proved 'harmless and suitable for use.' The word 'harmless,' however, has not been fully defined, and the FDA and a US court of appeals consider that it must be interpreted to mean harmless under any conditions of use. It is of interest to note that the FDA can take no legal action against excessive use of colours from any batch that has been certified for use.

Top priority has been given to FDA's current investigation into the more widely used food colours and particularly to the above mentioned yellow dyes. Yellow Nos. 3 and 4 in the US are mainly used in margarine and other dairy products such as cheese, and in 1956 the FDA certified 27,000 lb. of Yellow No. 3 and 38,000 lb. of Yellow No. 4. A comparatively small amount of Yellow No. 1 was certified (1,100 lb.) mostly for export while no Yellow No. 2 was produced in 1956.

In the US, the National Milk Producers' Federation state that coal tar yellow dyes are little used today in butter. Margarine manufacturers have not commented on the proposed ban. It is suggested by an US industry spokesman that FDA's tests have been carried out at too high a level and it is considered that at normal levels of use no harm has or will result from these four yellow dyes. US dye manufacturers will, it is believed, propose legislation to define clearly FDA's right to establish levels of use and tolerances for food colours. For the present, the industry will oppose the FDA proposed ban.

Vegetable colours are also being considered by the FDA for at the end of January the FDA announced that natural vegetable dyes, such as natural carotene and caramel, would be exempt from certification. This poses the problem of synthetic carotene for under the FDA plan, this would have to be certified. A coal tar colour is composed of or contains, chemicals derived from coal tar and by this definition synthetic carotene is a coal tar dye. Obviously the definition of coal tar dye requires to be modified and brought up to date to overcome such difficulties. These FDA actions are in line with the UK Government committee which has recommended that only a restricted list of dyes should be used for colouring food.

CO-OPERATIVE GROUP RESEARCH

BY MEANS of a series of surveys the National Science Foundation of the US hopes to provide the first overall view of scientific research and development in the US.

A report of such a survey, on 'Research by co-operative groups,' prepared by Batelle, has just been issued by the Foundation. It reveals that in 1953, 543 co-operative groups—trade organisations, professional and technical societies, agricultural co-operatives, and research-educational co-operatives—spent $21 million for research and development. It is of interest to note that most of this sum was for technical research and development, mainly in the chemical and engineering sciences. About 70 per cent of the money was spent for applied research and 30 per cent for basic research.

Of the various groups studied, it was found that professional and technical societies devoted most funds to basic research, while trade associations, as would be expected, tended to spend most for applied research.

Trade associations accounted for 60 per cent of expenditures, agricultural co-operatives 15 per cent, professional and technical societies 10 per cent, and research-education co-operatives five per cent. Expenditures by industrial organisations ranged from less than $100 to nearly $1.7 million. One-third of the reporting organisations (173) spent seven-eighths of the total dollar volume of group research ($18 million).

This report would appear to be significant not only by virtue of the determination of the volume of research carried out by co-operative organisations, but also by indicating the influence which such research support has upon research policies and practice, particularly in industry.

MOTHPROOFING OF WOOL

According to a statement by Mr. T. G. Carter, chairman of the Australian Wool Bureau, scientists of the International Wool Secretariat are reported to have developed a process which successfully mothproofs wool. Details of the process are to be announced within six weeks.

UK Synthetic Rubber Output will Total 80,000 tons by end-1958

Dunlop Director at London Symposium

With plants now coming into operation and new ones soon to be built the UK will shortly be essentially independent of other countries for the supply of synthetic rubbers. By the end of next year, British synthetic rubbers of various types will probably be manufactured at the rate of over 80,000 tons a year.

This was stated by Mr. E. A. Murphy, director of research, central research division, Dunlop Rubber Co. Ltd., at the first International Synthetic Rubber Symposium, held in London last week (see also CHEMICAL AGE, 30 March page 559).

Speaking of the future outlook, Mr. Murphy said that although the largest competitor of natural rubber, GR-S, was not able to replace, for example, large truck tyres, scientific progress did not stand still. He referred to the reports on polyisoprene and polybutadiene rubbers now in the early stages of development and to the introduction of new catalytic methods which yield polymers of greater molecular precision. Of greatest interest in this field was the work of Ziegler and Natta on the polymerisation of olefines and diolefines, the Alfin polymerisation of dienes, and the polymerisation of olefines on solid bed catalyst systems in the Standard Oil of Indiana and Phillips processes. Olefines generally gave high melting, crystalline and fibre-forming polymers with these new catalyst systems but it was possible to prepare catalysts which, although still possessing the desirable features of directive catalysts, gave rubbery polymers. It was these materials which were of considerable potential interest because of the low cost of the basic olefinic materials, such as ethylene and propylene, from which they are derived.

In conclusion, Mr. Murphy said that there was a growing demand for rubber, both natural and synthetic. He suggested also that modern biochemical research now being applied in Malaya and elsewhere would lead to considerable improvements in the quality of natural rubber and its economic developments.

Ameripol SN Rubber

A paper by the B. F. Goodrich Research Centre Staff for Goodrich-Gulf Chemicals Inc., was presented by Mr. Robert P. Kenney, European director, chemical activities, B. F. Goodrich Co. This dealt with Ameripol SN (cis-1,4-poly-isoprene), produced by polymerisation of isoprene using a Ziegler-type catalyst.

The identity of Ameripol SN with Hevea rubber hydrocarbon has been established by infra-red absorption, phase microscopy, second order transition methods and X-ray diffraction methods. Osmotic pressure and solution viscosity methods have indicated molecular weight and structure. Compounding has shown a close relationship between Ameripol SN and Hevea rubber such that direct substitution of one for the other can be made in practically any application.

To date two groups of 11×20 heavy-duty bus and truck tyres have been made and tested and more than 2 million miles of road testing has been carried out without a failure. It is considered that Ameripol SN is a potential replacement for all or part of natural rubber in tyres.

New Italian Elastomers

Preparation of linear polymers was the subject chosen by Professor Giulio Natta of the Industrial Chemical Institute, Milan Polytechnic. Partially isotactic (20.25 per cent crystalline) polymers of alpha-olefines, consisting of stereoblocks, show in orientated state elastic properties (reversible elongation of 100-200 per cent) and high tensile strength, as a consequence of a chain aggregation (acting as a physical thermolabile vulcanisation) connected with crystallinity.

High resilience is shown by ethylene-alpha olefine homogeneous polymers. From these, vulcanised rubbers have been obtained having tensile strength of up to 3kg./mm.^{2} elastic elongation higher than 500 per cent, good resilience and good chemical and abrasion resistance. Copolymers of alpha-olefines with small amounts of diolefines have also been prepared.

Self-reinforced Elastomers

Chemical, physical and rheological properties of self-reinforced elastomers were described by E. E. Gale, of the Sales and Technical Service Division, Polymer Corporation, US.

Cis-trans Ratio of 1,4-Polybutadienes

Physical properties of vulcanised 1:4-poly butadienes ranging from 95 per cent *cis* to nearly 100 per cent *trans* configuration have been investigated by Dr. Gerard Kraus, of Elastomer Reinforcement Research Phillips Petroleum Co., with co-authors Dr. J. N. Short and Mr. Vernon Thornton. Vulcanisates of all 1,4-polybutadienes with 15 per cent or more *cis* content are rubbery at ordinary temperatures. Polybutadienes having 93 per cent of *trans* content yield tough leathery crystalline vulcanisates at 80°F which at moderately high temperatures become rubbery.

Cis-forms have been found to have excellent resilience and low hysteresis even at temperatures of −40°F. Polymers with 87 to 82 per cent *cis* content remain rubbery down to their brittle point (Ca-85°C). Vulcanisates of 70 to 80 per cent *trans*-polybutadienes show crystallinity over a wide range of temperatures. Resilience at low temperatures is said to be somewhat better than GR-S.

SYNTHETIC RUBBER LANDMARKS*

1913 By this time several UK patents covered production of diene monomers; progress had been made in their polymerisation.

1930 ICI file patent on high pressure polymerisation of elastomer forming monomers (BP 365,102).

1934 Black synthetic rubber shown at opening of ICI Blackley laboratories. Dunlop carry out research in field of thioplasts.

1936 ICI begin major research project to become free of IG Farben patents; most promising rubber was methyl methacrylate—submitted to Dunlop for evaluation. Importance of carbon tetrachloride as modifier of polymerisation was discovered; outstanding results were obtained by copolymerising 2-chlorobutadiene with 1-cyano-butadiene.

1939-1945 Vinyl polymerisation was greatly speeded by ICI with mixtures of oxidising and reducing agents (essentially the Redox system). A new route for butadiene manufacture was found using 2-3-butylene glycol as starting material. Butadiene polymerisation was studied by Dunlop. ICI worked on condensation rubbers such as Vulcoprene A (a di-iso-cyanate-modified polyesteramide) and thioplasts. Dunlop showed interest when Far East latex supplies were cut off. Thiokol was produced.

1948 Petrochemicals developed 'Catarole' cracking process, yielding small quantities of C_4 hydrocarbons including butadiene.

1952 First batch of cold rubber made.

1953 UK firms began construction of monomer and synthetic rubber plants.

* From Mr. E. A. Murphy's paper.

New Elastomer Family

Mr. R. M. Pierson and co-authors of the research division, the Goodyear Tire and Rubber Co., gave details of a versatile family of elastomers which has been prepared by free radical addition of aliphatic mercaptans to the double bonds of diene polymers. High saturation levels were readily achieved without degradation of the basic polymer chain. Technology and kinetics are said to be similar to ordinary emulsion polymerisation.

A wide range of compositions and of physical properties were attained in the adducts by varying the nature of the base polymer, the mercaptan used and the extent of saturation. In general, resistance to ageing, ozone attack, heat, solvent swelling and to permeation by gases increased with increasing extent of saturation. A highly saturated methylmercaptan adduct of polybutadiene showed diffusion resistance better than butyl, solvent swelling intermediate between neoprene and medium nitrile content butadiene-acrylonitrite rubbers and ozone resistance comparable to better commercially available saturated rubbers.

Adducts with 85 per cent saturation levels could be cured in same way as base polymers. High saturation levels required actuated or 'butyl-type' curing systems.

Synthetic Rubber Auxiliaries

Organic auxiliary materials were reviewed by Dr. W. Mc. G. Morgan, development division Monsanto Chemicals Ltd. He stated that carbon black remains as yet a unique reinforcing filler, However, development of high-styrene rubber reinforcing resins had opened the way to the production of hard-wearing, low-gravity light-coloured stocks, which were finding increasing use in place of leather.

New Type Neoprene Latex

Neoprene latices were discussed by E. P. Hartsfield and a new type of neoprene latex—Type 750 which is claimed to have outstanding stability to storage, mechanical action and compounding—was described. It produces films characterised by low modulus, improved hot properties and resistance to stiffening due to crystallisation.

Polyurethane Rubber

Section leader of the main research laboratory Farbenfabriken Bayer, AG, Dr. Erwin Muller considered particularly polymerisation with polyalcohols, such as glycol and diamines. To achieve technically valuable properties for every di-isocyanate the suitable glycol or diamine had to be found, he reported. New combination possibilities between di-isocyanates and polymerising agents were mentioned.

Oil-resistant Rubbers

Oil resistance of nitrile and acrylic rubbers was discussed by S. Mottram, and P. H. Starmer, of the Technical Service Laboratory, British Geon Ltd. Investigations have shown that this is dependent on the chemical nature of the raw polymer. Properties other than oil resistance may be modified or enhanced by the incorporation of various compounding ingredients; e.g., fillers, particularly carbon black, improve tensile properties and plasticisers improve flexibility at low temperatures. Blends with p.v.c. are stated to offer resistance to ozone and reduce inflammability while retaining good oil resistance. Blending with other rubbers improves processing.

Silicone Rubbers

Recent developments in silicone rubbers were dealt with by Philip C. Servais of the Silastic section, product engineering laboratories, Dow Corning Co. and Dr. I. H. Riley, technical service department, Midland Silicones Ltd. They stated that vulcanisation is now possible by the reaction of vinyl groups with sulphur, by the use of metal catalysts at room temperature and by irradiation. Extruded or calendered silicone rubber can be vulcanised in seconds at 650°F.

Butyl Rubber Vulcanisates

Relationship of polymer structure to properties of butyl rubber vulcanisates was the subject of Dr. W. L. Dunkel of Enjay laboratories with co-authors, Mr. W. C. Smith and Mr. R. L. Zapp. A technique was reported which can be utilised in compounding butyl to obtain vulcanisates with increased resilience and improved dynamic properties. This consists of either thermal or chemical interaction of the polymer with carbon black. Co-vulcanisation of butyl with Bunga-S and natural rubber yields semi-ebonite compounds.

Butyl Polymers for Tyres

In a paper on the status of butyl tyres in the US, Mr. D. J. Buckley reported that the problem of resilience had been solved by chemically-promoted heat treatment of polymer-pigment systems. A butyl latex ENJ-B-12 which was found to be applicable as cord treatments for both rayon and nylon is now available in pilot-plant quantities.

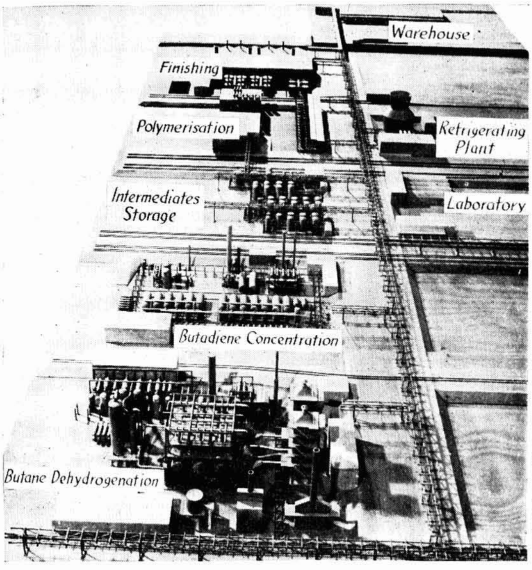
Research in vulcanisation rates has produced accelerated systems showing significant rate increases of vulcanisation of butyl compounds. A new butyl polymer ENJ-B-11 is said to open up new areas of compounds capable of rapid vulcanisation.

New Synthetic Rubber Plant Will Come on Stream Next Year

THIS new synthetic rubber plant, shown below as a model, will go on stream at Hüls, West Germany in summer 1958, state Chemische Werke Hüls. It will produce 45,000 tons of cold rubber a year. Site of the plant now under construction, measures 600 metres long by 250 metres. Workforce will total only 400 as production will be fully automatic.

The new cold rubber is butadiene styrene copolymer. The butadiene is made from n-butane by rehydrogenating using the Houdry process (this will take place in the foreground). Behind this is the butadiene concentration plant (Esso process) in which copper ammonia acetate is used. Next is a storage unit and then the polymerisation and the processing plant. Finished rubber warehouse is in the background.

Professor Paul Baumann, managing director, of the company gave a paper at the first International Synthetic Rubber Symposium held in London last week dealing with the latest developments in the synthetic rubber field (CHEMICAL AGE, 30 March, page 559).



Model of the new synthetic plant being built at Hüls, West Germany. From foreground to back are plants for dehydrogenation, butadiene concentration, storage, polymerisation and warehouse

Glycerine Increases Vinyl Polymerisation Rate

RESEARCH at the Polytechnic Institute of Brooklyn, New York, has shown that glycerine has a marked effect on the reaction rates of diffusion controlled chemical reactions. Glycerine increases the local viscosity of the reaction solution and hence influences the velocity of reaction.

Results show that increasing the glycerine content markedly alters the rate of polymerisation of vinyl compounds, the rate of clotting of blood, the fluorescence of diphenyl methane dyes and the rate of photobleaching or dyes.

Both the rate of vinyl polymerisation and the molecular weight of the resultant polymer are increased by the introduction of glycerine.

UK Chemical Exports & Imports in Jan./Feb.

EXPORTS

		QUANTITY		VALUE	
		Jan./Feb. 1956	Jan./Feb. 1957	Jan./Feb. 1956	Jan./Feb. 1957
INORGANIC					
Acids	Cwt.	32,463	40,156	97,790	102,807
Copper sulphate	Tons	10,471	4,902	1,139,551	454,434
Sodium hydroxide	Cwt.	1,037,875	835,718	1,211,538	1,038,632
Sodium carbonate	,,	762,649	711,091	489,637	496,776
Aluminium oxide	Tons	2,869	4,749	91,851	157,537
Aluminium sulphate	,,	6,398	4,612	96,956	68,979
Other aluminium cpds.	,,	676	587	28,835	25,268
Ammonia	Cwt.	17,158	11,785	61,736	40,795
Ammonium cpds. (not fertilisers or bromide)	Tons	3,729	3,457	144,027	128,838
Arsenical compounds	,,	490	782	37,679	57,415
Bismuth compounds	Lb.	58,886	64,470	51,253	54,596
Bleaching powder	Cwt.	83,374	37,988	128,194	68,894
Hydrosulphite	,,	7,073	22,023	55,421	174,585
Other bleaching materials	,,	18,462	20,117	80,666	92,417
Calcium compounds	,,	55,533	52,343	112,258	110,293
Carbon blacks	,,	74,866	126,265	261,651	450,129
Cobalt compounds	,,	2,887	1,990	127,114	101,982
Iron oxides (chemically manufactured)	,,	17,450	14,829	63,093	45,251
Lead compounds	,,	5,973	6,194	39,857	40,257
Magnesium cpds. (nes)	Tons	2,186	2,787	109,419	137,817
Nickel salts	Cwt.	9,792	15,240	97,593	159,316
Potassium cpds. (not fertilisers or bromides)	,,	7,531	6,993	82,609	79,090
Sodium bicarbonate	,,	121,442	108,941	108,069	98,645
Sodium phosphates	,,	9,649	29,115	45,633	127,464
Sodium silicate	,,	58,644	59,059	51,050	52,236
Other sodium cpds.	,,	236,617	229,337	534,870	591,027
Tin oxide	,,	814	1,732	31,341	64,188
Zinc oxide	Tons	1,200	1,296	93,898	77,624
Other inorganics (nes)		—	—	735,240	835,112
ORGANIC					
Acids, anhydrides & salts & esters	Cwt.	—	—	224,844	216,733
Glycerine	,,	14,936	25,264	163,841	226,478
Ethyl, methyl, etc., alcohols & mixtures (nes)		—	—	196,245	243,582
Acetone	Cwt.	31,388	20,490	71,373	64,664
Citric acid	,,	5,384	11,157	53,224	107,586
Gases, compressed, liquid or solid		—	—	177,309	298,972
Phenol	Cwt.	19,886	27,185	118,856	179,662
Salicylates	Lb.	116,084	213,813	37,736	60,658
Sodium compounds	Cwt.	5,757	4,739	59,048	66,260
Sulphonamides, not prepared	Lb.	145,678	271,956	110,451	192,935
Dyestuffs intermediates	Cwt.	12,726	18,919	234,851	271,376
Organic compounds (nes)		—	—	2,118,501	2,638,741
Total elements & cpds.		—	—	**9,775,108**	**10,500,051**
Coal tar	Tons	20,054	14,094	181,179	138,662
Cresylic acid	Gall.	472,138	509,741	143,764	187,340
Benzol	,,	3,811	1,559	1,560	709
Creosote oil	,,	2,336,211	3,169,163	151,104	216,470
Other mineral tar & crude chems. from coal, petroleum & nat. gas	Cwt.	46,828	41,148	105,572	94,864
Pigment dyestuffs	,,	4,337	4,294	202,203	177,771
Other syn. dyestuffs & compounds	,,	36,241	41,543	1,613,319	1,814,055
Synthetic pigments	,,	3,668	3,854	119,434	155,594
Veg. & animal dyeing extracts	,,	410	907	21,640	28,495
Tanning extracts	,,	17,043	21,811	79,696	99,420
Pigments, paints & varnishes		—	—	3,712,398	3,870,047
Drugs, medicines, etc.		—	—	6,020,270	6,248,627
Ammonium nitrate fertilisers	Tons	1,165	71	35,974	2,546
Ammonium sulphate	,,	14,836	3,068	285,927	58,456
Phosphatic & potassium	,,	—	—	16,802	10,439
Other manufactured fertilisers		—	—	141,399	138,908
Explosives		—	—	1,863,930	1,755,425
PLASTICS MATERIALS					
Phenol & cresol formaldehyde resins	Cwt.	11,062	8,811	70,031	71,996
Urea formaldehyde resins	,,	46,000	45,310	203,036	220,176
Vinyl resins, unplasticised	,,	21,988	28,782	237,375	248,883
Vinyl resins, plasticised	,,	19,852	15,987	258,644	190,116
Other vinyl resins	,,	27,159	31,669	320,537	434,359
Moulding powders	,,	112,629	158,377	1,416,064	2,030,846
Sheet, rod, tube, film & foil	,,	60,757	62,885	1,480,235	1,474,119
Insecticides, fungicides & weedkillers	,,	99,925	74,433	956,407	913,995
Carbons, decolorising or activated	,,	12,218	14,328	53,354	59,220
Tetra-ethyl lead anti-knock compound	Gall.	820,464	1,007,352	1,733,658	2,195,805
Other chemicals (nes)		—	—	2,189,994	2,939,511

IMPORTS

		QUANTITY		VALUE	
		Jan./Feb. 1956	Jan./Feb. 1957	Jan./Feb. 1956	Jan./Feb. 1957
INORGANIC					
Acids	Cwt.	19,100	14,210	53,268	42,659
Al. oxide abrasives	Tons	3,552	1,976	214,712	148,065
Silicon carbide abrasives	,,	2,333	1,077	234,174	109,052
Arsenic trioxide	,,	2,381	783	80,211	25,183
Borax refined	Cwt.	75,860	106,517	140,414	202,947
Calcium carbide	,,	84,196	129,594	154,112	242,592
Carbon black (channel)	,,	28,084	40,847	154,288	227,334
Other carbon black (not acetylene black)	,,	28,932	17,475	116,851	64,898
Cobalt oxides	,,	1,407	591	88,082	36,941
Iodine	Lb.	74,959	387,237	37,009	149,155
Mercury	,,	227,856	325,178	256,517	362,416
Sodium, calcium, potassium, lithium	Cwt.	14,400	4,675	224,196	38,126
Carbonate	,,	11,126	22,488	36,486	70,583
Other potassium cpds. (not fertilisers)	,,	12,559	16,930	60,595	77,569
Selenium	Lb.	27,564	32,595	109,500	188,553
Silicon	Tons	1,142	1,048	162,102	161,582
Chlorate	Cwt.	16,804	20,250	52,257	67,003
Phosphate	,,	2,358	923	12,056	4,685
Other sodium cpds.	,,	53,995	40,385	230,152	142,021
Inorganic chemicals (nes)		—	—	377,348	505,194
ORGANIC					
Acids, anhydrides & their salts & esters		—	—	372,263	297,433
Glycerine	Cwt.	16,392	10,192	127,533	60,961
Menthol	Lb.	12,112	55,504	26,684	119,880
Naphtha, methyl & alcohols & alcohol mixtures		—	—	354,109	291,947
Turpentine	Gall.	92,246	43,155	26,110	12,246
Glycol ethers & esters	Lb.	1,520,253	1,337,961	125,997	125,704
Sodium cpds.	Cwt.	18,617	27,613	212,251	292,743
Styrene (monomeric)	Gall.	670,109	157,990	376,641	85,816
Vinyl acetate (monom)	Tons	1,448	1,341	209,759	158,336
Dyestuffs intermediates	Cwt.	1,604	6,814	82,805	228,343
Organic cpds. (nes)		—	—	2,273,342	1,762,173
Syn. dyestuffs & cpds.	Cwt.	4,498	6,994	396,740	541,631
Dyeing extracts	,,	2,745	4,371	15,176	33,446
Tanning extracts	,,	155,175	164,004	593,362	614,107
Pigments (inc. tit dioxide)	,,	18,191	11,019	187,015	112,677
Other pigments, paints, etc.		—	—	90,570	157,440
Vitamins, salts & esters		—	—	288,309	206,441
Antibiotics		—	—	105,580	238,926
Alkaloids		—	—	201,992	90,417
Basic slag	Tons	30,274	30,780	240,685	252,763
Potassium chloride	Cwt.	2,075,161	2,010,138	1,712,195	1,732,852
Potassium sulphate	,,	62,220	62,007	63,841	63,983
Other fertilisers		—	—	121,011	373,594
PLASTICS MATERIALS					
Vinyl resins	Cwt.	21,978	22,671	314,136	336,821
Other syn. resins	,,	23,231	37,702	310,506	531,883
Moulding powders	,,	8,125	10,040	132,545	137,955
Sheet, rod, tube, film & foil	,,	21,637	22,410	991,949	1,039,590
Disinfectants, insecticides, weedkillers, cattle dressings	,,	3,967	9,656	144,342	326,137

EXPORTS OF CHEMICAL ELEMENTS AND COMPONENTS TO PRINCIPAL MARKETS

	Jan./Feb. 1955	Jan./Feb. 1956	Jan./Feb. 1957
	£	£	£
Nigeria	170,134	87,358	81,973
Union of South Africa	474,169	505,733	529,025
Rhodesia and Nyasaland	32,923	56,342	80,666
India	837,456	942,343	1,276,771
Pakistan	150,296	73,065	76,693
Singapore	96,884	84,800	114,159
Malaya	126,753	126,926	151,027
Hong Kong	76,117	95,598	133,599
Australia	557,833	680,682	760,799
New Zealand	208,914	201,070	158,908
Canada	271,163	261,866	257,306
Jamaica	83,311	198,786	179,701
Other Commonwealth	185,137	222,465	219,852
Irish Republic	233,785	249,070	210,988
Finland	152,227	106,949	121,217
Sweden	296,430	248,935	346,715
Norway	305,812	204,827	263,868
Denmark	226,439	223,032	208,242
Poland	61,958	23,371	66,123
Western Germany	200,343	169,522	387,640
Netherlands	312,965	375,093	403,356
Belgium	170,012	194,279	237,388
France	240,782	271,779	551,247
Switzerland	111,247	136,622	194,157
Portugal	42,620	111,508	208,820
Spain	69,627	60,906	105,920
Italy	236,090	329,442	329,324
Greece	135,895	333,672	24,038
Turkey	17,311	127,089	58,898
Netherlands Antilles	110,562	40,386	84,777
Egypt	165,848	146,551	—
Israel	38,170	46,200	92,425
Iraq	47,407	99,333	47,574
Indonesia	149,099	182,687	309,872
China	103,192	21,343	88,985
Japan	33,065	72,310	112,158
Phillipine Republic	53,563	49,484	32,038
United States of America	545,593	535,117	513,738
Mexico	120,719	129,971	72,200
Argentine Republic	517,824	63,311	210,528

DISTILLATES

★ For 107 years without a break, Dartmoor has housed criminal offenders. For many years before 1816 it was used to hold first French and then American prisoners-of-war. But Dartmoor's claim to fame has not rested solely on the fact that it is ideally sited for purposes of incarceration. The buildings were closed from 1816 to 1846 and then for a brief interlude of four years—until 1850—they became a chemical works. Alembic would like to hear from any reader who can tell him what prompted this out-of-character change, what chemicals were made on the 'Moor' and who was responsible for what must have been the bleakest chemical works in history.

★ Last week's reference in Chemical Age's survey of Lancashire and Cheshire to the fact that ICI's pharmaceutical division was building new research laboratories in Alderley Park, calls to mind the 500 year association of the Cheshire beauty spot with the Stanley family.

Lord Stanley of Alderley sold his library and much of his furniture to meet death duties when he succeeded to the title in 1931. The house was demolished and he lived in a small separate wing. The whole estate of 4,600 acres was sold in 1938 and it was then broken up.

Most of the 350-acre park, now owned by ICI, is being farmed. The shell of the laboratories is completed and the buildings should be opened by the end of the year. One of England's most gracious and stately home will then have become one of the country's most modern research laboratories.

★ East Germany's 250,000 chemical workers are giving their Communist Government a considerable headache. Party secretary at Halle, Fran Bruk, in a recent article in *Neues Deutschland,* the official newspaper, complains some chemical workers have adopted the view that East Germany must be incorporated in the Federal Republic to give the workers a better living standard.

★ 'The distillate of the acid that is eating into the structure of our trading position today' is described by Sir Miles Thomas, chairman of Monsanto Chemicals, in an article published in the *South Wales Echo* last week. He does not believe that sheer greed or insiduous political influence are responsible for the current industrial unrest.

The problem is more fundamental and Sir Miles sees it as a lack of proper understanding of industrial finances. Who is to blame? He declares 'We of the management classes must accept a large measure of responsibility. . . . The gap between employer and employee has widened alarmingly since world war 2.' Employers have done precious little to stem the demand for higher wages.

The solution: a change in the attitude that starts with the employers, is explained to union leaders and then, more important, to the workers. Employers must do far more to educate their workers; they must spend much time and money cultivating public relations and they must keep the workpeople in the picture 'in respect of the make-up of our prices.'

★ It would be interesting to see a comparison of capital now being spent by various industries on new buildings and plant. Certainly, chemicals would figure high on the list. An example of recent 'hustle' building in the industry comes from BB Chemical Co. Ltd., whose new three-storey office block was opened on 24 March at Ulverscroft Road, Leicester. From the date of the contract being signed, the offices were built and ready for use in the space of 52 weeks.

★ Average weekly earnings for all workers in the chemical industry in 1956 is given by the Ministry of Labour as £10 8s 5d, the lowest rate of a list of nine industrial groups. Highest paid jobs (average of all workers) were metal manufacture (£14 10s 6d) and in the docks (£13 10s 9d). This might come as a surprise to chemical manufacturers who have always maintained that their workers were comparatively well rewarded.

The position is considerably changed, however, when the comparisons of average weekly earnings are confined to adult men; in this case the chemical industry figure is £12 0s 8d, fifth in the list behind paper and printing (£13 13s 9d); metal manufacture (£13 8s 0d); engineering, shipbuilding, electrical (£12 13s 5d); and vehicles (£12 11s 8d).

★ Chemical employers have for long enjoyed good relations with their workpeople. Latest evidence of this comes from Billingham, where last week Dr. S. W. Saunders, joint managing director of that ICI division, said that one in every three employees had long-service awards. Mr. T. C. Robinson, engineering works manager, added that over 7,000 had so far qualified for awards in the division and that by 1959, about 1,100 men would be qualifying each year. The division employs a total of 13,000 men.

★ Still concerned over the Soviet action in Hungary, Waterford dockers are to discuss a resolution calling on them not to discharge cargoes of Russian potash. Ships concerned are said to have been loaded at Hamburg, although their cargoes originated from Russia and were said to be 'the product of slave labour'. Many will find this sentiment commendable, but one that stems from muddled thinking for there is no doubt that such action hits the importing firm as much as the Soviet Union.

Alembic

SYNTHESIS OF PENICILLIN ANNOUNCED BY US CHEMISTS

Chemical synthesis of penicillin has now been accomplished at Massachusetts Institute of Technology by Dr. John C. Sheehan, and Dr. K. R. Henery-Logan. Dr. Sheehan began his penicillin research investigations in 1948 and final results have now been announced in the *J. Amer. Chem. Soc.,* 11 March issue.

Novel reactions and technology which are expected to prove of value in solving other chemical problems, are used in the Sheehan process. It consists chiefly of a series of reactions of room temperature or below. The crucial stage occurs when a carbon atom is bonded to a nitrogen atom, completing the structure of the final product, phenoxymethyl penicillin, which is known as penicillin V, the orally effective form of the antibiotic.

It is not thought that the new chemical method will be cheap enough to compete with the established fermentation process, but it is hoped that the new forms will prove effective against organisms now resistent to natural penicillin and against a wider variety of infections. New penicillins may also have less tendency to produce allergic reactions.

This research on the chemical synthesis of penicillin has been aided financially by Bristol Laboratories of Syracuse, New York, US. Further research is being conducted by Merck, Sharp and Dohme Research Laboratories where 10 new types of the synthetic penicillin were prepared. It is stated that these types are all antibiologically active and could not have been obtained through the fermentation process.

Gibberellic Acid for Research

Small quantities of gibberellic acid are now being offered to research workers interested in plant-growth stimulators, by Pfizer Ltd., Folkestone. The Pfizer organisation produces gibberellic acid by fermentation processes.

Experimental evidence so far available in the US indicates that gibberellic acid, when sprayed on plants or trees, can result in a doubling or trebling of linear growth in a few weeks. The effects are said to be most spectacular with 'dwarf' varieties, indicating an important association with genetic structure.

PLASTICS AGAINST CORROSION

Properties and Uses of Synthetic Materials in Chemical Engineering

RECENTLY, plastics have begun to play a substantial part in the prevention and control of corrosion and, together with rubber compounds, are probably the most promising group of materials available to the chemical engineer for this purpose.

Most plastics materials are inherently resistant to chemical attack and a few of them, notably polytetrafluoroethylene (p.t.f.e.), are inert to the majority of chemicals met with in the industrial field. However, the virtue of corrosion resistance alone does not imply that a particular material is, or could be, a universal choice; equally important is the requirement that the material can be fabricated into the structure necessary, whether large or small, or of complex shape.

One of the principal advantages of plastics is that they can be produced in a great variety of forms. Polyvinyl chloride, for example, can be calendered to flexible film, or pressed out as rigid or flexible sheet, or produced in block form; it can be extruded into flexible or rigid profiles of virtually any shape—tubing of 15 in. diameter is now commonplace; it can be injection moulded with accuracy; it can be expanded to give flexible or rigid sponges; it can be formulated into pastes for spreading and coating. Not all plastics are available in all these forms, of course, neither are they all as resistant to chemical attack as p.v.c., but it should be clear that this versatility is of great value to the corrosion engineer, whose problems cover a very wide range of situations and conditions.

Varying Properties of Plastics

Before dealing with the individual plastics in detail it should be remembered that there are two principal methods of varying the properties of plastics: by 'tailoring' the basic polymer, or by judicious compounding of the polymer with other substances.

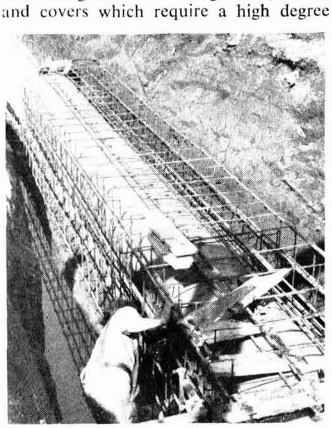
Compounding of p.v.c. with other materials is now standard practice and, depending on the additives, compounds can be produced ranging from soft and rubbery-like materials to tough and extremely hard substances. This point has been stressed in order to make clear that, while compounding has many advantages, a major disadvantage is the fact that the chemical resistance of a plastics material may often be reduced by the addition of materials such as plasticisers, stabilisers and so on, which are not themselves especially resistant to chemical attack.

Vinyl Materials: As may have been gathered, p.v.c. and its associated polymers and compounds comprise the most important group of plastics at present in chemical plant. By virtue of its physical properties it has become the principal material used by fabricators of chemical plant and, in general, it is used for all purposes where its relatively limited mechanical strength is not a handicap, i.e. for pipelines, troughs and valves, centrifugal and axial flow fans and fume and air conditioning ducting.

An outstanding property of p.v.c. is its excellent abrasion resistance and because of this it is being specified for lining chutes and as backing plates for belt conveyors in the chemical industry. Rigid p.v.c. is used for constructing acid dip tanks, and for lining steel or concrete tanks. Until recently it was difficult to use rigid p.v.c. for lining steel tanks due to the fact that the coefficient of expansion of rigid p.v.c. is about seven times that of steel and this meant that, in service, rigid p.v.c. linings frequently broke down due to the stresses set up by unequal expansion, particularly where warm liquids were being handled.

For certain applications loose insert linings, suitably reinforced, have been tried, but these have proved to be expensive. Where conditions are not too severe, lightly plasticised p.v.c. linings have been employed with considerable success, and another way of overcoming the difficulty has been to use a laminate of rigid and soft p.v.c., thus putting a layer of soft material between the lining and the metal to take up the differential expansion. (For oxidising liquids, such as 96 per cent nitric acid, vinylidene chloride copolymer is used for the upper layer of the laminate). This, however, posed certain jointing problems, particularly where very corrosive liquids were involved.

A major advance has been the recent introduction of rubber-modified p.v.c. sheet (weld rod etc.), which has the degree of flexibility necessary to overcome the previous difficulties, and this material is now being used for lining tanks, hoods and covers which require a high degree of protection against chemical attack.

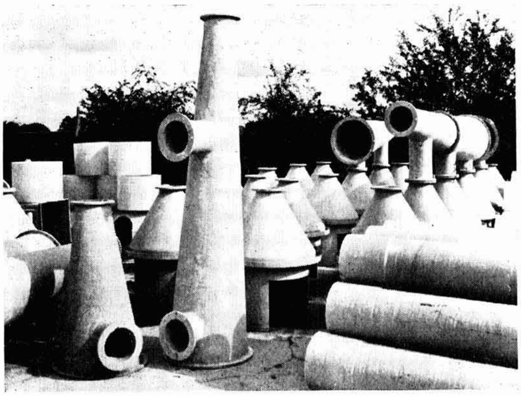


Section of centrifugally cast polythene effluent drain showing reinforcing bars before pouring of concrete. Courtesy ICI plastics division

Welding of rigid Vybak p.v.c. ducting made up from sections of extruded tube by Extrudex Ltd., Bracknell. Courtesy Bakelite Ltd.

Apart from its limitations as to temperature rigid p.v.c. has three unusual characteristics for which allowance has to be made when it is used as a structural material in chemical plant. These are: notch sensitivity; elastic memory and the fact that its tensile strength is a function of the duration of the applied stress. The approach to construction in rigid p.v.c. is quite different from that in metal and is one of the reasons why the use of rigid p.v.c. in chemical plant has not advanced in Great Britain to the same extent as it has in Germany. There, much of the original development work on rigid p.v.c. was carried out prior to the recent war and, since the end of hostilities, considerable technical data have been built up, on which chemical engineers can draw freely. This has enabled the Germans to produce very ambitious units which have up to now set a world standard in chemical plant design.

Vinyl materials are also used for surface coating purposes. Vinyl chloride/vinyl acetate copolymer, for instance, is extensively employed in solution as a paint. Special primers are used to effect good adhesion to metal, and steel, brass, copper and even aluminium can be given protective coatings in this way. Vinyl coatings give excellent protection against fumes and splash, and their ageing properties are also very good. Apart from chemical plant vinyl coatings find application in other fields of engineering: one recently reported from America involved the painting of 27 lock and dam installations on the Mississippi. Here an important advantage is the resistance of the vinyl coatings against abrasion of the metal gates at the water line caused by floating debris, such as logs; another valuable asset is the rapid drying of the coatings, due to the fact that no oxidation or curing process is necessary, drying being achieved by solvent evaporation



Ducting, cowls and stacks for a fume extraction system at a preserve factory made from Bakelite polyester and epoxide resins reinforced with glass fibre material by Mendip (Chemical Engineering) Ltd.

alone. This means that dam gates can be painted and returned to service more quickly, thereby reducing maintenance costs.

For extremely corrosive conditions coating technique is modified by using a top sealing coat based on straight p.v.c., without plasticisers. Where resistance to solvent or petrol is required, formulations incorporating other resins, such as polysulphides, are often used.

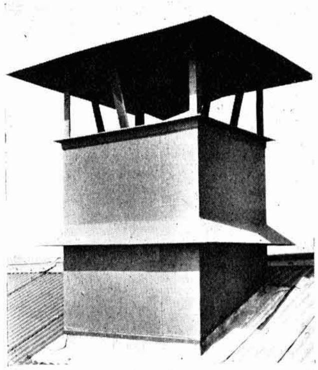
Polythene: When plastics were first exploited in Great Britain for structural work in chemical plant soon after the recent war the logical material to use was polythene, because of its outstanding chemical resistance. Development in this country was ahead of that on the Continent—in contrast with the situation regarding rigid p.v.c.—and, initially, much chemical plant fabrication was carried out in polythene. However, although polythene is still extensively used, it has always been known to have serious limitations—quite apart from any economic considerations. Firstly it has not the rigidity of p.v.c. and, particularly for pipework, it requires more or less continuous support. A second disadvantage is the fact that it cannot readily be bonded to other materials—unlike p.v.c., for which several solvent-based cements are available. Even so, polythene is an automatic choice for work involving corrosive substances that would attack a vinyl material e.g. hydrogen fluoride. It also has many other uses.

For Tank Linings

Applications for polythene which have so far proved successful include tank linings (although the problem of differential expansion has so far tended to limit the size); extraction hoods and ducting, and chimneys and wash towers. Overshadowing all of these, however, is the use of polythene piping. Without doubt this has been a major success and about 6,000 tons of polythene were used in 1956 for this purpose. Early difficulties due to degradation by sunlight have been overcome by pigmenting with (usually) about 2 per cent carbon black. Jointings present no problem and for long pipe runs standard grades of piping are available in lengths of up to 500 ft. Cold water, chemical, and pharmaceutical liquids, foodstuffs, beer and wine are all conveyed *via* polythene piping. Large diameter pipelines for chemical plant and for effluent disposal are produced by centrifugal casting, and apart from its corrosion resistance a virtue of polythene pipe in this type of application is the speed with which it can be laid.

In film form polythene is used for anti-corrosion membranes, especially in chemical and pharmaceutical factories, and in thinner gauges for lining metal drums which contain chemical in solid or paste forms. Polythene is used on an appreciable scale for coating purposes, being applied to metal surfaces either by flame-spraying or by hot dipping. Typical uses include coverings for fan components and wire goods such as racks for glassware, and plating racks.

Reinforced Plastics: Undoubtedly one of the most important developments in the use of plastics to combat corrosion



Cowling for acid exhaust system made from rigid p.v.c. in position at the factory of British Geon Ltd.

has been the substantial progress made in the application of glass reinforced polyester and epoxide resins, and in particular the highly successful use of 'compound laminates', i.e. laminates consisting of an epoxide/glass layer (or layers) backed by layers of polyester/glass. The high strength/weight ratio of these materials means that structures made from them are lighter than those produced from metals; in addition, they have the advantage over the chief thermoplastics (p.v.c. and polythene) in that they can be used for structures requiring operating temperatures of about 150°C (a conservative figure) as compared with 70°C for p.v.c.—although the chemical resistance of resin/glass is, in general, not as good as polythene or p.v.c. A further attribute is that resin/glass can be 'laid up', to form virtually any shape, including double and other complex curvatures difficult or impossible to achieve with thermoplastics.

The properties of resin/glass structures, however, depend principally upon the type of resin used and upon the care taken in fabrication. It has been recognised for some time that, even under the best conditions of fabrication, results of tests on physical properties of the cured laminate frequently reveal a broad 'scatter', which means that to achieve a given property the designer must always allow a disproportionate amount of extra material, which is wasteful. Even so, the advantages of resin/glass are many, and the possibilities very great. As an illustration of what can be done, a large tank, 8 ft. by 6 ft. by 4 ft. and a stand for it, 10 ft. high, have both been fabricated in epoxide polyester/glass. (See CHEMICAL AGE, 2 March, p. 379) In use the tank contains about 9 tons of zinc chloride, a corrosive and messy material which would rapidly attack both tank and stand if these were made of metal. What is significant, from the chemical engineering point of view, is not the mere size of the tank, although this is impressive enough, but the fact that the stand is a properly stressed engineering structure and is both strong and rigid enough to support safely the considerable weight involved.

Other uses of resin/glass structures in chemical plant and similar equipment include fume ducting, chemical transfer systems, and the protection of the metallic parts of bifurcated fans. An interesting combination of materials recently demonstrated by one manufacturer is a tank made of rigid p.v.c., skinned with polyester/glass, the object here being to combine the chemical resistance of the vinyl material with the stiffness and rigidity of polyester/glass.

Large p.v.c. tanks frequently require bracing or some other form of support to avoid sagging and, where splashing is encountered, this bracing has also to be of a corrosion resistant material, which is often inconvenient, if not expensive. Although this type of construction is still very much in its infancy nevertheless laminates of two or more plastics materials, or of plastics with metals, are likely to play an important role in the corrosion field, following the precedent of laminated films and foils—such as polythene/cellulose and polythene/aluminium—in the realm of packaging.

P.t.f.e. and the Fluorocarbons: Because it consists solely of carbon and fluorine polytetrafluoroethylene is exceptionally stable and chemically inert. It is unique among thermoplastics in having a working temperature range of up to 300°C and only molten alkali metals, fluorine and chlorine trifluoride have any affect on p.t.f.e. up to that temperature. No material is known which will dissolve it and p.t.f.e. does not absorb water, nor is wetted by it. It is non-inflammable and will weather indefinitely.

Thus from the corrosion point of view p.t.f.e. would at first seem a veritable panacea but in fact the material has two disadvantages—high cost and difficulty of working. Cost—even in spite of a recent substantial reduction—limits the use of p.t.f.e. for all except the most highly specialised purposes, while fabrication techniques suitable for other thermoplastics are useless for p.t.f.e. for above its transition temperature (327°C) the material becomes completely amorphous and does not flow. Because of this three special methods for using p.t.f.e. have been developed: sintering (similar to the processes used in powder metallurgy); lamination to less costly material, notably metals and rubber; and by dispersions in water and other liquids.

The sintering technique has been employed for making certain small corrosion-proof components, but the other techniques are of more importance to the corrosion engineer. Laminates of p.t.f.e. with rubber, for example, are being used by chemical pump and valve manufacturers for diaphragm facings and for washers, gaskets and gland packings, while p.t.f.e. dispersions are used for coating and lining tanks and other vessels, as also is thin p.t.f.e. film. A recent use is for shaft seals and running faces in pumping equipment for highly corrosive liquids. Generally speaking, p.t.f.e. in dispersion form is likely to find a great many applications in combating severe conditions of corrosion, now that this technique has been brought to a high standard of efficiency, and supplies of p.t.f.e. are more readily available.

More Manageable

Polytrifluorochloroethylene is similar in properties to p.t.f.e. but is more manageable and can be moulded and extruded. It is used for packings, valve diaphragms and similar applications.

Phenolic Materials: For surface coating, among the most important materials are the stoving formulations based on phenolic resins. These have now been in use for many years and their applications include food cans, razor blades, filter presses and reaction vessels. When cured, phenolic coatings are hard, impermeable and resistant to water and to most acids and solvents. They are not, however, very elastic and, on a flexible metal, are liable to crack under impact. In addition they are susceptible to attack by alkalis.

Recent work has shown that by modifying phenolic resins with certain polyamines, notably ethylene diamine and diethylene triamine, the flexibility of the coatings has been somewhat improved and their resistance to alkalis considerably enhanced. In addition, polyamine-modified phenolics have excellent resistance to oxidising acids. An even more important advance has been the modifying of phenolics with epoxide resins to produce coatings which have greatly superior adhesion and flexibility and very much better alkali resistance than those based on straight phenolic resin. Thus the previous disadvantages of phenolic coatings appear to have been largely overcome and it should now be possible to produce coatings to meet practically any requirements of the corrosion engineer.

General purpose phenolic moulding materials have adequate resistance to acids and organic solvents and to many dilute alkalis but to meet particular circumstances a variety of special grades are available. One manufacturer, for instance, provides a wood-filled grade for the manufacture of acid battery boxes and another grade having good mechanical strength coupled with exceptional resistance to alkalis and mild oxidising agents. More important, perhaps, are the phenolic fabric and asbestos laminates, which have a surprising number of applications especially for gears and bearings which are in contact with corrosive vapours and gases.

Nylon Polymers: Nylon polymers are attacked by inorganic acids and by oxidising agents, but they are resistant to most organic liquids. Thus, their properties are, in general, complementary to polythene for chemical applications, and further features are high strength and comparatively good temperature resistance Most anti-corrosion uses of nylon involve coatings, both by flame-spraying and hot dipping. Typical uses include the protection of coated filter press plates and processing drums. Moulded nylon components such as links, grommets and so on are used in bottle washing and filling equipment.

Miscellaneous: Reference to all the applications of plastics in the corrosion field is impossible in an outline such as this but some miscellaneous uses include furane cements for laying up pickling tanks and phenolic/asbestos compositions for lining reaction vessels.

British Firm to Make NRC Vacuum Melting Equipment

Now being made in the Elecfurn Works, Watford-By-Pass, of Wild-Barfield Electric Furnaces Ltd., are vacuum melting, heat-treatment and analysing equipment of proved NC design. This new development follows the recent signing of an agreement with the National Research Corporation, Massachusetts. Products include arc furnaces for the production of pure metals such as titanium, steels etc; induction furnaces ranging in capacity from 12 lb. to 3,000 lb. for vacuum melting of special steels, heat-resisting alloys, uranium etc.; resistance furnaces for laboratory and research applications; hydrogen in titanium vacuum analyser for routine tests; vacuum fusion gas analyser for determining oxygen and hydrogen content of metals; vacuum diffusion pumps etc.

No Breakages during Erection of 25ft. high Glass Plant

THE 25-ft. high all-glass tower installed recently in the research works of the Billingham Division of ICI Ltd. (see CHEMICAL AGE, 23 February, page 330) was erected by QVF Ltd., Fenton, Stoke-on-Trent. This was the first all-glass plant constructed for Billingham and Mr. J. G. Window, QVF sales director, tells us that work on it took only three months, during which time none of the glassware was broken.

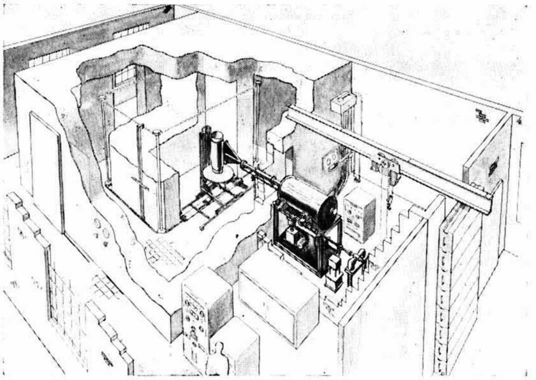
It is being used for work in connection with Terylene and one of the principal chemicals involved in the process is hydrochloric acid.

Metrovick Develop Commercial Irradiation Equipment for Research

RECENTLY, an industrial type of linear accelerator to deliver a beam of 4-MeV electrons with a power output of 1.5kW has been supplied to the AERE radiation laboratories at Wantage by the Metropolitan-Vickers Electric Co. Ltd., where it is to be used for research into the effects of radiation on plastics and other similar materials.

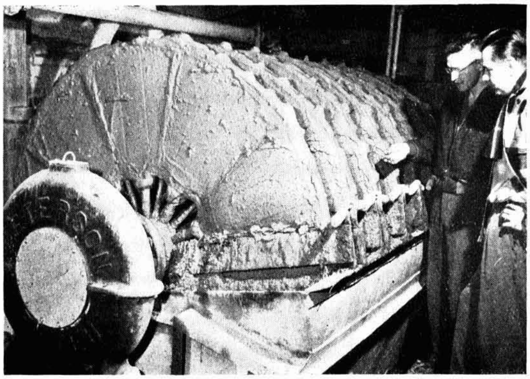
For these and similar purposes the Metropolitan-Vickers Company will shortly have an irradiation service from a special laboratory being set up at the company's Barton works. This is now being equipped with a 4-MeV linear accelerator, which will enable commercial undertakings to buy machine time in order to study the effect of irradiation on their products or to carry out a manufacturing process.

This service is designed to help in the launching of new processes evolved from research in radiation chemistry and sterilisation.



An artist's impression of the new laboratory

NEW FLOCCULANT FOR URANIUM CONCENTRATE PRODUCTION



Disc filters at Climax Uranium's mill are aided by Separan 2610 in separating water from uranium-bearing solids. The flocculating agent is also used in the thickening tank from which the solids are cycled up to the filter:

A RECENT US Atomic Energy Commission announcement stated that the annual production of uranium concentrates has doubled to a rate of 8,000 tons a year.

The uranium milling industry is a young one, and the present US Colorado Plateau mills are soon to be increased to a total of 20 by virtue of new contracts signed with the AEC. They are supplied with carnotite-uranophane, pitchblende, tyuyamunite and other primary and secondary uranium ore minerals.

Since the ores being mined contain an average of 0.23 per cent uranium, the problem of achieving the most complete recovery of uranium possible has been a real challenge to the industry. Similarly, with so many different kinds of ores being exploited for their uranium content, one major economic factor in the industry has been the question of discovering technically feasible processes which will uniformly extract the maximum of uranium and produce these values in a readily marketable form for the AEC.

Mill Processes

Mills operating on the Plateau utilise processes such as salt roast carbonate leach, carbonate leach, acid cure and acid leach to put uranium values into pregnant liquor solutions. Recovery of uranium is effected by various means (including column ion exchange, solvent extraction and resin in pulp, among others).

One key problem has been the filtration and separation of pregnant liquors containing uranium from solids and ore tailings. Much work has gone into the testing of various flocculants and filter aids to accomplish this purpose—both in the mills and in the laboratories of chemical companies supplying the industry.

Natural gums and starches as well as inorganic flocculants have been used until recently, but during the last two years of intensive operations on the Plateau synthetic flocculants have come into their own to provide effective filtration and settling of uranium-rich solutions. Today, one such synthetic filter aid has, in many instances, supplanted the older products. This is Separan 2610, the new high-speed flocculating agent of The Dow Chemical Company, which was developed several years ago after an extensive period of research. The chemical is a high-molecular-weight acrylamide-type polymer.

Assessment of its value has now been possible. It has made counter-current decantation, one of the main recovery processes, feasible by greatly decreasing production costs. It has been an indispensable factor in the efficient operation of carbonate leach circuits. Moreover, it has permitted the raw leaching of sandstone ores; whereas previously roasting had been a necessary preliminary step.

Saving in Costs

A Colorado mill which thickens and filters fine ore prior to roasting and acid leach estimates that it would have saved $70,000 in plant construction costs if Separan had been available when the mill was originally built. Today, using the product in its thickeners and disk filters, a saving of about $2,000 each month in labour and operating costs is effected by the mill. The chief metallurgist at this mill says that the flocculant has eliminated a potential loss of several thousand dollars each year in uranium overflow. Also for every dollar invested in the flocculant, the mill has been able to save an average of almost four dollars.

Another large mill in southwest Colorado has found effective use for Separan 2610 in its precipitation plant, where it controls green sludge in large thickeners. The capacity of these thickeners has increased three-fold. Big 60-foot thickeners high above this mill's precipitation plant use the compound to give its counter current decantation circuit a more uniformly clear pregnant liquor overflow. Higher still in this plant's layout is a final thickening tank which utilises this flocculant to remove all solids from solution prior to dumping the solids in a tailings pile. In the primary acid leach circuit, its use has increased tonnage by 20 to 25 per cent.

Still another large mill in New Mexico has quadrupled the capacity of its filters on current ores by using Separan, while another circuit in the mill has tripled capacity, by installing the flocculation in the carbonate leach circuit.

Better clarification of pregnant liquor going into ion exchange columns is claimed if Separan is used. It has also been used to clarify river water.

In carbonate leach filtration from 0.1 to 0.4 lb. of Separan 2610 per ton of processed material has yielded four-fold filtration rates, while in acid leach filtration from 0.05 to 0.2 lb. of the flocculant per ton is common.

Although the uranium milling industry has made effective use of Separan 2610, other mineral industries—copper, lead, zinc, manganese, soda ash, titanium and others—have achieved similar results with the flocculant.

Scot Invents ' Corrosion Proof Valve '

AN INVENTION which has a number of possible applications both in the chemical and oil industries has led to the starting of a new industry in Arrochar, Argyllshire. It is said to be a new principle in valve construction, which, the inventor claims, makes his product acid and corrosion proof.

The valve has been devised by a West of Scotland manufacturer, Mr. John McLean. The distributing agents are Potter, Cowan and Co. Ltd., Glasgow.

The valve incorporates a lining of premoulded rubber, insulating operational parts from substances flowing through.

Mr. McLean, over the past eight years, has built up a considerable business for several types of valves and stopcocks of robust construction. While working at the Loch Sloy hydro-electric scheme he had the idea for a new type of valve which would be sufficiently strong and compact to withstand the severe treatment often involved under the conditions prevailing in such construction work.

ICI's Vacuum Arc Melting Plant for Titanium

THROUGH Fleischmann (London) Ltd., 16 Northumberland Avenue, London WC2, Imperial Chemical Industries Ltd. have ordered a vacuum arc melting plant which is to produce annually about 2,000 tons of double melted titanium ingots. This melting plant will be one of the largest in the world and probably represents the most advanced type. Among other devices it will be equipped with fully automatic, electronically controlled electrode feeder gear and be laid out for remote control. The plant was developed by W. C. Meraeus G.m.b.H., of Hanau, Western Germany, in collaboration with ICI Ltd., and is at present under construction at Hanau. Heraeus are suppliers of vacuum arc melting furnaces to practically all European titanium manufacturers and atomic energy authorities as well as various overseas firms. It is suggested that this type of furnace will, in the near future, assume increasing importance for melting special steels.

Overseas News

NEW SULPHUR BEDS DISCOVERED IN SICILY

CONSIDERABLE prospecting work has been carried out in Sicily by the Italian Sulphur Board (Ente Zolfi Italiani). This work includes a geological survey of about 5,900 square kilometres and preparation of geological maps on 1 : 25,000 scale. Work done since 1 July 1955 covers an area of 1,400 kilometres.

Consideration of the results of this work has permitted the surveyors to concentrate their attention upon 38 particularly promising districts. Since 1 July 1955, complete geological reports have been prepared on five of these areas. Geophysical investigation has been carried out in the districts of Aragona, Comitini, Calati-Monte Torre, Contrada Gessi, Enna-Calascibetta, Canicatti, Delía-S. Elisabetta, Musufula-Piana Gugazzi, and Mazzarini Nord.

Detailed geological and geophysical surveys have permitted the details of the structure of various chalk-sulphur strata which have supplied valuable information concerning the topography of sulphur-bearing formations proper to be ascertained. This investigation has been accompanied by sounding drilling which has totalled no less than 30 million feet since 1 July 1955.

The results secured include the discovery of saline strata at Centuripe, Assoro, Recalmuto, and Castertermini, the discovery of sulphur beds of industrial importance at Santa Rosalia Sinatra (Aragona-Comitini), Quattrofinaite (Recalmuto), San Gaetano Lavanche (Caltanissetta), and Bubboni (Mazzarino), the discovery of minor sulphur beds at Palma Monetchiaro and Gessi (Piazzo Armerina), and discovery of extensive potassium-salts beds at Recamuto and Cannarella-Salinella (Enna).

Australian Sulphuric Acid Production in 1956

Production of sulphuric acid in Australia during 1956 increased to nearly 925,000 tons. This figure is stated to be somewhat below earlier expectations because continued wet conditions in New South Wales and Victoria, coupled with credit restrictions, have reduced demand for superphosphate.

There has been some further expansion of the use of indigenous sulphur, but some increase in sulphur imports has been necessary. These are likely to have exceeded 200,000 tons for the year (195,482 tons in 1955). Acid production is estimated to have taken 300,000 tons, 40 per cent from local products.

Initial difficulties at the new plant at Cockle Creek have now been overcome; it is operating on Mount Morgan pyrites.

Under consideration has been the possibility of using pyrites-gold concentrates from Kalgoorlie as raw material in acid production.

Acid-making capacity at the 50,000 tons a year ammonium sulphate plant at Risdon is to be further expanded by the addition of a fourth flash roasting furnace and a third contact acid unit.

NBS Adds to List of Rubber Compounders

Two synthetic rubbers have been added to the list of standard materials for rubber compounding prepared by the US National Bureau of Standards. They are styrene-butadiene rubbers type 1,000 and 1,500, the first rubbers issued as standard samples. Fifteen standard samples for rubber compounding are now available from the bureau. They are:

No.	Name	Approx. weight of sample in grams.	Price per sample
370	Zinc oxide	2,000	$2.15
371	Sulphur	1,400	1.75
372	Stearic acid	600	1.90
373	Benzothiazyl disulphide ...	500	1.75
374	Tetramethylthiuram disulphide	500	3.50
375	Channel black	7,500	3.50
376	Light magnesia	450	2.40
377	Phenyl beta-naphthylamine	600	4.00
378	Oil furnace black	7,000	3.50
379	Conducting black	5,500	3.50
380	Calcium carbonate	6,000	2.50
381	Calcium silicate	4,000	2.50
382	Gas furnace black	7,500	3.50
386	Styrene-butadiene rubber, type 1,500	34,000	27.00
387*	Styrene-butadiene rubber, type 1,000	34,000	23.00

* This sample is the remainder of reference rubber X-768 GR-S established in 1955 by the Federal Facilities Corpn., Office of Synthetic Rubber.

Rhodesian Plant to Open

Plascon Industries, Johannesburg, is to start a £150,000 paint and plastics factory in Bulawayo, Rhodesia. A contract for the sale of premises in the light industrial area of Bulawayo has been concluded. The firm will employ about 40 people.

Canadian Natural Gas and Sulphur Project

Third largest sulphur producer in the world, Jefferson Lake Sulphur Co., has reached an agreement with Mobil Oil of Canada Ltd. to develop and recover natural gas and sulphur from an 80,000 acre area east of Calgary, Canada, it is announced. Three wells completed in the Farmout area have indicated substantial reserve of sour gas with an expected recoverable sulphur content of 12 long tons per 1,000,000 cu. ft. of gas processed.

Drilling will start within 90 days. If adequate reserves are proved (and preliminary surveys indicate the area is a major sulphur reserve in western Canada) the company plans to build a gas processing and sulphur manufacturing plant, having an initial recovery of 350 long tons daily. It would employ between 20 and 30 persons.

Activities of India's State Trading Corporation

Some details of the activities of India's Government State Trading Corporation, established last May have now been released. Export contracts to the value of Rs 10.6 crores (£8 million) and import contracts to the value of Rs 9.8 crores (£7.4 million) have been concluded. Forty per cent of the import contracts were with Communist countries and covered such items as soda ash, caustic soda and ammonium sulphate.

The State Trading Corporation also bought quantities of caustic soda from the UK, ammonium sulphate from the US, nitrates from Chile and gypsum from Pakistan.

Iraqi Sulphur Recovery Project

Development Board and Ministry of Development of Iraq have invited tenders from qualified firms for the engineering, supply, erection and commissioning of a plant for the recovery of both elemental sulphur and liquefied petroleum hydrocarbons from natural gas. Full details can be obtained from the Iraqi Embassy, London.

Glass Industry in Italy

Today about 225 firms are engaged in the production of glass in Italy. They employ about 26,000 persons and their productive capacity totals nearly 550,000 yearly tons. In 1956 they produced about 385,000 tons of various types of glass and thus worked to the extent of about 70 per cent of their capacity.

The glass produced was subdivided by types in the following manner:

Plate glass of various kinds ...	109,000 tons
Glass for building industry ...	13,000 tons
Bottles and allied articles ...	226,300 tons
Knick-knacks, fancy objects, etc.	20,000 tons
Articles for industrial use (insulators, electric bulbs, etc.) ...	6,000 tons
Scientific and laboratory glassware	4,700 tons
Artistic glass	6,000 tons

Exports of bottles, demijohns, and similar receptacles have been satisfactory, and exports of artistic glass also kept at the level of the preceding year.

Brazilian Company to Increase Chemical Production

It is reported that a large Brazilian company, Matarazzo, plans to increase production of glycol compounds, carbon tetrachloride, chlorine compounds, benzol, synthetic rubber, polyacrylic and polyamide fibres, and some petrochemicals.

By-Products from Australia's Morwell Gas Plant

Careful attention is being paid by the Gas and Fuel Corporation of Victoria, Australia to the possibility of recovering valuable phenols from the tars and waste liquors, if any are found to be present in worthwhile concentrations. Spent wash oil from the gas washing tower is stripped in a special distillation column in the by-products plant to recover the crude benzol. A benzoraffin plant is to be installed to hydrogenate this crude benzol to produce high octane spirit.

It is estimated that when in full operation, this by-products plant will produce 3,450 gallons of tar products and 1,600 gallons of benzol from the 410 tons gasified daily.

German Uranium Deposits

A thorough survey is to be carried out of uranium deposits in Hessen which have been found at Frankenberg in disused slate mines. Small uranium deposits have been found in Rheinland-platz at Insbach-am-Donnersberg and Birkenfeld-Nohfelden. Other deposits are reported to have been found in the Black Forest and eastern Bavaria as well as in some of the German brown coal fields.

US Belgian Subsidiary to make Detergents

Soap and detergents will be manufactured at Malines, Belgium, by the subsidiary company of Procter and Gamble, US. A very large factory of five separate buildings occupying a site of 25 acres has been built in 13½ months. Total cost is estimated at B.Frs. 140 million (£1 million) of which 85 per cent has been spent in Belgium.

Highly mechanised plant for the production of detergents has been installed. As a precaution against fire a 40-metres high water tower has been erected having a capacity of 400,000 litres and a centrally heated reservoir to guard against fire.

GEC Develop X-ray Analyser

Research scientists in the X-ray department of the General Electric Co. in the US have developed an X-ray emission spectrometer for use in chemical analysis.

The new equipment is claimed to be capable of analysing elements down to atomic number 13 (aluminium) and has the advantages over older methods of being quick, convenient and non-destructive.

Plant for Methyl Butynol Production

Plant, having a three million lb. annual capacity, is to be built by the Air Reduction Co., US, at Calvert City, Kentucky, for production of methyl butynol, a tertiary acetylene alcohol and methyl pentynol.

Methyl butynol is produced by reacting acetylene and acetone using a basic catalyst.

Both chemicals retain the triple bond of the parent acetylene, but are themselves completely stable.

European Federations Issue Annual Reports

Annual reports for 1955 have now been published by the European Federation of Chemical Engineering and the European Federation of Corrosion. These two reports summarise the work of the two federations and survey research activities throughout Europe. Copies of the reports, price DM10 each, may be obtained from the General Secretariat of the appropriate organisation, Frankfurt am Main 7, Postfach.

Greek Nitrate Plant

It is reported that no bids were received from British interests for the construction of a nitrate plant for Greece. Bids were received from Italy, Holland, Germany and from Franco/US and Germano/US interests. Estimated cost is $30 million.

New Wool Research Laboratory for Sydney, NSW

A modern wool research laboratory, to be built at a cost of £200,000 at Prospect, Sydney, NSW, will replace the existing research centre, now considered inadequate. The new laboratory will be used by experts from the Scientific and Industrial Research Organisation. There will be accommodation for 50 research workers, including some from overseas and Colombo Plan students.

Acrylonitrile Expansion by Carbide and Carbon

Acrylonitrile production will be doubled by the second quarter of 1958 at their Institute, West Virginia, plant according to an announcement from Carbide and Carbon Chemicals Co. Demand for acrylic fibres, high impact resins, Buna-N type rubber and new acrylonitrile derivatives is given as the reason for this expansion. Acrylonitrile is also used with butadiene to give a Buna-N rubber.

New thermoplastic terpolymers, made from acrylonitrile, butadiene and styrene are stated to have high-impact and high distortion strength.

Two new derivatives of acrylonitrile—dimethylamino propylamine and diethylamino propylamine—are used in the manufacture of textile softeners. Rayons and cottons treated with these softeners have a more pleasing texture. Acrylonitrile is also said to show promise as a cyanoethylating agent for upgrading the mildew resistance of cotton.

This new X-ray emission spectrometer is an aid to speedy analysis

Ammonia Production in Italy

During 1956, 454,040 tons of synthetic ammonia were produced in Italy. This is an increase of 8.7 per cent in comparison with the 417,769 tons produced in 1955, and of about 24 per cent in comparison with the 361,098 tons produced in 1954.

Radioactive Ore found in North-East India

What is believed to be one of the world's largest deposits of radioactive ore has been found by the Indian Atomic Energy Department in North-East India.

Surveys are reported to show that the deposit contains more than 3.3 million tons of ore, containing 300,000 tons of 10 per cent thorium, 10,000 tons of uranium of 0.3 to 0.4 per cent concentration and about 80 million tons of ilmenite.

Fiat to Prospect for Radioactive Minerals

The Fiat Company has applied to the Italian Ministry of Industry and Trade for a permit to prospect for radioactive minerals in the district of Cavour, not far from Cuneo, Northern Italy.

The presence of such minerals in this area has been shown by work carried out by professors and technicians of the University of Padua. The local authorities have already obtained a concession on radioactive mineral waters existing there.

Preliminary investigation, the results of which have led to the application for a prospecting permit, were carried out for the Fiat Company by staff of the Polytechnical Institute in Turin.

Uranium Output in Ontario's Bancroft Area

Monthly production objective of $600,000 worth of uranium oxide is expected to be reached this month by Bicroft Uranium Mines, the first producer in Ontario's Bancroft area. Output began officially on 3 December.

Concentrating problems have now been overcome, it is learned, and the mill recovery rate is running at about 91 per cent of the anticipated maximum.

Indian Firms to Concentrate on Dyestuffs Intermediates

Govt. to Make Primary Products

FOLLOWING discussions between the representatives of the Ministry of Heavy Industries, the Government of India and the dyestuffs manufacturers, it has been agreed that special emphasis should be laid on the manufacture of the intermediates required for the production of dyestuffs. Some of the more important intermediates will be produced by a central factory which the National Industrial Development Corporation will set up, while others will be included in the manufacturing programme of the makers of dyestuffs themselves.

In October 1956, the Government of India decided that the National Industrial Development Corporation should undertake the manufacture of primary intermediates and asked firms in the private sector to indicate the kind of development they would undertake for the production of intermediates representing later stages in the manufacture of dyes. The meeting discussed the targets for the annual consumption of dyes by 1965 on the basis of the reports submitted to Government by the expert teams from abroad. The following targets were agreed upon: Azo compounds, 3,000; basic compounds, 750; naphthols, 1,250; fast bases, 1,250; vats (absolute), 1,200; sulphur black, 2,150; other sulphurs, 225 tons per annum.

Plantation Rubber Industry:—The Report of the Plantation Enquiry Commission dealing with the plantation rubber industry has been published.

Rubber Consumption

Consumption of rubber in India is estimated by the Commission to rise to 40,000 tons in 1960 and 65,000 tons in 1970. The extra production of natural rubber required to meet the demand by 1965, after providing for synthetic rubber that may be available, will be about 20,000 tons.

New Mineral Deposits:—Two large deposits of limestone, containing an estimated reserve of nearly 124 million tons, have been discovered in the Guntur District (Andhra State). The deposits constitute a small portion of the Palnad limestone which is suitable for use in the manufacture of Portland cement. The limestone is compact, sub-crystalline and extremely fine grained; it resembles marble and is capable of taking a fine polish.

Extensive reserves of good quality limestone estimated to be of the order of 406 million tons, are stated to exist in Dehra Dun-Mussoorie areas.

Production of Salt:—India attained self-sufficiency in salt in 1951 when the production was 744 lakh maunds (2,660,000 tons). The production in 1956 amounted to 889 lakh maunds; the target fixed for 1960-61 is 1,000 lakh maunds per annum.

Provision of Rs. 1.87 crores for the development of the salt industry has been made in the Second Five Year Plan, out of which investment in the private sector will be Rs. 1.2 crores and in the public sector about Rs. 67 lakhs. Programmes for the development of the industry in the private sector include establishment of laboratories and model farms, improvement in brine supply channels, installation of plant and machinery, and provision of amenities for labour. The rock salt mines at Mandi are to be developed on scientific lines by sinking shafts etc. at a cost of Rs. 8 lakhs. The production of salt from this source will increase from 1.5 to 4 lakhs maunds per annum.

Penicillin, DDT:—Highest output so far for penicillin processed at the penicillin factory at Pimpri, run by the Hindustan Antibiotics (Private) Ltd., was attained during January 1957, when 1,514,250 mega units of crude penicillin were processed compared with 1,118,572 mega units processed during December 1956; production of penicillin during January 1957 amounted to 1,569,000 mega units as compared with 1,040,000 mega units during December 1956.

INDIAN *NEWS*LETTER

Hindustan Insecticides Ltd., Delhi, produced 16.16 tons of technical DDT and 36.69 tons of formulated DDT during January 1957.

The project for a second DDT factory with a capacity of 1,400 tons per annum, to be set up at Alwaye (Kerala State), is also making satisfactory progress. Offers received for the setting up of the formulation plant etc., are being examined.

Boron-Free Enamels:—Borax is one of the essential constituents of vitreous enamelling compositions and constitutes about 30 to 40 per cent of the enamel batch. No satisfactory source of borax has been located in India and the requirements, valued at about Rs. 4 lakhs per annum, are therefore entirely met by imports.

A process (Indian Patent No. 54394) for the production of enamels in which the use of borax is omitted, has been developed by the Central Glass and Ceramic Research Institute, Calcutta. Enamel compositions comparable in performance and cost to conventional borax enamels have been developed. They are suitable for both two-cover coat and single-cover enamelware under present conditions.

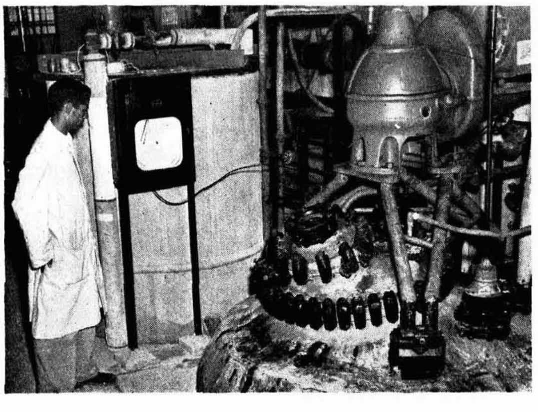
Titanium-opacified enamels have been recently introduced in India, particularly in view of the difficult supply position and high cost of tin oxide now employed as the opacifier. Incorporation of titanium oxide, however, imparts a faint yellowish tint to the finished enamel. With boron-free enamel compositions, however, the use of titanium oxide as opacifier does not cause yellowing and the finished articles are comparable in whiteness to those obtained with tin oxide-opacified enamels.

Trials at two large enamel factories have shown that boron-free enamel compositions can be used under normal factory conditions and no special equipment or change in the processing techniques is required. Enamelling costs are comparable.

Mica Insulating Bricks:—Developed by the Central Glass and Ceramic Research Institute, Calcutta these bricks will shortly be produced on a commercial scale by Reliance Fire Bricks and Pottery Co. Ltd., Calcutta and Bhupal Mining Works, Bhilwara (Rajasthan). The bricks, which are intended to replace vermiculite bricks in the construction of laboratory and industrial furnaces as backing materials, are reported to be satisfactory.

Laboratory Furnaces:— Tests carried out with laboratory furnaces have confirmed the superior heat insulating properties of mica bricks over vermiculite bricks. When the furnace was kept at 570°C, the outside temperature of the mica bricks rose from 96 to 102°C in two hours, while in the case of vermiculite bricks the temperature rise was 104 to 110°C.

(Continued on page 608)



A view of the final DDT reactor at the Delhi factory of Hindustan Insecticides (Private) Ltd. Capacity of this plant is to be doubled (see CHEMICAL AGE, *9 February, page* 255)

Mitchell—AMF Group Awarded German Atomic Contract

AGAINST competition from six other nuclear power concerns the Anglo-American company, Mitchell Engineering Ltd., London, and AMF Atomics Inc., New York, has been awarded the contract to build West Germany's first atomic power station. This was the first atomic power contract which was open to international competition and the first foreign order for an atomic power plant in which a British company has played an important part.

The contract was awarded by Rheinisch-Westfalisches Elektrizitatswerk AG, the largest power enterprise in the Federal Republic. Value of the order is about $5.3 million, of which Mitchell Engineering will receive about three-fifths. AMF Atomics will supply the reactor core and control devices. First loading of the core will cost about $1.5 million. All payment is to be made in US dollars.

Designed to give an output of 15 MW, the power station will be in operation in the autumn of 1959.

Water Plant

The closed circuit boiling water plant, which will be installed in the RWE power station, works on a simple system. Water is allowed to boil in the coolant passages of the fuel elements which are of uranium and thorium oxide clad in zirconium alloy.

An important feature of the use of oxide fuel is that there can be no chemical reaction between metal and water which might lead to a damaging explosion.

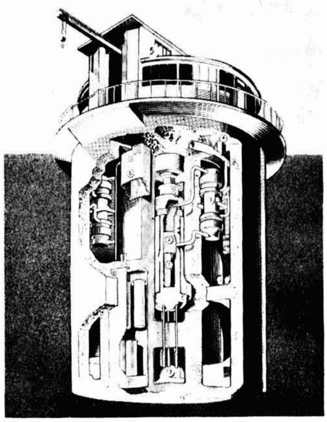
Power output of the reactor will be 58 MW and the surface temperature will not exceed 550°F. Pressure in the reactor vessel will be 900 p.s.i.g.

The core is surrounded by heavy steel plate and nine in. of water serve as a reflector. The biological shielding will consist of the equivalent of a four in. steel plate and seven ft. thick concrete with a minimum density of 125 lb. per cu. ft.

Boiling water reactors have been proved, in a series of experiments over several years, to be inherently safe. In addition, a number of precautionary devices will be incorporated in the RWE plant.

As a result, the possibility of a rupture in the reactor vessel due to a power excursion is extremely remote but, should it occur, the primary shield and a quenching system of room-temperature water to condense steam escaping from the reactor vessel, will be sufficient to contain all radio-active material in the event of a 'maximum credible accident'. Such an accident is defined as the 'simultaneous rupture of the primary and secondary steam systems plus a very considerable nuclear energy release.'

Because of the safety in operation of



This diagram represents the boiling water reactor power plant to be built by Mitchell Engineering in association with AMF Atomics Inc., New York. Key is: 1 reactor core; 2 boiling water; 3 heat exchanger; 4 steam outlet; 5 fuel handling room; 6 fuel storage tank; 7 control mechanism bay

the boiling water reactor the RWE power plant will be situated only half a mile from a populated area. The only radioactive waste from the plant will be resins collected on the ion exchange column which will be used to keep primary water clean. About two cu. ft. of this waste will be extracted every year and removed in a shielded coffin. Radioactive water from the primary circuit system will be kept in retention tanks for the normal cooling off period before being flushed in the normal drainage system.

F. G. Mitchell (left), chairman, Mitchell Engineering, receives from K. F. Albrecht, German representative, confirmation of a nuclear power station contract. Second left is E. B. N. Mitchell (Mitchell Engineering Group); next to him is G. Jackson, manager, nuclear power division

INDIAN *NEWS*LETTER

(Continued from page 607)

Coal-fired Muffle Furnace:—The use of mica bricks reduced heat losses and improved the thermal efficiency of furnaces appreciably. Employing mica bricks, the temperature recorded was 400°C. The saving in fuel was of the order of 30 to 40 per cent.

The insulating properties of mica bricks have been found to improve with time. The furnace temperature dropped from 1,000 to 400°C in the initial stages; at the end of three years, the furnace maintained a temperature of 600°C after overnight cooling.

Reverberatory Furnace:—Mica bricks gave an equally good performance in a 25-ton reverberatory furnace the charging door of which was screened with a 3 in. lining of these bricks. Radiation was reduced appreciably, and it was possible to work without inconvenience within a few inches of the door.

Oil-fired Furnace:—Mica bricks have also been used in a factory for insulating oil-fired tilting furnaces. The use of 4½ in. refractory and 1½ in. mica brick lining is reported to have given satisfactory results even for furnace temperatures as high as 1,500°C. The bricks after prolonged use were found to be in perfect condition.

This development is expected to find an outlet for appreciable quantities of waste mica. The Planning Commission estimates the total requirements of insulating bricks by 1960-61 at 60,000 tons per annum. Even if 25 per cent of the requirements are met by mica insulating bricks, about 150,000 cwt. of waste mica would be used up for this purpose.

Carbon Tetrachloride from Sewage Gas:—A process for the production of carbon tetrachloride from sewage gas has been developed at the National Chemical Laboratory, Poona. Chlorination of sewage gas is effected in a fluidised bed at a chlorine:methane ratio of 3.57:1 and chlorine feed rate of 7.78 moles/hr. Using activated carbon as the fluidised catalyst at 350°, a carbon tetrachloride yield of almost 90 per cent of theoretical is obtained. The fluidised bed technique, which enables easy control of the reaction, can be used with advantage for chlorination of methane on an industrial scale.

Non-Ferrous Metal Industries:—Inaugurating the first meeting of the Council held in New Delhi on 22 January 1957, the Union Minister for Heavy Industries announced that the National Industrial Development Corporation had decided to establish an aluminium plant at Mettur (Madras State) with a capacity of 10,000 tons per year. A proposal for the establishment of an aluminium plant of the same capacity at Hirakud has already been sanctioned by the Government of India. With the expansion of the existing units and these two additional smelters, the country would annually produce about 30,000 tons of aluminium during the Second Plan period. In addition, the establishment of an aluminium plant in the Rihand area in Uttar Pradesh is now in hand.

EQUIPMENT REVIEW

Chemical Plant : Laboratory Apparatus Safety and Anti-Corrosion Products

STAINLESS STEEL VESSELS

A NEW RANGE of standard production stainless steel vessels for all storage and mixing requirements and for heating and cooking, has been introduced by T. Giusti and Son Ltd., 210-212 York Way, Kings Cross, London N7.

A variety of types of storage and mixing vessels are offered in capacities ranging from 10 to 2,000 gallons. Standard models are fabricated from 18/8/1 (EN.58 B) stainless steel with alternative types of top edge stiffenings, legs, lids and outlets, depending on the size and purpose of vessel and gauge of material.

Giusti stainless steel vessels

Hemispherical jacketed vessels ranging from 7 to 500 gallons are available. Inner vessels are of dull polished stainless steel and jackets are in mild steel. The jackets can also be offered in stainless steel.

Dished jacketed vessels from 25 to 200 gallons are of two types, one has a bolted on jacket whereas the other has a welded jacket. The standard vessels are designed for a working pressure of 40 p.s.i. and are hydraulically tested to 80 p.s.i. Turbo or anchor type agitators, cooling coils, etc., can be provided to special request.

THERMOCOUPLE POTENTIOMETER

THE MINI thermocouple potentiometer has been introduced by Doran Instrument Co. Ltd., Stroud, Gloucester, to meet the call for a light portable unit, having an accuracy and performance equal to that of larger instruments. Two ranges are provided, 0-20 and 0-100 millivolts, thus covering both base and rare metal thermocouples. Readings direct to 10 microvolts per division are obtained on the lower range.

Current through the potentiometer coils is adjusted on the 100 millivolt range to a value of 10 milliamperes by reference to the internal Weston normal ministandard cell and standardisation can be carried out on either range irrespective of the reading dials.

Source of current is a 1.5 volt dry-cell fitted in the base. A panel provides easy access to the cell and to the switch contacts and slide wiring. The galvanometer requires no levelling; its sensitivity can be varied from zero to maximum by a small control knob. Supplied in a plastics case with lid and strap, weight is $7\frac{1}{4}$ lb.

ELECTRIC IMMERSION HEATERS

VITREOSIL electric immersion heaters, previously fitted with rubber caps, are now being supplied at the same price with p.v.c. caps to facilitate use with chromic acid. The Thermal Syndicate Ltd., PO Box 6, Wallsend, Northumberland, state that both rubber and p.v.c. capped units can be supplied quickly for heating acid electroplating solutions, acid pickling tanks and acidic solutions.

Envelopes of these demountable heaters are stated to be unaffected by all acids, except hydrofluoric and phosphoric, even up to the highest temperatures. A new booklet, available from the company, gives details of installation and stresses that this can be effected with complete safety from electrical shock.

RENDERING BRICKS WATER REPELLENT

BRICKWORK and masonry can, it is claimed, be rendered completely water-repellent by a treatment developed by Evode Ltd., Stafford. A colourless solution, Evosil, based on a silicone is applied by brush or spray to the masonry. Surface appearance is unaltered, but the resin compound penetrates into masonry to form an impregnable barrier against water.

In soft brick, the depth of penetration is about 3/16 in. Porosity of building material is said to be unaffected and it is stated that one treatment will last many years. The effect of efflorescence is also retarded. Cinder blocks and similar highly-porous materials can be given maximum protection if they are first painted with two coats of a cement paint.

Covering capacity of Evosil is about 25 sq. yd. per gallon. Treatment becomes effective within 24 hours of application. Prices per gallon are: 34s 6d. in 1 gallon cans; 33s in 5 gallon drums and 32s in 10 gallon drums.

PRECISION GROUND GLASS BALLS

PRECISION ground glass balls are now available from the English Glass Co. Ltd., Empire Road, Leicester, in a size range from .070 in. to $1\frac{1}{8}$ in. diameter. Diameter can be held to ±.001 in. and sphericity to .0005 in. Material used is a good quality soda glass, but balls of up to $\frac{3}{8}$ in. diameter can be produced in heat resisting glass.

The company states that ballotini are now available from .04 mm. up to 12 mm. in diameter. Closely graded, the material consists of glass balls of near spherical form. For use in fractionating columns, chromatography, research and filter tests, it is said to be practically inert to acids and alkalis, and to be uniform in grading.

SEALCOIL PLATE COILS

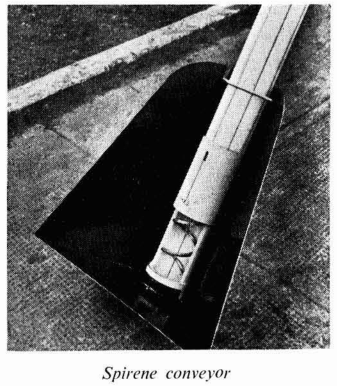
FOLLOWING the recent widespread use in the US and Canada of flat plate coils in the plating and chemical processing industry, Hurseal Group Sales, 229 Regent Street, London W1, announce the introduction of their new range of Sealcoil plate coils, for use as heating and cooling units.

Flat plate coils can be used wherever pipe coils are now fitted and are claimed to be easier to clean, easier to install and considerably cheaper.

Sealcoil plate coils are now available in mild steel but later will be produced in stainless steel which will greatly broaden their application and use. The standard widths of 18 in., 24 in. and 30 in. are available in practically any length.

SPIRENE PORTABLE CONVEYOR

ALTHOUGH primarily designed to handle grain, the Spirene conveyor produced by Andrew Young and Son, 45 Midwharf Street, Glasgow C4 can handle many



Spirene conveyor

granular chemical materials provided they are not excessively abrasive.

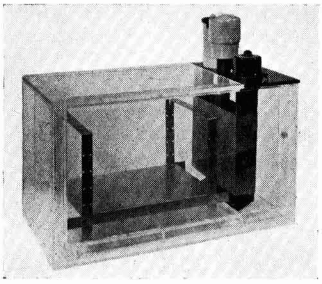
The conveyor tube is made of polythene, approximately $\frac{1}{4}$-in. thick, and reinforced by pre-stressed high tensile steel stranded wires. The conveyor spiral inside the tube is a helix, like a coil spring, and has no central shaft. There are considerable clearances between the spiral and the tube wall, and in operation the spiral floats in the conveyed material.

Running costs are low, the totally-enclosed motor being only $\frac{1}{2}$ h.p. An adjustable handle makes the Spirene easy to carry.

MINUS TWENTY TRANSPARENT BATH

THE MINUS twenty transparent bath manufactured by Townson and Mercer Ltd., Croydon, Surrey, has an accuracy of control ±0.1°C and operates from room temperature down to −20°C. It is suitable for use with refrigerator X81 for −10°C or refrigertors X81S for −20°C and has an unobstructed bath space of 17 in. by 11 in. by 12 in. liquid depth.

The control system operates by means of a thermostat in the bath controlling the refrigerator system directly. Evaporator coils are in a by-pass circuit from the bath circulation, and the temperature control from this layout has proved very constant. No source of heat is used so the bath will only run from a few degrees ambient, downwards.



The 'Minus Twenty' Bath

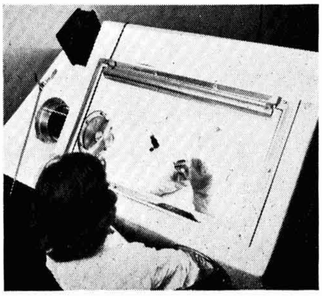
Heat from the room slowly raises the bath temperature and the thermostat then starts the compressor motor via a relay which recools the evaporator coils. Stirring is arranged to give a mass flow over a weir at one end of the tank. A suitable liquid for use in a Perspex tank and at low temperatures is odourless kerosene.

The bath is made of two layers of Perspex, ¼ in. thick, separated to give a 1-in. wide sealed air gap. A Perspex lid can be provided as an accessory.

NEW VACUUM CABINET

VACUUM cabinet produced by John Bass Ltd. is said to embody the main features required by bacteriologists, research laboratories, chemical laboratories, metallurgy, nuclear research and hospital clinical laboratories.

The cabinet is designed to provide a wide variety of operations, assuring complete visibility. Single units can be directly connected to form a continuous system.



Vacuum Cabinet by John Bass

The manufacturers state that alpha and beta emitters of high energy can be handled safely giving operating personnel the maximum visibility.

Hermetically sealed airlocks with quick-acting doors are fitted. This permits passage into or out of the main housing during a critical atmospheric condition, without change of internal condition. All openings are gas tight through the fitting of neoprene washers. Negative air pressure is not disturbed when introducing materials through the lock.

The cabinet is supplied with a vacuum pump to maintain a satisfactory negative pressure against any small leaks in the glove ports or airlock. Air is exhausted through a micro filter which is easily detachable for disposal purposes.

US FLOATMETER TO BE MADE IN UK

CONCLUSION of a licence agreement with Industrial Instrument Corporation of Odessa, Texas, for the manufacture and sale of the IIC differential pressure flowmeter in Britain is announced by Elliott Brothers (London) Ltd.

This instrument is based on a dry-type (no mercury) bellows-operated differential pressure measuring unit, which may be used in conjunction with readily available Elliott recording, controlling and transmitting mechanisms to provide a complete range of flowmeter instruments.

The IIC model 700 differential pressure unit is said to combine the latest engineering features and is designed to have ample power for sustained accurate measurement and fast response speed. Wide-temperature compensation is provided together with completely automatic over-and under-range protection.

MINIATURE MICRO GAP TOGGLE SWITCH

A NEW miniature micro gap toggle switch, catalogue No. S.250, has been produced by Arcolectric (Switches) Ltd., Central Avenue, West Molesey, Surrey. This switch has been type tested to a quarter of a million operations on its full rated load. Rated 10 amp., 250 v. a.c. only, it is designed on the micro gap principle employing fine silver contacts.

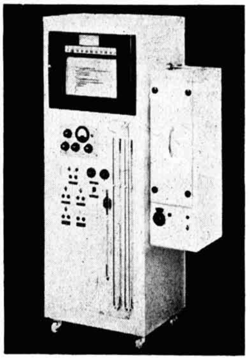
A single pole on/off switch, it is suitable for continuous heavy duty controlling heater or motor loads on appliances and industrial equipment. The low contact resistance and light operating pressure make the switch equally suitable for electronic instruments.

ELECTRONIC POTENTIOMETER RECORDERS

ELECTRONIC 'continuous balance' potentiometer recorders, developed by Honeywell-Brown Ltd., 1 Wadsworth Road, Perivale, Greenford, Middlesex, are supplied as standard components by two principal manufacturers of vapour phase partition chromatography equipment.

In vapour phase partition chromatography the components of the vaporised sample (in one method of detection) affect the electrical resistance of a hot wire as they emerge from a chromatographic column. The changes in electrical voltage thus produced are measured by, and are automatically recorded on, the moving chart of a recorder.

The changes in electrical resistance of the hot wire are measured by the instrument's 'continuous balance' potentiometer circuit. The measurements are recorded as a series of peaks on the recorder chart. The position of the peaks on the trace affords the qualitative evidence for analysis. The height or area of the peaks provides the quantitative information required.



Electronic Potentiometer Recorder

NEW MINIATURE LAMP

A NEW development in miniature lamps, the capless lamp, is announced by AEI Lamp and Lighting Co. Ltd., Crown House, Aldwych, London WC2. It is expected to be of great interest to manufacturers of electronic equipment and control panels.

Its principal advantages are said to be compact design, and resistance to humidity, vibration and high temperatures. It can be operated at temperatures up to 600°F.

The new lamp has no metal cap, no cement and no soldered connections, but has an accurately moulded glass base with formed lead wire contacts symmetrically disposed on opposing faces about a centrally moulded tubular section.

Lead wire contacts are formed closely to the glass faces and are terminated at the end remote from the seal outlet by a groove moulded across each face of the glass base. This moulding provides registration for both light centre length and axial alignment and offers scope for simplified socket design without sacrificing performance reliability.

RADIATION THICKNESS GAUGE

RADIATION thickness gauge, type 170, developed by Isotope Developments Ltd., Beenham Grange, Aldermaston Wharf, near Reading, Berks, in collaboration with Davy and United Engineering Co. Ltd., has been designed specifically for use in the metals industry to provide an instrument giving accurate thickness indication with a very fast response time (0.05 sec.) and making no contact with the material under inspection.

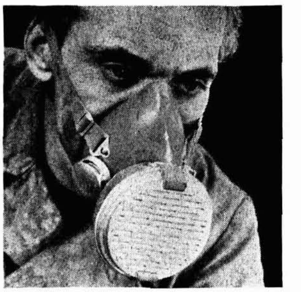
The mechanical construction of the gauge is such that it will withstand the conditions normally encountered on cold metal processing lines.

Standard thickness range is 0.005 in. to 0.025 in. of steel. Special arrangements extend the range down to 0.002 in. or up to 0.040 in. Variations as small as ½ per cent of sheet thickness give a clear indication on the instrument and may be used to actuate the reject mechanism.

Two controls are provided to select the positive and negative values of 'off-gauge' at which the reject signal is actuated. These controls may be graduated in thickness or weight units or in percentages.

DRAEGER DUST RESPIRATOR

DRAEGER 74 filter mask, manufactured by Panorama Equipment Ltd., Panorama House, 29-36 Seymour Mews, Wigmore Street, London W1, has been approved by the Ministry of Power. Designed with a supple well sealing rubber face and chincup it is fitted with two fully



Draeger Filter Mask

protected exhalation valves. The filter container is made of aluminium and is complete with inhalation valve. Designed especially for damp and smudgy dusts, the mask gives protection against course dust, it provides good protection against dust of coal, flour and wood; protection against fine dust, such as mineral, quartz, asbestos, glass abrasive metal and lead fumes; and protection against dust and gas, such as solvent fumes when paint spraying, weak concentrations of acid gases, sulphur dioxide and ammonia.

DRY-POWDER FIRE EXTINGUISHER

SPECIALLY designed to combat fires of the most dangerous types—those including alcohols, industrial solvents and other inflammable liquids—is a new dry powder fire extinguisher by Nu-Swift Ltd., Elland, Yorks. It is claimed to be able to kill a fire in only a few seconds.

In the hands of an inexperienced operater, the extinguisher is said to quell a petrol fire 9 sq. ft. in area; in experienced hands, the efficiency quotient is 14 sq. ft.

The 'extraordinary capacity' is due to the nature and preparation of the dry powder and the method of expulsion. The dry powder consists of a number of chemicals, the principal being sodium bicarbonate. Processed in the company's own mill, recently built at a cost of £30,000, it is specially prepared, mixed, ground, sieved, dried and pressure-sealed so that it will not cake, pack or coagulate.

The extinguisher interposes oxidation inhibitors (negative catalysts) into flames, halting their chain reaction. The dry-powder is held, with dried carbon dioxide, in a sealed pressure charge so that it cannot be affected by atmospheric humidity; particles are regular in size and shape.

This new extinguisher is particularly suitable for fires involving hot oils or asphalt when the body of the fuel is heated to 250°F or over, since no boil-over will be caused by the use of dry powder.

CALANDRIA VACUUM EVAPORATORS

A REDESIGNED series of stainless steel external calandria vacuum evaporators, model 66, is being produced by Apex Construction Ltd., 15 Soho Square, London W1.

These evaporators have smooth lines and are easy to clean and maintain. They are said to provide highly efficient evaporation due to high speed natural circulation of liquor, and to operate successfully on foaming materials. Useful for heat sensitive materials, the contact lino between liquor and heating surface is short.

HYDRAULIC PRESSURE CLEANING

A COMPACT high-pressure hydraulic cleaning unit which embodies several unique features is now being exported by Joseph Evans and Sons (Wolverhampton) Ltd.

Originally designed for use in paper mills the unit is now used in many other industries with applications in oil refineries, chemical works, dairy plant and locomotive cleaning.

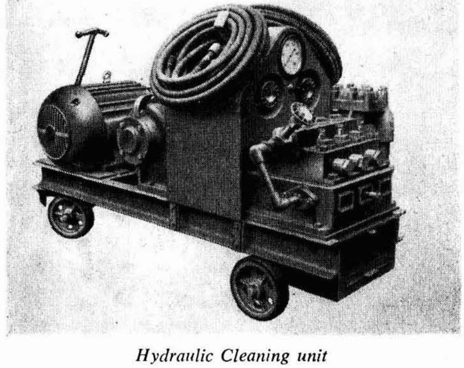
At the heart of the installation is a 1½ in. by 4 in. stroke totally enclosed horizontal treble ram pump, capable of delivering 16.5 gallons per minute against a pressure of up to 1,000 lb. p.s.i. For jet cleaning a gun is supplied which has a venturi aperture and entrains air, delivering high-pressure water and air from the nozzle. The air intake can be connected to a dry sand supply so that a wet sand blasting effect is produced, which is particularly advantageous when carrying out difficult operations such as the cleaning of heat exchanger tubes in oil refineries or the removal of paint. Similarly detergents can also be inducted into the water supply.

An adjustable spray nozzle can be fitted to the gun and the high-pressure jet can be easily changed to a fine spray.

A unique feature of the unit is claimed to be the unloading valve which automatically by-passes full pump output back to suction when the nozzles are closed and also handles any excess capacity over and above that required at the set delivery pressure. This means that the unit can be controlled by one man from the gun.

Pipe cleaning can be carried out by this unit. By means of self-propelled pipe-cleaning nozzles the hose is automatically driven either forwards or backwards along the pipes by the force of the water. Bends in pipe lines can be successfully negotiated.

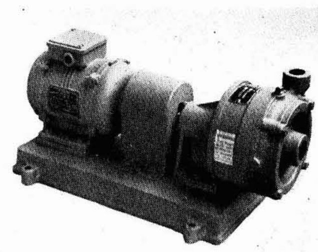
The complete unit is mobile, being mounted on a fabricated steel frame trolley with rubber tyred wheels and axles.



Hydraulic Cleaning unit

IMPROVED CENTRIFUGAL PUMPS

LATEST range of improved pumps introduced by Girdlestone Pumps Ltd., 23 Davies Street, London W1 is the Seal range which has been designed exclusively to



Girdlestone Centrifugal Pump

meet the requirements of efficient mechanical shaft sealing on small pumps.

These pumps incorporated mechanical shaft sealing exclusively and have seals of suitable types for all water duties and for solvents and many corrosive liquids that cannot be handled satisfactorily in pumps with stuffing boxes and glands. The following advantages are claimed: (1) complete cooling of the seal by the liquid pumped without resort to flushing pipes, (2) large internal liquid area prevents settlement of suspended or foreign matter around seal, (3) replacement of seal is simple, the suction end cover and impeller only needing to be removed.

The pump units, comprising volute, impeller, suction end cover and mechanical seal, are available with delivery connections in five sizes from ¾ in. to 1½ in. and all five sizes have the same shaft and flange dimensions for interchangeability of mounting.

People in the NEWS

● The Meldola Medal for 1957 has been awarded to Dr. T. S. West, lecturer in analytical chemistry, University of Birmingham. After graduating with first-class honours at the University of Aberdeen Dr. West moved to Birmingham where he received his Ph.D. in 1952. His early research work was concerned with the development of new reagents for titrimetric analysis. He developed mercurous nitrate as a stable titrant and showed it to have widespread applications to chemical analysis. Together with Dr. Belcher of Birmingham, he initiated a programme for the development of a comprehensive scheme of ultimate organic micro-analysis on the 50μg. scale. Dr. West has written papers and reviewed many books for Chemical Age. The Meldola Medal, the gift of the Society of Maccabaeans, is awarded each year to the chemist who, being a British subject and under the age of 30 on 31 December of that year, is considered to show the greatest promise as indicated by his or her published work.

● Sir John Cockcroft, Director of Atomic Research at Harwell, was unanimously elected chairman of the Bagdad Pact Scientific Committee at its first meeting in Bagdad on 31 March.

● Among new Fellows of the Royal Society elected on 21 March are: F. S. Dainton, professor of physical chemistry, University of Leeds; J. K. N. Jones, professor of chemistry, Queen's University, Kingston, Ontario; H. S. Lipson, professor of applied physics, University of Manchester; Bruno Mendel, professor of pharmacology, University of Amsterdam; F. L. Rose, director of research, Imperial Chemical Industries (Pharmaceuticals) Ltd.; E. L. Smith, research biochemist, Glaxo Laboratories Ltd.; and Sir Ewart Smith, deputy chairman and technical director, Imperial Chemical Industries Ltd.

● Mr. A. J. Steward, deputy treasurer, ICI Ltd., retired at the end of March. Mr. A. E. Frost and Mr. S. W. Weysom have been appointed deputy treasurers to succeed him.

● Mr. G. C. H. Matthey has been elected chairman of Johnson, Matthey and Co. Ltd., following the recent death of Mr. H. W. P. Matthey. Mr. G. C. H. Matthey was appointed a joint managing director of the company in 1913, and served in this capacity for 35 years.

● Mr. George C. H. Clark has resigned as a director of Bowmans Chemicals.

● Mr. F. H. Mackenzie has resigned from the Boards of A. Boake, Roberts and Co. (Holdings) and its main subsidiary.

● Officers and executive committee of the British Disinfectant Manufacturers' Association have been elected for the ensuing year as follows:

Chairman: Mr. W. Mitchell, Hull Chemical Works Ltd.; *vice-chairman*: Mr. H. C. Askew, Reckitt and Colman Ltd.; *hon. treasurer*: Mr. Victor G. Gibbs, William Pearson Ltd.; *executive committee*: Mr. R. G. Berchem, Mr. A. Ernest Berry, Sir Knowles Edge, Dr. N. H. Poynton, Mr. C. W. Richards, Mr. J. Moffat Scott, Mr. S. L. Waide; *hon. auditors*: Mr. R. E. Dexter, Mr. F. C. Seager; *secretariat*: Mr. W. A. Williams, M.B.E., B.Sc. (secretary), Mrs. G. I. Rathborn (executive officer), 86 Strand, London WC2.

● Mr. P. D. O'Brien and Mr. B. E. A. Vigers have resigned their positions as joint managing directors of Laporte Titanium Ltd., owing to increasing responsibilities within the Laporte group. They remain chairman and vice-chairman respectively. Mr. W. Woodhall, a director and general manager of Laporte Titanium Ltd., has been appointed managing director.

● Mr. John J. Miller has been appointed general manager of the alumina division, Olin Revere Metals Corporation. Mr. Miller will be in charge of the Olin Revere alumina facilities now under construction at Burnside, La., a new plant that will have a capacity of 350,000 tons of alumina a year.

● Major T. W. Adam has relinquished his office as managing director of the Monckton Coke and Chemical Company after 45 years' association with the company. He will remain a member of the Board.

Mr. J. Gallagher has been appointed general manager of the company.

● Dr. James Craik, chairman of the Nobel division, Imperial Chemical Industries Ltd., and vice-chairman Glasgow and West of Scotland Management Association, will preside at one of the sessions of the Scottish management conference to be held at Gleneagles from 3 to 5 May. Subject of the session, to be held on 4 May, is 'Do your salesmen help or hinder your sales plan?'

● Dr. Denis Taylor, head of the electronics and instrument division, Atomic Energy Research Establishment, Harwell, has been appointed a director and general manager of Plessey Nucleonics. He has also been appointed research executive of the aircraft and electronics groups of the Plessey Co. and will be responsible for the co-ordination of the company's nuclear programme.

● Dr. G. D. Rosen, B.Sc., Ph.D., F.R.I.C., is to be nutritional adviser to Pfizer Ltd., of Folkestone, Kent. The post is newly created and the appointment takes effect on 29 April. Since 1949 Dr. Rosen has been a research biochemist with J. Bibby and Sons Ltd., of Liverpool, where he carried out physico-chemical and nutritional research on proteins and fats and on the formulation and manufacture of animal feeds. Previously he was in the food products division of Lever Bros. Ltd.

● From 1 April Mr. G. A. Wilson has been appointed division labour manager for the Nobel division of Imperial Chemical Industries and Mr. R. Haslam has been appointed division staff manager. Mr. Wilson came from the Billingham division where he was deputy division labour manager. Mr. Haslam joined Nobel division in 1947 as a technical service engineer and became an assistant manager of the technical service department in 1955.

● Mr. David H. Conklin has been appointed managing director and Mr. William D. Eaton secretary and treasurer of The Du Pont Co. (UK) Ltd. During the second world war Mr. Conklin was for three years stationed at the US Naval Operating Base at Londonderry, Northern Ireland, near the site of the neoprene plant to be built by Du Pont. For his work at Londonderry he was awarded the OBE. He joined Du Pont (US) in 1947 and rose to become director of sales for the petroleum chemicals division. Mr. Eaton has been with the US company since 1936 and was formerly manager of the tax division.

● Mr. W. H. Child, manager at Fort Dunlop since 1940 of the Government contracts department and, since 1946, of the central price register, has retired, after 38 years' service, because of ill-health. He is succeeded by his assistant, Mr. H. Neville.

● From September next, Professor Henry Norman Rydon, at present professor of chemistry and director of the applied chemistry laboratory at the College of Technology, Manchester, will become professor of chemistry at Exeter University.

● Mr. J. G. Bedford, works manager of the Ciba Laboratories Ltd., outlined opportunities in the chemical industry for young men in an article in the *Grimsby Evening Telegraph* last week.

● Mr. L. C. Harman, divisional administration executive of Smiths Aircraft Instruments Ltd., has recently been appointed to the board of Waymouth Gauges and Instruments Ltd., one of the Smiths group.

Commercial News

Shawinigan Chemical's Record Sales

BUSINESS of Shawinigan Chemicals Ltd. wholly-owned subsidiary of Shawinigan Water and Power Co., showed increased sales volume at a lower margin of profit for 1956. Sales were up 8.9 per cent to reach an all-time record. Net profit dropped 29.4 per cent and total net earnings were down 30.8 per cent. The chemical company's share of undistributed earnings of associated companies not consolidated was approximately $875,000.

Shawinigan Chemicals' expenditures for new construction totalled $4,733,000 compared with $1,098,000 in 1955. Included were construction of a new rotating-hearth carbide furnace now in operation in Shawinigan Falls: completion of additions to the vinyl acetate plant; construction of a sulphuric acid plant; initial construction of a caustic soda and chlorine plant; and development work on a new plant site in Shawinigan East where the sulphuric acid and caustic soda and chlorine plants are located.

Volume of domestic sales of Canadian Resins and Chemicals Ltd., an associated company, continued to expand during the year, but profit margins were down owing to substantial reductions in market prices of vinyl products throughout North America. Results achieved by B. A. Shawinigan Ltd., another associated company, were considerably better than in 1955 and the company's Montreal East plant is now being enlarged to increase production capacity of phenol and acetone by 50 per cent.

St. Maurice Chemicals Ltd., another associate, operated its Varennes, Que., plant at a higher level of capacity than in 1955. In the US, Shawinigan Resin Corp., made good progress during 1956 on construction of a new plant at Trenton, Mich., for production of Butvar, a polyvinyl resin used in safety glass, and also on additional facilities at its Springfield, Mass., plant for manufacture of Gelvatol polyvinyl alcohol.

In the UK Hedon Chemicals Ltd., a Shawinigan Chemicals' associate company, completed construction of a plant near Hull where vinyl acetate for UK markets is now being produced.

British Chrome & Chemicals

British Chrome and Chemicals (Holdings) are maintaining their 12½ per cent dividend with a final of 6¼ per cent for 1956. Group trading profits etc., increased from £534,783 to £598,385. After heavier charges for depreciation of £111,000 (£95,000) and tax £249,100 (£205,500), the net profit is £4,000 higher at £238,285 (£234,283).

Viscose Development Co.

A final dividend on ordinary and preference of 9½ per cent has been declared by Viscose Development Co., making 12½ per cent for 1956 (same). Profit was £80,485 (£79,294) and net profit after tax was £35,002 (£39,227).

Glaxo Laboratories Ltd.

Glaxo Laboratories Ltd. announce an interim dividend on the ordinary stock of five per cent for the year ending 30 June 1957 which will be paid less tax on 14 June. A progress report on the first half year's trading will be posted to stockholders in a few days.

Henry Balfour and Co.

Group trading profit of Henry Balfour and Co., chemical engineers, for year ended 31 October was £131,790 (£160,244). Net profit was £46,880 (£57,267). Dividend of 15 per cent (same) is declared on ordinary.

NEW COMPANIES

M. R. McGregor Ltd. Capital £4,500 £1 shares. Manufacturing, wholesale, retail, consulting, research, analytical, pharmaceutical and dispensing chemists and druggists. Directors: W. McGregor (chairman) and M. R. McGregor. Registered office: 1 Station Terrace, Shenfield, Essex.

Dalkin (Rotherham) Ltd. Capital £5,000 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs etc. Directors: J. Hinchliffe, F. Lancashire, and E. Shaw. Registered office: 42-3 Wellgate, Rotherham.

F. D. R. Blackton Ltd. Capital £100 in £1 shares. Manufacturing, research, dispensing and analytical chemists and druggists etc. Directors: Frederick D. R. Blackton and Gladys J. Blackton, both of 'Winnats', Woodvale Road, Cowes, IoW. Registered office: 120 High Street, Cowes, IoW.

MORTGAGES & CHARGES

Herbros Ltd., London WC, chemical manufacturers. 27 February, £6,000 charge, to Evelyn L. Gordon, London; charged on leasehold 3 High Street and 3 Cross Keys Mews, Marylebone.

John E. Moore Ltd., Yeadon, metallurgists. 28 February, mortgage, to Westminster Bank Ltd. securing all moneys due or to become due to the Bank; charged on The Croft, Forest Moor Road, Knaresborough, with fixtures.

Sheltons (Northampton) Ltd., plastics manufacturers. 22 February, charge, to Westminster Bank Ltd. securing all moneys due or to become due to the Bank; charged on factory premises at Spencer Bridge Road, Northampton, with fixtures.

SATISFACTION

Clay and Son Ltd., London E, fertiliser manufacturers. Satisfaction 5 March, of mortgages or charges registered 22 February 1946, 1 May 1947 and 27 February, 2 April and 22 October 1953.

Voluntarily Winding-up

The British Malayan Petroleum Co. Ltd., registered office St. Helen's Court, Great St. Helen's, London EC3, Mr. C. N. Chater of Seria, Brunei, appointed liquidator, 18 March.

Semtex Move

The Semtex office in the West End of London has moved from 123 Pall Mall to c/o Alfred Goslett and Co. Ltd., 127 Charing Cross Road WC1. (Gerrard 7890).

Market Reports

INDUSTRIAL CHEMICAL PRICES FIRM

LONDON Firm price conditions continue in most sections of the industrial chemicals market. Contract deliveries are being taken according to schedule and the flow of new business on home account is reasonably good although buyers are somewhat hesitant, because of the uncertainties arising from the engineering dispute, to cover more than immediate requirements. Home trade business in fertilisers continues to expand. Export trade has been maintained on a good scale with India and Australia the chief outlets. The returns for overseas shipments of chemicals since the beginning of the year show an improvement over the same period for 1956. Activity in the coal-tar products market continues reasonably good with creosote oil, cresylic acid and the solvents in steady request.

MANCHESTER Prices generally on the Manchester chemical market during the past week have maintained a firm front, the outstanding change being the advance in borax and boric acid. The textile and allied industries and other leading industrial consumers are taking good contract deliveries of the alkalis and most heavy chemicals and both home and export enquiry has been maintained. Seasonal activity in the fertiliser market has continued and in some sections delivery delays are becoming longer. Pitch, tar and creosote oil are active in the tar products markets.

GLASGOW Overall the position of the Scottish heavy chemical market during the past week has shown little or no change; although business has been steady in some sections of industry, there has been in others some curtailment of deliveries due to the present industrial unrest. Fertilisers, however, have continued to show increased activity, particularly in regard to current demands. Prices on the whole have been steady.

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 (Sale Branch), 25 Southampton Buildings, Chancery Lane, London, WC2, price 2s 6d including postage; annual subscription £6 6s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection. 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. Dates on which these applications will be open to inspection are given in 'Official Journal (Patents)'.

AMENDED SPECIFICATIONS

On sale 8 May or as soon as possible thereafter.

Complex compounds of iron carbonyl and a cyclopentadiene. Shell Refining and Marketing Co. Ltd. 737 124
Elastomeric diisocyanate modified polyesters. Goodrich, B. F., Co. 750 148

ACCEPTANCES

Open to public inspection on 8 May 1957.

Heating and drying of a continuous length of a material comprising organic fibres. Lippke, P. 774 227
Synthesis of pyridines. Celanese Corp. of America. 774 436
Washing, bleaching or like compositions. Seifenfabrik Hochdorf, AG. 774 153
N-thioamines. Monsanto Chemical Co. 774 570
Device for assessing activity of chemical compounds in relation to micro-organisms. Consolidated Laboratories, Inc. 774 155
Filler bodies for carrying out reactions of gases with solids in fluidised beds. Badische Anilin- & Soda-Fabrik, AG. 774 325
Producing metallisation effects on textile material. Heberlein & Co., AG. 774 439
Apparatus for the projection of substances in powder form. Berthoud & Cie. 774 446
Method and apparatus for dispensing measured quantities of liquids. General Motors Corporation. 774 246
Synthesis of o-alkyl-p-alkoxyphenols. Universal Oil Products Co. 774 335
Synthetic ester lubricant blends. Esso Research & Engineering Co. 774 457
Fibres of thermoplastic materials. Owens-Corning Fiberglas Corp. 774 339
Glass compositions. Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St-Gobain, Chauny & Cirey. 774 248
Methods and apparatus for contacting gases and liquids. Diamond Alkali Co. 774 249
Reductive N-alkylation process. Universal Oil Products Co. 774 345
Gas mixture fractionating processes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. 774 252
Unsaturated esters, ethers and aldehydes Hoffman-La Roche & Co., AG., F. 774 462
Alkaloid derivatives. Ciba Ltd. [Addition to 744 290.] 774 463
Controlling dimensions of linear drawn bodies. Owens-Illinois Glass Co. 774 355
Organic esters. Pfizer & Co., Inc., C. 774 464
Treatment of cellulosic materials to impart flame resistance thereto. Dow Chemical Co. 744 263
Sterol compounds and purification thereof. Upjohn Co. 774 466
Amino carboxylic acids. Inventa AG., für Forschung Und Patentverwertung. 774 468

Open to public inspection on 15 May 1957.

Thermoplastics. Compra Plastics Ltd., and Sturm, R. H. 774 891
Corrosion-preventing lubricating oils. Lobitos Oilfields Ltd., Brown, T. F., and Killcross, J. 774 672
Cold-setting compositions yielding chemically resistant solid masses. Farbwerke Hoechst AG Vorm. Meister, Lucius, and Brüning. 774 674
Disazo-dyestuffs insoluble in water. Farbwerke Hoechst AG Vorm. Meister, Lucius, and Brüning. 774 676
Hexamethylenetetramine. Meissner, J. [Addition to 722 434.] 774 789
Polymers. British Petroleum Co. Ltd., Habeshaw, J., and Rae, R. W. 774 871
Method of and apparatus for treating fat-containing material. Sheppy Glue and Chemical Works. 775 003
Bactericidal and fungicidal compounds and preparations. Ciba Ltd. 774 679
Thermoplastic polymeric materials. ICI Ltd. 774 681
Monoazo dyestuffs containing heavy metal and their use. Geigy, J. R., AG. 775 005
Dispersions. Farbwerke Hoechst AG Vorm. Meister, Lucius, and Brüning. 775 008
Liquid adhesive or other viscous liquid dispensers. Dachinger, H. 775 009
Metallisable trisazo dyestuffs. Geigy, J. R., AG. 774 682
Oil and water emulsions. Anzin Ltd. 774 792
Electrolysis of iron metal salt solutions. Siemens and Halske Ges. 774 896
Polymerisation. Monsanto Chemical Co. 774 897
Polymer containing compositions. British Petroleum Co. Ltd., McLean, A., Habeshaw, J., and Rae, R. W. 774 873
Ammonium sulphate. Koppers Co. Inc. 775 010
Cobalt complexes of heterocyclic carboxylic acid hydrazides. Farbenfabriken Bayer. 774 684
Quinone condensation products. Farbenfabriken Bayer. 774 794
Cobaltiferous azo-dyestuffs. Ciba Ltd. [Addition to 757 485.] 775 011
ε-Hydroxycaproic acid esters. Farbenfabriken Bayer. 774 687
Terephthalic acid. Chempatents Inc. 774 902
Oxidising mercaptans or mercaptides to disulphides in a two-phase system consisting of a light hydrocarbon oil phase and an aqueous alkali metal hydroxide phase. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. 775 015
Synthetic ester lubricants. Esso Research and Engineering Co. 775 017
Ortho-methylolphenols. Distillers Co. Ltd. 774 696
Sulphur dioxide from sulphur and sulphur trioxide. Allied Chemical and Dye Corp. 775 020
Pesticidal compositions. Shell Refining and Marketing Co. Ltd. 775 021
Epoxy resins. Distillers Co. Ltd. 774 582
Derivatives of diphenyl urea and uses. Geigy, J. R., AG. 774 802
Phenthiazine derivatives. Soc. des Usines Chimiques Rhone-Poulenc. 774 882
High density spray-dried granular, soapless detergent composition. Purex Corporation Ltd. 774 804
Thermosetting resinous moulding composition. American Cyanamid Co. 774 805
Polyester resin compositions. Pittsburgh Plate Glass Co. 774 807
Dihydrazinophthalazine derivatives. Cassella Farbwerke Mainkur AG. 774 808
Isothiourea derivatives containing sulpho-acid groups. Boehme Fettchemie Ges. 775 026
Metallisable monoazo dyestuffs. Geigy, J. R., AG. 774 884
Aromatic *o*-hydroxydiazo compounds. Geigy, J. R., AG. 774 885 774 886
Complex metal salt-soap compounds. Esso Research and Engineering Co. 775 027
Treatment of silica. Columbia Southern Chemical Corp. 774 585 774 586
Production of furfural and acetic acid from pentosan-containing material. Oronzio de Nora Impianti Elettrochimici. 774 809
Epoxide resins. ICI Ltd. 774 810
Polyesters of terephthalic acid. ICI Ltd. 775 030
Removing arsenic compounds from phosphoric acid. Knapsack-Griesheim AG. 774 709
2-Benzthiazyl sulphenomorpholide. ICI Ltd. 774 710
Analysing liquids which contain a crystalloid substance and a non-crystalloid substance. Technicon International Ltd. 774 711
Porous materials impregnated with synthetic resin. Dynamit AG Vorm. A. Nobel and Co. 774 713
Trisazo dyestuffs. Ciba Ltd. 774 916
Complex copper compounds of direct-dyeing dyestuffs. Ciba Ltd. 775 034
Alkylation of aromatic hydrocarbons. ICI Ltd. 774 716
Synthesis of lysergic acid and homologues thereof. Lilly, E., and Co. 774 984
Pure benzene carboxylic acids. Newby, H. (Chemische Werke Huls AG). 774 920
Epoxy resin compositions. National Lead Co. 775 035
Monoazo dyestuffs derived from cyanuric chloride. ICI Ltd. 774 925
Emulsions of polymers. British Oxygen Co. Ltd. 775 038
Pyridazine compounds. Ilford Ltd. 774 724
Ion exchange resin indicator compounds. Security Trust Co. of Rochester. [Addition to 728 383.] 774 726
Polymethine dyes. Kodak Ltd. 774 779
Heterocyclic quaternary salts. Kodak Ltd. 774 780
Monoazo-dyestuffs. Ciba Ltd. 774 819
Alkali metal borohydrides. Callery Chemical Co. 774 728
Polyvinyl alcohol. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. 774 729
Exothermic compositions. Diamond Alkali Co. 774 889 774 890
Piperidines. Ciba Ltd. 774 822
2-Methyl-butanol-(1)-one (3). Rheinpreussen AG für Bergbau und Chemie. 774 934

Benzenesuphonylguanidines. Oesterreichische Stickstoffwerke AG. **774 823**
Organic halogen compounds. ICI Ltd. **774 737**
Anhydrous ketene. Celanese Corp. of America. **774 825**
Ethers of 2-methylol-butene-1-one (3) and polymers thereof. Rheinpreussen AG für Bergbau und Chemie. **774 826**
Aromatic carbonyl compounds from aryl ethylenes. Naamlooze Vennootschap Polak und Schwarz's Essencefabrieken. **774 608**
Copper-containing disazo dyestuffs. Sandoz Ltd. **775 048**
2-Amino-3-nitro-5-acylthiophene azo dye compounds. Eastman Kodak Co. **774 611**
Trisazo dyestuffs. Cassella Farbwerke Mainkur AG. **774 612**
Electrodeposition of nickel. Udylite Research Corp. **774 614**
Terephthalic acid. Chempatents Inc. **774 835**
Aromatic or heterocyclic hydroxycarboxylic acids. Farbenfabriken Bayer. **774 837**
Acetylenic esters. Hoffmann-La Roche, F., and Co. AG. **774 621**
Coating compositions. Du Pont de Nemours, E. I., and Co. **774 625**
Preparation of halohydrins of fatty acids. Rohm and Haas Co. **774 946**
Cross-linking of polymers. Kellogg, M. W., Co. **774 947**
Electroplating aluminium and electrolyte therefor. United States Steel Corp. **775 055**
Etherified resins. Distillers Co. Ltd. [Divided out of 774 582.] **774 583**
Epoxy resins. Distillers Co. Ltd. [Divided out of 774 582.] **774 584**
Condensates of the dicarbamate of diethylene glycol with formaldehyde. Rohm and Haas Co. **774 749**
Concentrated formic acid from formates. Chemische Werke Hüls AG. **774 751**
p-Toluic acid. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **774 954**
Epoxidised polymers. Food Machinery and Chemical Corp. **774 752**
Benzoic acid derivatives, and processes for their preparation. Thomae, Dr. K., Ges. **774 635**
Chemical compounds useful in the synthesis of lysergic acid and its homologues. Lilly, E., and Co. **774 985-774 992**
Complex heavy metal salts. Badische Anilin- und Soda-Fabrik. **774 956**
Tetrahydroisoquinolino - alkyl-β-phenoxy ethers. Wander, Dr. A., AG. **774 649**
Mixing gases. Research Corp. **774 653**
Tyrosine. International Minerals and Chemical Corp. **774 961**
Recovery of tocopherols from deodoriser sludges. Eastman Kodak Co. **774 855**
Fibres and filaments. Abbey, A. (Dow Chemical Co.). **774 762**
Esters of halogenated phenoxyacetic acids. Boehringer, A., Boehringer, E., Liebrecht, I., and Liebrecht, J. (trading as Boehringer Sohn, C. H.). **774 763**
Epoxidised copolymers. Food Machinery and Chemical Corp. **774 765**
Halohydrins. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **774 766**
Tropane and ψ-tropane derivatives. Sandoz Ltd. **774 858**
Acrylonitrile polymers stabilised with certain beta-alkylaminopropionitriles. Abbey, A. (Dow Chemical Co.). **774 768**
Stabilisation of acrylonitrile polymers. Abbey, A. (Dow Chemical Co.). **774 769**
Polyglycidyl ethers of tetraphenols. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **774 663**
Certain 3-substituted-1, 2, 4-triazoles. Olin Mathieson Chemical Corp. **774 867**
Water-dispersible copolymeric resinous materials. Berger, L., and Sons Ltd. **774 868**
Phosphate coating of metal surfaces. Kemp, J. A. (American Chemical Paint Co.). **774 667**

Patent for Plastics Release Agents

According to British Patent 749,958, water soluble products of value as release agents in plastics moulding processes can be prepared by reacting glycerine with dimethyl dialkoxy silanes by ester exchange in pyridine solution or, preferably, with dimethylsilizanes in dimethyl formamide.

Chemical Manufacturers as Electricity Users

REPRESENTATIVES of many of the firms of chemical manufacturers and chemical engineers were guests of Merseyside and North Wales Electricity Board at the opening of the new electrical industrial development centre, Paradise Street, Liverpool recently. One interesting feature of the inaugural exhibition was an illuminated panel showing how the industrial electricity load is spread throughout the Board's area. The chemical and oil refining industry is by far the biggest company with an annual demand for 870,000,000 units, maximum demand 148,000kW.

Chemicals and oil refineries account for about 40 per cent of the electricity sales to large industries.

Portable Hydrogen and Acetylene Plants Reported from US

FROM the Institute of Gas Technology, Chicago, comes a report of a completed basic process research, and the building of a prototype portable acetylene plant, using jet fuel as raw material. This project, as also the Girdler Company's parallel development of a portable hydrogen plant, is sponsored by the US Army Corps of Engineers.

In the acetylene producing unit the process operates at 2,800° F and ½ atm. in the presence of superheated steam. Subsequent purification produces a stream of 95 per cent acetylene. The portable acetylene units with readily available raw material eliminate the need for handling of calcium carbide, with its dust difficulties and hazards. There is also the feature of mobility.

The Girdler Co.'s unit for hydrogen production produces 98 per cent hydrogen by catalytic steam-reforming of diesel oil. This is of considerable interest, for steam-reforming has up to now been limited to lighter hydrocarbons, such as methane or propane. Heavier hydrocarbons via partial oxidation processes have been used previously to make hydrogen.

Although carbon deposition on the reforming catalyst was expected, the Girdler Company state that extended test operation showed good catalyst life is obtained provided that a 2½-hour steaming period follows each 21½-hour-on-stream period.

Features of note for the chemical engineer are that the portable unit uses four catalyst-filled tubes less than 8 ft. long and about 6 in. in diameter, made of a heat-resistant type of stainless steel. The usual industrial hydrocarbon reformer uses catalyst-filled tubes ranging from 20 to 40 ft. in length. The absorber and monoethanolamine reactor, too, which in a conventional unit stands some 30 ft. high, has been produced in two 7 ft. high sections, operated with gas flow in series and monoethanolamine flow in parallel. Also included in the mobile unit are a 15 h.p. steam generator which produces 500 lb./hr. of 100 p.s.i.g. steam and furnishes entire steam requirements; boiler feed water treating and heating system; a water cooling tower designed to cool 50 g.p.m. of water from 110°F to 90°F and an oil storage tank to hold one day's supply of diesel oil.

The process employed is described as follows: Diesel oil is mixed with superheated steam and the vaporised mixture is passed through the reformer tubes containing nickel catalyst. Endothermic heat of reaction is provided by burning more diesel oil in the furnace space surrounding the tubes.

Reforming reaction is carried out at somewhat higher temperature and steam-to-carbon ratio than normally used to reform methane or propane. More steam is mixed with the reformed gases—hydrogen, carbon monoxide and carbon dioxide—and the mixture is passed through a shift converter.

Carbon monoxide is converted to carbon dioxide, with the formation of an additional equivalent amount of hydrogen. Carbon dioxide is stripped out of the gas by the monoethanolamine solution (20 per cent) to the absorbers. The hydrogen is compressed to 2,275 p.s.i. The monoethanolamine is reactivated by stripping off carbon dioxide in a packed tower equipped with a steam-heated reheater.

CEA Develops Automatic Sulphur Dioxide Recorder

AN AUTOMATIC sulphur dioxide recorder and a portable meter have been developed by the Central Electricity Authority Research Laboratories, Leatherhead, which operate in the range 0-50 p.p.h.m. sulphur dioxide, with a sensitivity of 1 p.p.h.m. The range can be extended by a simple adjustment, but the sensitivity decreases in proportion to the increase in range. The two instruments were described by W. G. Cummings and M. W. Redfearn in a paper to the Institute of Fuel on 27 March.

The automatic instrument continuously records sulphur dioxide concentrations and operates on the principle of the absorption of the sulphur dioxide in a continuous counter current column and the measurment of the increase in the conductivity, due to sulphuric acid formation, in the reagent solution.

As the instrument is intended for long periods of continuous operation on a fixed site, extreme portability is not required. Nevertheless, the instrument is small enough to be moved easily. The portable meter, however, can be used in a small car for rapid surveys in a particular area. As this meter is likely to be subject to temperature changes, a photoelectric absorptiometric method for determining sulphur dioxide was chosen. An alternating current is also necessary. A starch-iodide reagent was chosen as this was found to be most sensitive to sulphur dioxide.

Cost of the instruments has been kept to a minimum and long field trials have proved their reliability. Investigations with these recorders have indicated that when plumes from modern power stations reach the ground the concentration of sulphur dioxide in them is low.

International Conference on Detergents

AN INTERNATIONAL CONFERENCE on the Science of Detergents is to be held next week in London, from 8 to 12 April. Sir Eric Rideal, F.R.S., is the president and Lord Brabazon is the honorary president of the conference. Dr. L. H. Lampitt is chairman of the organising committee which includes wide representation covering industrial and academic interests.

A comprehensive programme of lectures has been arranged by a committee headed by Dr. J. H. Schulman, head of the Department of Colloid Science at Cambridge University.

Authors of about 190 papers to be given come from 18 countries. The full field of detergents and surface activity will be covered. Chemical and physical action of detergents and allied research problems will be considered.

FOR YOUR DIARY

MONDAY 8 APRIL

SCI (Chemical Engineering Group)—London: 14 Belgrave Square SW1. Symposium on safety. Also on 9 April.

SCI (Corrosion Group)—London: 14 Belgrave Square SW1, 6.30 p.m. Spring lecture: 'Recent research at Milan on the electrochemistry of corrosion' by Professor R. Piontelli.

Incorporated Plant Engineers—Dundee: Mathers Hotel, 7.30 p.m. 'Problems of textile research' by H. Corteen.

TUESDAY 9 APRIL

I.Chem.E.—Birmingham: University. Symposium on chemical engineering education. Also on 10 and 11 April.

Society of Instrument Technology—Manchester: College of Science and Technology, 7.30 p.m. 'Science and art of instrumentation' by J. K. Burkitt.

WEDNESDAY 10 APRIL

SCI (Agriculture Group)—Bristol: Long Ashton Agricultural Research Station. Symposium on 'Trace elements in soils, plants, and animals'. Also on 11 and 12 April.

SAC—Birmingham: Mason Theatre, University, Edmund Street, 7 p.m. 'Analytical chemistry of beryllium' by E. Booth.

Institute of Fuel—Institution of Civil Engineers, Great George Street SW1, 5.30 p.m. 'Koppers-Tolzek gasification process' by Hans Koppers.

SCI (Food Group, Nutrition Panel)—London: 14 Belgrave Square SW1, 6.15 p.m. Annual general meeting. 6.30 p.m. Chairman's address: 'Diet and coronary disease: some correlations and speculations' by Professor J. Yudkin.

FRIDAY 12 APRIL

CS—St. Andrews: Chemistry Department, St. Salvator's College, 5.15 p.m. 'Chemical and Antituberculosis activity of some new phenazines' by Dr. V. C. Barry.

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Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels), Higher National Certificate, University degree. Candidates taking their examinations in 1957 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.

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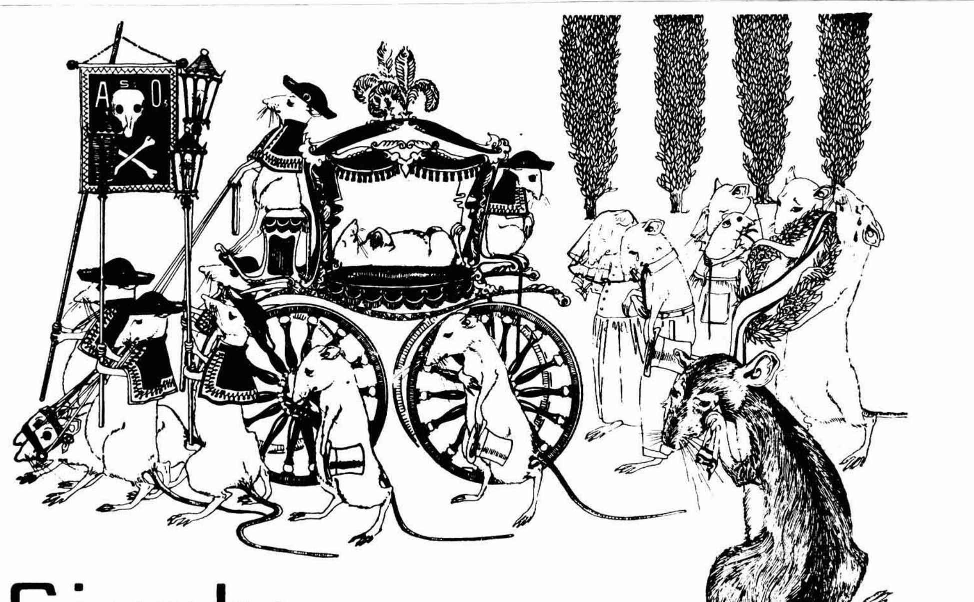
Interview Boards arranged at intervals, as required. Early application is advised.
Z2758/120/1/57/JT/a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