WITH METALLURGICAL SECTION

The Chemical Age

VOL LXVIII 3 JANUARY 1953 No 1747

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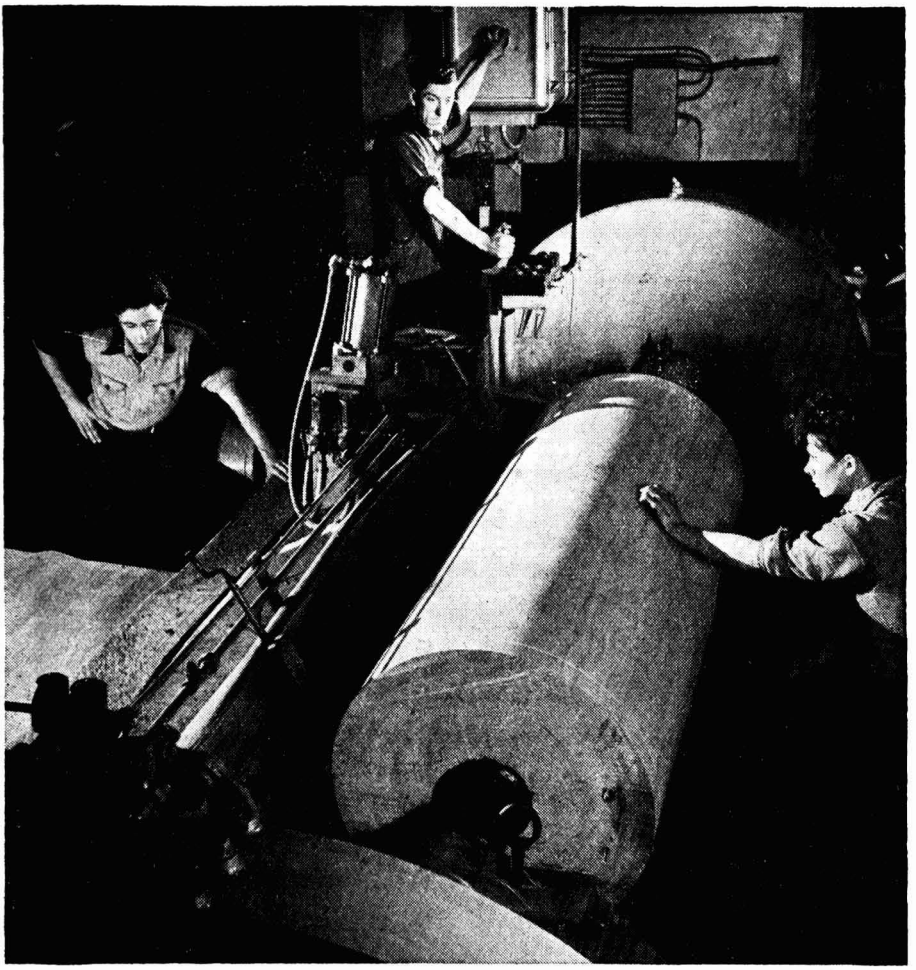

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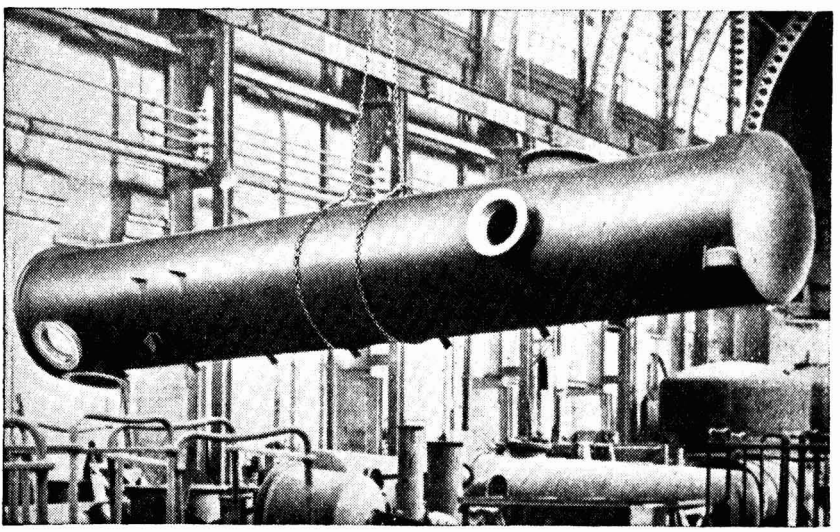
Issued by the British Electrical Development Association

★ *This is one of a series of technical advertisements designed to advise Chemical Engineers and others of the extent of the Anti-Corrosion Service provided by DUNLOP. Other advertisements deal with soft rubber, ebonite, butyl, P.V.C.*

ANTI-CORROSION No. 5

NEOPRENE



Neoprene is resistant to the effects of heat, oxygen and sunlight. Its resistance to oil is superior to that of natural rubber. It is also relatively impermeable and resists gas diffusion well. Animal, vegetable and petroleum base products cause slight swelling, but have little effect on the physical properties of a neoprene lining. In general, neoprene is used in contact with inorganic chemicals and most organic compounds, the more highly saturated having least effect on the lining. Strong alkalies can be successfully handled. Compounded with suitable antioxidants, the resistance of neoprene to copper salts is much better than that of rubber. The maximum recommended temperature is 90°C. The use of neoprene with the following chemicals, among others, is not recommended:—strong oxidising acids such as concentrated sulphuric, nitric, chromic, and acetic acid, or creosote. The lining or covering of chemical plant can be carried out at Dunlop factories, or on customer's own premises, subject to various limitations of plant design, facilities available and the type of protection required. Detailed service data should accompany all enquiries, so that Dunlop technicians can advise accordingly.

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The
Chemical Age

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The New Year

IT would hardly be truthful, however pleasant, to prophesy that 1953 can be a year of stability. The most that may be hoped is that it will prove to be a year of stabilised instability, a year in which the international situation is held to its present low temperature level and a year in which Britain and the sterling Commonwealth countries manage to avoid a worsening of their currency-cum-trade equilibria. Small improvements in these major and perpetual crises might possibly take place—but to hope for more than that is to discard common sense. It is sad to realise that a year that brings with it the Coronation of a young sovereign cannot also bring greater prospects of genuine peace in the world and soundly based prosperity at home.

In short, the advance verdict on 1953 must be one or other of those hospitalised euphonisms—' as well as can be expected,' ' slight improvement,' or, for sheer abandon ' fairly satisfactory.' There are already distinct signs that emphasis upon rearmament will lessen and that upon exports will be intensified. For some industries this will bring greater difficulties and uncertainties. Rearmament business, once obtained, has the merit of definition—with specifications and prices known beforehand, and the buyer fully contracted. Export trade is a very different matter for the sellers' market in most commodities has gone. The chemical industry is more happily placed in these respects than most. The world market for chemicals is still expansive. In a good many cases the rate of expansion in demand may have fallen but actual recession is exceptional. There are very few signs, for example, of set-backs to the American chemical industry and its vast plans for production increases. Without risking complacency we can feel confident that the British industry's output in 1953 will find enough buyers at home and abroad. It is somewhat fallacious, however, to look upon the chemical industry's main contribution to national economy as dollar-earning. If its potentialities are used fully at home, its dollar-saving capacity is far more important.

There are no official bush whisperings to make us believe that some realistic attention will be paid in 1953 to the basic problem in chemical education—

the supply of teachers of chemistry to schools. In a welter of reports and recommendations about higher education in science, the foundation of it all is deplorably neglected. According to a private source of information, this summer only two scholars in one of our most technical-industrial areas 'opted' for teaching chemistry as their future careers. This may not be precisely accurate for privately acquired statistics suffer sometimes from incompletion; but were the accurate figure twenty instead of two, it would still be dangerously low. On the contrary, there are signs of a call for further economy in educational services, and it is sadly to be doubted whether any axe set in motion by Whitehall can make its slashes with prudent selectivity.

For chemists 1953 may be a particularly bitter year. The fate of *British Abstracts* will become known. Informed persons hold the view that the situation is critical. Chemical Council Joint Subscription demands have carried a sad little affix in red—members may or may not receive their abstracts in 1953. It all depends upon the Council's success in collecting sufficient funds from external sources. We are inclined to agree with the view recently expressed by a correspondent to *Chemistry & Industry* (1952, 50, 1223): '. . . the amounts in question are quite insignificant to central Government and it is quite clear that this is where the money should come from. An opportunity exists to demonstrate that the fashionable eulogies paid to science are not just lip service.' During 1952 some correspondents to our own columns have suggested that national pride is the only *raison d'être* for *British Abstracts* and that we can all utilise the abstract services of other countries. In the long run and with our own abstracts gone, would British research papers be assured of a fair showing in a world of expanding science and often, too, of increasingly sensitive nationalism? For this country to abandon its long-honoured share in keeping the records of world science in 1953 will certainly be a strange accompaniment to the plaudits of a year of Coronation.

These are sober thoughts for a christening. It is always kinder and more cheering, perhaps, to suppose that a newborn child will be an improvement upon its parents, that hope and faith will outmatch heredity. But we must frankly admit that something more stimulating is required if 1953 is to be a greatly superior year to 1952 or 1951.

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Notes & Comments

Germany & Japan

IT is very easy to exaggerate the revival of Germany's chemical industry. Recent reports, indeed, have indicated that other branches of West German industry are recovering much more vigorously. In 1952, German exports of chemicals actually lost ground made in 1951. The 'de-synthesis' process still being applied to the I. G. Farben combine is regarded as a major obstacle to progress, for until the new shape of the industry is clearly defined, capital will not be easily obtained for research and plant investment. In antibiotics, petroleum chemicals, and even synthetic rubber, Germany is far behind Britain or America or both. Only in the two somewhat allied fields of plastics and synthetic fibres is Germany making rapid strides towards a prominent position in the modern world picture. At present, Germany is spending only about one-half of British expenditure on research, though here Rutherford's dictum that 'if we haven't got the money, we must use brains' might be borne in mind. However, even when the I. G. Farben reorganisation has been completed, the fact that some of the main plants of the pre-war industry and the cheap coal sources are in the Soviet Zone cannot be altered.

U.S. Firms Assisting

THE recovery of Japan's chemical industry seems to be taking place much more smoothly. Some of the largest U.S. firms have taken a direct and active part in reconstruction. The demands of the Korean war have stimulated all Japanese industry. If it is still true that the best index is sulphuric acid production, then it is worth noting that Japan's monthly output is now 5 per cent above its highest pre-war figure and some six times the low output reached at the end of the war. While Germany still produces only penicillin, Japan is now producing penicillin and streptomycin. As in Germany, the production of plastics is particularly advancing. The main limitation on Japan's chemical revival and growth is that of raw materials, many of which are abnormally scarce and dear. Japanese competition with chemicals is not feared by the United States. No parallel with the low-priced pre-war cotton or rubber goods is believed to be possible. Other countries that, like Japan, must export to live may not be able to take so complacent a view. The effect of a powerful chemical industry in Japan may well be indirect by improving the quality of other goods that Japan can export at highly competitive prices.

Quinine × 1,000

ONE of the outstanding developments of the old year has been Daraprim or 2:4-diamino-5-*p*-chlorophenol-6-ethylpyrimidine. Tests of this new anti-malarial drug were in hand before 1952, certainly, but it was during 1952 that the high promise of this new British drug became known. It is at least 12 times as powerful as chloroquine, but to many readers this comparison may mean little for the procession of anti-malarial drugs in the past decade has been swift and changing. Perhaps the more striking statement is that it is 1,000 times more powerful than quinine. It is tasteless and the dose required to prevent malaria infection is only 25 milligrams per week. In Africa a village ridden with the disease was collectively treated with Daraprim. In two months the human population was cured. Even more remarkable the mosquitoes ceased to carry the malaria parasite—for, with malaria dispelled from their victims, the mosquitoes no longer became carriers through biting. In America, volunteer prisoners in a penitentiary were exposed to malaria-carrying mosquitoes and given Daraprim. No cases of malaria resulted. Apart from its unique potency, Daraprim has another advantage over its strongest predecessor: it can also suppress attacks of relapsing malaria. For this latter form of the disease chloroquine has been ineffective and a second anti-malarial drug has generally been used.

Results Variable

IT is still too early to assess the full potentialities of Daraprim. There has not been enough time to find for certain whether the disease can hit back by developing some degree of tolerance to regular suppression by weekly doses. Although no undesirable side-effects have yet been displayed, caution and experience with other anti-malarials suggests that there is still time for some such limitation to make itself known. In clinical tests so far reported there seems to be variation in curative results; for example, 50 milligram doses rather than 25 have been found necessary in some areas. The detailed picture is still taking shape. For Daraprim as a preventative drug, the verdict of U.S. Public Health scientists seems definite enough: 'A person could, if he took this new drug, go into a region heavily infested with malaria and never come down with malaria while there or after leaving the region.' In a few years' time it may well be that the development of Daraprim by Messrs. Burroughs, Wellcome and Co. was the principal scientific advance of 1952. Though first made in this company's U.S. research laboratories, Daraprim is already on the English market but is not yet available in America.

A Notable Anniversary

FROM time to time it is our pleasure to record in our columns notable anniversaries of personalities in the field of trade and industry covered by this journal. This week we take justifiable pride in an anniversary of our own here in Bouverie House. Sir Ernest Benn, chief proprietor of THE CHEMICAL AGE, and Lady Benn will today (Saturday) celebrate their Golden Wedding at their home, 'Morven,' Oxted, Surrey, and every member of the staff in London and the provinces has joined in signing an illuminated address of greetings and congratulations to them. Although Sir Ernest has relinquished some of the major duties he so successfully carried out for many years—he was succeeded in the chairmanship of Benn Brothers Ltd. and Ernest Benn Ltd. by his second son, Glanvill, and in the chairmanship of the United Kingdom Provident Institution by his eldest son, John—his judgment, wisdom and counsel are still happily actively at the service of his board colleagues. In recent days his incisive mind and his virile pen have been applied anew to spreading the gospel of the virtues of individual freedom, and his new book, 'The State the Enemy'—his 18th book, by the way—is to be published next Monday.

The Chemical Age Year Book

MUCH valuable information in compact form concerning the principle chemical and allied organisations, research associations, and prominent figures in the chemical and allied industries, is contained in THE CHEMICAL AGE YEAR BOOK for 1953 which is now being dispatched to subscribers.

The 'Guide to Chemical Literature' has been completely revised and gives details of books on chemical and allied subjects published or reprinted during the last five years.

While the 'Who's Who' section has been considerably extended, useful features for reference have been retained such as: British Standard Specifications and Recent Patents affecting chemical industries; Statutory Safeguards in Chemical Processes; International Atomic Weights, Volumetric Analysis, and so on.

Sources of plant, instruments and chemicals can be easily traced in the Buyers' Guide which, in its enlarged form, gives a comprehensive list of products and their manufacturers.

The volume, again in its maroon and gold cover, as usual contains a diary and calendars for the current year and 1954.

Copies (price 21s.) may be obtained on application to the publisher.

Organo-Tin Compounds & Stabilisers

Supplies Now Available in Britain

VINYL compounds manufactured from indigenous materials are finding a wide and rapidly expanding field of applications in the United Kingdom. Both quantitatively and in the variety of resins and latices which have been developed, primary producers of PVC materials have made headway since the war. Yet British plastics manufacturers have been handicapped by the absence of many useful compounds. In the United States some 200 different resins are available to commerce, and users can obtain materials with the optimum combination of properties for any specific application. In this country the range of plastic raw materials is considerably smaller and choice has necessarily been limited by the supply position.

The problem of stabilisation, for example, is complicated by the very versatility of PVC, which has necessitated the development of many different stabilisers, each capable of stabilising a particular composition under particular conditions and imparting the desired combination of properties. Vinyl compounds must be stabilised under conditions ranging from the extrusion of the unplasticised polymer at 170°C. to the calendering of material containing up to 50 per cent of plasticiser at 190°C., or of stabilising either compound to withstand a moulding process with a long cycle. The material may have to be crystal-clear or it may be loaded with heavy fillers. It may be processed hot, or applied as a cold, free-flowing paste and then rapidly heated to a high temperature.

Degradation Reaction

Unless PVC is really well stabilised, hydrochloric acid is given off in degradation reaction which is autocatalytic, that is to say, it is catalysed by its own reaction products. The rate of reaction doubles for every 10°C. rise in temperature, and above a certain temperature the reaction becomes exothermic. It follows that if PVC which has not been sufficiently stabilised is subjected to heat and pressure in a confined space such as a cylinder of an injection moulding machine, it is liable to explode.

In recent years growing interest has been taken, particularly in the United States, in a group of organo-tin compounds which are proving particularly valuable as stabilisers for PVC. Both in Canada and the United States these compounds are also being used for stabilising chlorinated transformer oils, but oils of this type are not made in Britain and not much is therefore known here about this field of usage. It is understood that one or two other minor uses are being developed in the States, but it is essentially as materials which combine acid acceptance, reactivity with polyenes and anti-oxidant action that this group of compounds has become commercially important.

Patent of 1936

The use of the alkyl, aryl and mixed alkyl-aryl derivatives of tin dates from Yngve's patent of 1936, which included such materials as tetraphenyl tin. A later development by the same worker was the introduction of the oxides and hydroxides; e.g., dibutyl tin oxide, which is a compound of importance to plastics manufacturers. Yngve's investigations in this field culminated in his celebrated work on the dialkyl tin dicarboxylates, which has led to the development of a considerable industry in the United States. Dibutyl tin dilaurate is probably the most efficient all-round stabiliser known, combining complete transparency with powerful acid acceptance, ability to react with conjugated polyenes, and a useful degree of anti-oxidant activity. Dibutyl tin maleate has also been used commercially, but is now falling out of favour because of the irritant fumes evolved from it during the milling of vinyl compounds in which it is present. Modified alkyl tins have also been investigated, and it is claimed that tetra-α-thienyl tin is more effective than either tetrabutyl or tetraphenyl tin. Other compounds mentioned in the patent literature include alkyl tin alcoholates.

In the United States the annual output of organic tin compounds is now in the region of 300-400 tons, but until very recently there appears to have been little or no commercial production in Britain, possibly on account of the hazards associated with the Grignard reaction. After years of research this gap

is now being filled by Pure Chemicals, Ltd., of Kirkby Trading Estate, Liverpool; a company which was formed some ten years ago by Dr. N. A. Hornstein for the purpose of preparing fine organic chemicals by essentially classical synthetic methods. At the time when this company was looking for someone experienced in the application of organic tin compounds, an inquiry happened to be received from a well-known PVC chemist, H. Verity Smith, who was endeavouring to find a source from which these compounds could be obtained. The upshot was that Smith readily accepted an invitation to join the staff of Pure Chemicals, Ltd., and take charge of this new branch of the business. At that time development had only reached the pilot plant stage, but full production was started in September, 1952. Manufacture is at present confined to dibutyl tin oxide and dibutyl tin dilaurate, but a wide range of organo-tin compounds is envisaged.

Crystalline Solid

Dibutyl tin dilaurate (di-*n*-butyl dilauroyl dioxystannate), in the pure form, is a crystalline solid, but in order to achieve maximum dispersion and ease of incorporation in all types of vinyl compounds, the British product is supplied in a form which, due to traces of other organo-tin esters, remains liquid at room temperature. It sets at −2°C. and is not distillable at 5 mm. The specific gravity is 1.055 $^{20}/_{20}$, the refractive index 1.475 at 20°C., the flash point 450°F., and the viscosity 53.8 centistokes at 20°C. The compound is 1/10 as volatile as DOP at 160° C. It is soluble in esters, all the common vinyl plasticisers, petroleum ether, benzene, toluene, acetone, chlorinated hydrocarbons, etc., and is insoluble in water.

Dibutyl tin dilaurate may be applied to almost all types of PVC compounds and is capable of improving almost any PVC formulation, but this compound is expensive and in many formulations cost is an objection to its use. Pure Chemicals, Ltd., are therefore making a series of proprietary stabilisers based on the synergystic action of other stabilisers on organic compounds. The effect of this action is that either 3 per cent of stabiliser A or 3 per cent of stabiliser B may be effective, but 1 per cent of stabiliser A plus 1 per cent of stabiliser B may be more effective than 3 per cent of either of these stabilisers singly. In the United States this phenomenon is used to counteract the very high prices of organic tin compounds by the preparation of proprietary stabilisers containing tin compounds in conjunction with other, cheaper stabilising materials. By this means the expensive tin compound is made to stabilise a greater amount of polymer because of its increased efficiency. Since different stabilisers have different effects and are useful for different purposes, the British company have investigated numerous combinations of substances and has picked out those which seemed most effective for certain well-defined types of application. It is intended to concentrate initially on a few proprietary stabilisers, each of which will fill an important need in a particular field.

The first type is designed to facilitate the extrusion or moulding of thick, crystal-clear vinyl sections. A thin vinyl sheeting can be made glass-clear without much difficulty, but hitherto the absence of a suitable stabiliser has made it virtually impossible to achieve comparable results with thicker sheets. This limitation will be overcome when the proprietary stabiliser is available in commercial quantities.

Non-Toxic Applications

The second type is intended for non-toxic applications such as PVC conveyor belts for use in food factories. The organo-tin compounds are generally regarded as being non-toxic and their use for non-toxic applications is permitted in the United States, where the regulations are more stringent than in Great Britain. This stabiliser will have to be used in conjunction with a non-migrating plasticiser, but it happens to be particularly effective in combination with the polymeric plasticisers. It will also be suitable for non-toxic applications in which a high degree of clarity is required, such as PVC beer hose, milk hose, fruit juice hose, etc. In the past British manufacturers have been unable to make PVC sufficiently transparent for this purpose and there has been a tendency to use polythene, which is more expensive. With the new stabiliser PVC is much clearer than polythene under any conditions.

Pilot batches of both these stabilisers have been made, but the tests have not yet been quite completed and as yet neither type is commercially available, although production will not be long delayed.

The third proprietary stabiliser on the company's programme is soluble in all plasticisers and PVC solvents commonly

employed and is intended for plastisols and organosols and for cocoon packaging. Since organic tin compounds are essential for the production of PVC cocoons, British industry has hitherto been obliged to rely on imported materials.

The fourth proprietary stabiliser is designed to make it possible for cable coverings with a very high resistance to be produced in Britain.

Some products marketed in the United States as proprietary stabilisers are simply organic compounds heavily diluted with a solvent or plasticiser. The stabilisers to be marketed by the British firm will contain no solvents, but they may contan a little plasticiser, which will be added in some cases because it is considered that, for ease of dispersion, stabilisers for PVC should either be liquids or thin pastes.

Will Widen Scope

The advent of organo-tin compounds will widen the scope of the British plastics industry by facilitating the development of new and important applications in fields where progress has hitherto been restricted by problems connected with stabilisation. The potential value of this new branch of the chemical industry becomes immediately apparent when it is considered that at present the whole of Europe is dependent on the United States for supplies of organo-tin compounds. It is understood that the British company's compounds are comparable in price with the American products, but their proprietary stabilisers will be cheaper. The dibutyl tin dilaurate manufactured by Pure Chemicals, Ltd., is slightly purer than the American compound.

Since 1948 Pure Chemicals, Ltd., have been associated with the old-established firm of H. J. Enthoven & Sons, Ltd., whose interests in the fields of non-ferrous metals are widely known. This association has enabled the former company to embark on the ambitious programme of research and development which has led to the manufacture of organo-metallics as a new branch of the chemical industry. Interest created in the new range of materials, as well as the increasing variety of the more usual organic chemicals now being manufactured, have necessitated the establishment of a central sales office, housed at the London headquarters of H. J. Enthoven. Mr. F. C. Thompson, a senior executive of the parent company, has undertaken the necessary liaison between the two firms.

Oil Concessions in Persian Gulf

AN immediate start of exploration operations is planned in the new underwater oil concession covered by an agreement recently concluded between the Sheikh of Quartar, H.E. Sheikh Ali bin Abdulla bin Quasim al Thani and 'Shell' Overseas Exploration Co. Ltd. The area extends into the Persian Gulf outside territorial waters, and the concession is the first actually granted on the basis that if oil is eventually discovered in commercial quantities a 50-50 arrangement would apply.

Negotiations, on Shell's behalf, were undertaken by Mr. G. O. Higgins, who returned from retirement for this special assignment. Mr. Higgins was responsible for directing the rehabilitation of the Seria oilfields in Borneo after their twofold destruction during the last war.

The land and territorial waters of Quatar are already held under concession by Petroleum Development (Quatar) Ltd., an associate of the Iraq Petroleum Company, and oil is already being produced, and shipped from the port of Umm Said.

Phthalate Prices Reduced

A REDUCTION in the price of 'Bisol' diethyl phthalate (normal grade) and dimethyl phthalate by 2d. and 2½d. per lb. respectively as from 29 December, 1952, has been announced by British Industrial Solvents, Ltd.

New prices are as follows:—

		Dimethyl	Diethyl
10 tons, spot or contract	(*a*) ..	1s. 10¾d.	2s. 2¾d.
5 ,, ,, ,,	(*a*) ..	1s. 11d.	2s. 3d.
1 ,, ,, ,,	(*a*) ..	1s. 11½d.	2s. 3½d.
45 gallons	(*a*) ..	2s. 0¼d.	2s. 4¼d.
10 ,,	(*b*) ..	2s. 2¾d.	2s. 6¾d.
5 ,,	(*b*) ..	2s. 3¾d.	2s. 7¾d.

(*a*) Carriage paid, in containers charged extra and returnable at seller's expense.

(*b*) Carriage paid, in non-returnable containers.

Price reductions of 2½d. per lb. for dimethyl phthalate and 2d. per lb for diethyl phthalate as from 29 December, 1952, have also been announced by A. Boake, Roberts & Co., Ltd.

'Terylene' Polyester Film to be Released

Wide Range of Potential Applications

'TERYLENE' polyester film will be released in small quantities for appraisal by industry about the middle of this year, it is announced by Imperial Chemical Industries, Ltd., in a statement just issued giving details about production of the film together with its general, thermal, mechanical and electrical properties and chemical resistance.

Laboratory work on the manufacture of 'Terylene' polyester film, of which I.C.I. holds the world rights outside the U.S.A., has been carried out by the Plastics Division, Welwyn Garden City, which is responsible for its development and a pilot plant will be in operation during the year. Bulk quantities of film will not be available until a large-scale plant is in operation.

Production of the film is by a melt casting technique. As the viscosity of molten 'Terylene' is about a fifth of that of the usual grade of polythene, the process calls for great accuracy of die manufacture and close control of temperature and die pressure. No additives whatsoever are added to the polymer during film making and the finished film is glass clear and possesses a glossy surface.

The cast film, however, has a relatively low yield point and is thermally unstable, so that subsequent processing is necessary to convert it into a marketable material. This consists of drawing the film in two directions at right angles, which improves the mechanical properties of the film equally in all directions, and finally 'heat setting' the drawn film by holding it in such a way that it cannot contract and heating it to temperatures of around 200°C. The final film is extremely strong and tough and is thermally stable up to the setting temperature.

Very thin gauge film can be made. It is expected that 0.0003 in. film will be available from the pilot plant; this material is quite tough and comparatively easy to handle.

TABLE OF PROPERTIES

General

Specific gravity	1.39
Area factor sq. in./lb./0.001 in.	20,000
Water absorption per cent by wt., prolonged immersion in water	0.5
Water permeability 38°C. 90 per cent R.H. g./sq. m./day/ per cent	30

Thermal

Melting point °C.	265
Temperature at which film flows under stress of 2000 p.s.i. °C. (sag temperature)	180—190
Inflammability	Ignites and burns with difficulty. Passes B.S. 850 (1939)
Low temperature flexibility	Remains flexible at −50°C.

Mechanical

The film has balanced properties in all directions and no difference properties can be detected when conditioned and tested at humidities between 70 and 100 per cent R.H.

Yield stress at break p.s.i.	14,000
Tensile strength p.s.i.	25,000
Elongation at break per cent	50
Tear resistance Elmendorf gm. cm./cm. tear/.001 in. thick	120
M.I.T. Folding Endurance	No detectable damage after 100,000 cycles

Chemical Resistance

Good resistance to mineral acids, including concentrated phosphoric acid, but decomposed by concentrated sulphuric. Moderate resistance to alkalis, excellent to oxidising agents. Excellent to organic compounds with the exception of phenols and chlorinated phenols.

Electrical Properties

Dielectric strength volts/0.001 in.	4,500
Volume resistivity ohm./cm.	1017
Dielectric constant 60 cycles/sec.	3.1—3.2
1000 ,,	3.1—3.2
10^6 ,,	3.0—3.1
Power loss factor 60 ,,	0.002
1000 ,,	0.004—0.006
10^6 ,,	0.013—0.015

It is expected that the thin gauges of film will find applications in a number of specialised fields, such as the manufacture of adhesive tapes and so on, and also in the electrical industry. Its use in electrical equipment will enable the bulk of insulation to be reduced and make possible the use of higher working temperatures.

For packaging, the high clarity and toughness of the film would be very attractive, and the fact that at least twice the area per lb. would be available with 'Terylene' than with any other film now on the market would also be important, but it is not expected that any film will be sold for this purpose during the initial stage of the development. During this period the polymer available for conversion to film will be limited and with manufacture on a pilot machine the film will be relatively expensive.

It may eventually be possible to produce a photographic base film from 'Terylene.'

Continuous Flow Production

Chemical Process Controlled by the Use of Electronics

THE modern trend in almost every industry is to install plant for continuous flow production, and in this direction much progress has been made in many aspects of chemical manufacture. Products in which the proportions of different chemicals must be accurately maintained are produced on conveyor systems in which the weights of the ingredients are regulated automatically, and in other cases the rate of flow of a single material is closely controlled to meet the requirements of subsequent stages in the manufacture of the product.

An interesting example of the use of electronics to provide automatic control of the flow of materials is afforded by the installation at the Heysham works of Imperial Chemical Industries, Ltd., of two constant weight feeder equipments which were commissioned late in 1951. The machines were built by Richard Simon & Sons, Nottingham, and are controlled by electronic gear supplied by The General Electric Co., Ltd.

Closely-Regulated Flow

Each equipment provides a closely-regulated flow of approximately 10 tons per hour of powdered limestone which is used in connection with a continuous chemical process. Any desired rate of flow over a range of $3\frac{1}{2}/1$ in weight can be selected by means of a calibrated control knob, and this flow is then automatically maintained by the equipment without further attention from the operator.

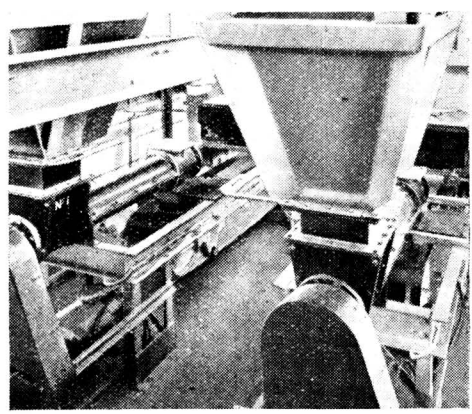
Powdered limestone from the preceding stage of the plant is fed in to a hopper, and is loaded on to a conveyor belt by means of a motor-driven screw located in the base of the hopper. The centre portion of the loaded belt passes over a roller which is linked mechanically to a sensitive weighing mechanism housed in a container located above the belt, and two sets of contacts mounted on the weighing mechanism are employed to give signals to the electronic control gear when the loaded belt is too heavy or light. The screw speed is then automatically adjusted until the balance of the weighing machine is restored, so that a constant flow of limestone is maintained for a constant speed of the conveyor belt.

The Simon Patent Constant Weight Feeders are designed to deliver a continuous flow of material at any desired rate per hour, irrespective of any alterations in the bulk density or changes in the ability of the material to flow.

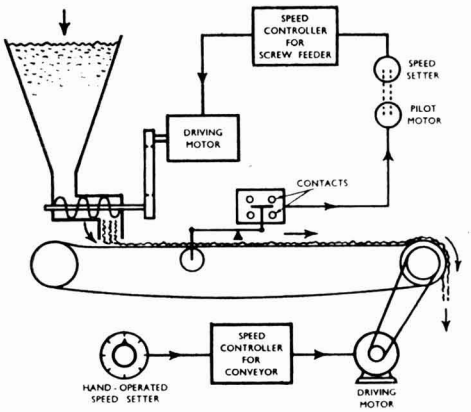
Since the machines are controlled by weight they do not suffer from the limitations of volumetric feeders. Thus if there is a partial blockage in the feed inlet the weighing machine will promptly detect the reduction in the feed rate and automatically apply the necessary correction to the feed control unit (in this case the pilot motor and speed setter unit). Similarly, if there is a change in the density or consistency of the product the weighing unit will promptly cause the feed control unit to operate, thus adjusting the flow to the desired pre-set rate.

Setting of these feeders for a given throughput is very simple. After placing the required weights on the weighing beam, the operator pre-sets the flow rate by setting the band conveyor speed controller until the required speed is shown on the tachometer dial. A conversion scale is provided to indicate the rate of flow in tons per hour.

A patented feature which consists of a simple automatic two-rate correction control is embodied in the constant weight feeders. Thus, if a large change takes place in the bulk density of the material, a



General view of the constant weight feeder machines installed at the Heysham Works of I.C.I., Ltd.



A diagram of one of the machines

continuous correction is applied to the feed control unit until the feed rate is correct. The weighing unit will then apply corrections in small increments only, thus preventing hunting. Pilot lamps are incorporated so that the operator can see at a glance which correction is being applied to the feed rate.

When there is no material above the feed inlet, a cut-off switch sounds an alarm. The feeders also record the amount of material which has been delivered.

Complete control gear including the electronic apparatus for each feeder is housed in a ventilated cubicle of sheet steel construction, and to prevent the ingress of dust the control cubicles for both machines are mounted side by side in a pressurised control room.

The equipment operates from a 440 volts, 3-phase, 50 cycles supply and is provided with a 3 h.p. variable speed d.c. motor for driving the screw and a similar motor rated at 1½ h.p. for driving the conveyor belt. Both machines are separately excited, the d.c. supplies for the field circuits being obtained by means of metal rectifiers and the supplies for the armatures from thyratron rectifiers. A three-phase bank of thyratrons is used for the supply of the screw motor and a two-phase bank for the conveyor motor; apart from this feature the electronic control circuits of the two motors are similar.

Method of operation is as follows:—

For the control of each motor an adjustable 'speed setting' reference voltage is provided. The speed setting of the band conveyor is adjusted manually, and in the case of the screw feed motor a pilot motor is used to vary the speed setting in accordance with the signals from the contacts on the sensitive weighing mechanism.

In each case the reference voltage is compared with the voltage across the armature of the motor, and the difference voltage is then amplified and is supplied to the control grids of the thyratron rectifier. The output voltage of the rectifier—that is, the voltage applied to the armature—is consequently varied to match the voltage selected by the speed setter.

To protect the thyratrons from overloads a limiting circuit is included which prevents the armature current from exceeding a predetermined value. If the motor is stalled, the current will remain at the limiting value for 30 seconds, after which a thermal overload trip will open the armature contactor.

The fall in motor speed as the mechanical load is increased is corrected by a compensating circuit which increases the voltage applied to the armature in proportion to the increase in armature current.

Australian Wool Wax Process

AN IMPROVED process for recovering wool wax from scouring liquors has been devised by Australian chemists of the Commonwealth Scientific and Industrial Research Organisation.

It enables greatly increased recoveries, from 50 to 70 per cent as against the usual 20 per cent recovery. One of the largest wool scouring firms in Australia will install plant to operate the new processes commercially. It is claimed to combine cheapness with efficiency, and equipment used resembles that employed for the flotation separation of minerals from ores.

The scour liquors are fed progressively through a battery of cells fitted with impellors, which concentrate the wax on the surface of air bubbles. A stable froth of high wax content forms at the top of the cells, and the concentration of wax increases as the froth is propelled through the battery. The wax is recovered from the froth by centrifuging after dispersal in alkaline solution.

After most of the recoverable wax has been floated off, the residual liquors may be returned to the scouring bowls again. The final product complies with specified trade requirements for a neutral wool grease.

Patent Office Centenary

Unique Documents seen at Recent London Exhibition

CHEMICAL inventions and discoveries and their industrial application have naturally involved a close connection with patents through the ages. The exhibition held at the London Patent Office from 17-19 December therefore held a special interest for chemists.

Although a number of important events in the patent world happened, of course, long before 1852, that date was in fact the cause of the exhibition. It was in December that year that the Great Seal Patent Office, as it was then called, opened at Southampton Buildings, Chancery Lane, London, as the sole office for granting patents for inventions.

This was indeed a turning point in the history of patents. Up to that time granting of patents was an exceedingly complicated affair. It involved visits to seven different offices, the preparation of numerous documents, and payment of fees totalling £100 for a patent for England alone. If extending to the United Kingdom it meant attendance at 16 offices and payment of over £300. The application had to pass through 10 separate stages, at two of which the personal signature of the Sovereign was required.

The system was attacked by Dickens in *Household Words*, 1850. ('A poor man's tale of a Patent')—of which a copy was among the exhibits—and its reform urgently demanded. A leaflet available to all visitors to the exhibition briefly described subsequent reforms and developments, including the work of Mr. Bennet Woodcroft in respect to classification and so on.

Exhibits also included a wide selection of relevant documents; circulars, specimen letters patent, trade marks, designs, a selection from the Woodcroft Collection of Lives of Inventors, and a collection of historical documents.

Technology of the Century

Technology of the century was illustrated by a selection of about 100 important specifications in the major industries; for example, 44/1856 manufacture of iron and steel; 1135/1852 Portland and other cements; 737/1855, brewing beer; 2031/1864 manufacture of cast steel; 6051/1884; nitrocellulose for varnishes; 5,127/1878, plating metals; and many others relating to gas, electricity, steam engines and so on.

Chemical industry was not given a very good showing, but at the request of a CHEMICAL AGE special representative some early abridgements (acids, alkalis, and so on) were fetched from the basements. It was Class 40 and dated from 1622 up to 1866. It had been published in 1869 by order of the Commissioners of Patents for Inventions and contained some quaint inventive ideas.

The first in the book is No. 20 of A.D. 1622 (10 May) in the name of Sir Edmund Harewell and others for 'Sondry kindes of Soapes and also makinge of soape ashes, pott ashes, and salte for Soape' (no specification enrolled; Letters Patent printed price 4d.). No. 22 of A.D. 1622 (5 October) in name of Christopher Eland: 'Makinge of white and redd leade as it is now made for painters within our Realme of Englande.' Surrender of Letters Patent 4 March 1634.

Making of 'Hard Soape'

Another of these earliest patents (23/1623) was also for 'making of hard soape with the materiall called berilia and without the vse of any fire in the boyling; also for makings softe soape.' Berilia was potash (made from bean and peastraw and kelp).

One of the most comprehensive of these old chemical patents was No. 50 of 1630, by David Ramseye 'to multiplie and make saltpeter in the open feilde in fower acres of ground sufficient to serve all our dominions; to raise water from lowe pitts by fire; to make any sorte of mills to goe on standing water by continuall mocion without helpe of winde, waite or horse; to make all sorts of tapestrie etc.'

Altogether some 60,000 specifications were issued from 1622 to 1866.

Under the Patent Law Amendment Act of 1852 Mr. Bennet Woodcroft, F.R.S., professor of machinery at University College, London, was appointed Superintendent of the Specifications for the duties of classification, indexing, printing and publishing. He was largely responsible for the

establishment of the Library in 1855, now one of the finest technical libraries in the world, especially for journals and patent specifications.

Appreciation must also be noted of the open access system and of the courtesy and ever willing helpfulness of the chief librarian and his staff.

Patents are serious things; often very serious for the inventor and his agent. But there is a lighter side which was not neglected in this unique exhibition. A selection of about 50 curious and unusual specifications was included. Among these were: 2115/1867 for a jet-propelled aircraft; 11413/1908, combined rocking chair for husband and vacuum cleaner for wife, as illustrated; 358/878, electrical device to prevent snoring. An electric circuit with low power battery was attached to the snorer's wrist, with microphone responsive to the low frequency generated by person snoring; electric bell sounds close to him supplemented if need be by light tap or blow from sharp or blunt instrument as preferred); 393/673 (German idea) device for intercepting moisture running down hands and wrists while eating crayfish; another idea from a London tailor was for trousers cut alike front and back to equalise wear.

Many fundamental and important discoveries in the chemical and allied fields have not necessarily been patented and indeed are often not patentable. In Karrer's 'Organic Chemistry' is a chronological list of important dates in the history of organic chemistry. Possibly only the minority of these inventions or discoveries have been patented. They begin with 1760, preparation of cacodyl by Cadet; followed in 1769 by crystalline tartaric acid from argol; 1772, observation of methane formation by Priestley; and 1779, preparation of glycerol from olive oil.

A date of particular significance to the Patent Office was 1902 when the Act of that year, following recommendations of a special Commission, authorised investigation as to novelty of all inventions for which patents were sought. This involved scrutiny of the accumulated documents of 50 years.

When the work was eventually brought up to date in 1907, 375,000 patent records covering every phase of human ingenuity had been summarised in 1168 volumes containing 200,000 pages, 610,000 abridgments and 475,000 illustrations.

Alcohol-Petrol Blends

DESIRE for self-sufficiency with respect to liquid fuels on the part of countries deficient in indigenous petroleum resources has assumed importance in recent years and has brought the problem of alcohol-petrol blends as fuel in internal combustion engines to the forefront.

Conflicting reports have been made with regard to the use of alcohol as motor fuel, and an investigation was recently undertaken by the Central Laboratories for Scientific and Industrial Research, Hyderabad, to determine the performance of alcohol-petrol blends as fuel in internal combustion engines without altering the engine setting.

It was found that the maximum power output is nearly the same for pure petrol and 20 per cent blend; it is about 15 per cent less for blends containing higher amounts of alcohol. The specific fuel consumption decreases slightly, up to 20 per cent alcohol in the blend, and then gradually registers about 4-6 per cent increase for every 10 per cent increase of alcohol in the blend.

Details of the investigation were given in the November, 1952, issue of the *Journal of Scientific and Industrial Research*.

India produces more than 5,000,000 gallons of power alcohol annually, out of which about 4,000,000 gallons are used for blending with petrol. The production of alcohol from molasses and agricultural wastes, according to the article, can provide an immediate cash return, apart from cutting down imports of petrol.

Sodium Gluconate Available

LAST week Kemball, Bishop & Co., Ltd., of Three Mill Lane, Bromley-by-Bow, London, E.3, announced the addition of sodium gluconate to their list of manufactures.

It is said that among its various applications are the prevention of scale in the washing of glassware, the prevention of the deposition of hard water salts on textile fabrics, as an inhibitor of corrosion, and as a masking agent in iron tannage. It is also likely to be of interest to the photographic industry.

Further data may be had on application to the manufacturers.

Selling & Market Research

An Important Aspect of the Chemical Industry—Part II

HOWEVER well equipped the salesman may be personally, there are clearly many factors largely or wholly beyond his control that must profoundly affect his sales. He must have the right type and quality of product, at the right price, and, most important, capable of prompt delivery. It must be better adapted to its special purpose than anything else, preferably a much improved product. If it can serve several uses, so much the better, though here some caution is necessary and it is better not to claim too much.

These and other matters involve the basic questions of cost of production, successful research, and the complexities of national and international finance; including the many problems discussed at the annual conference of the British Institute of Management at Harrogate, the Commonwealth Conference and the intricate questions of tariffs (inter-imperial or otherwise). Above all the vital matter of export credit facilities and other forms of Government support and encouragement are concerned. Much has been said on this latter lately—not altogether commendatory—in view of what is happening in Germany.

Unfair Competition

Despite assurances to the contrary in high official quarters in other countries, for example, Japan, there are increasing signs of unfair competition. Undercutting in the export markets and selling below costs is difficult to combat. At all events our traders could be aided in the fight, for example, by reduced taxation and less Government and municipal extravagance; or better value for the money spent on taxation.

Another item in costs, that of labour, also demands serious attention. The general public, including of course the workers in all industries, still does not fully appreciate the vital importance of our export trade in the economic life of the country, and the necessary corollary that costs must be reduced to the utmost. In the chemical industries fortunately it may perhaps be claimed that this is better understood than in some others.

Anxiety about exports should not be allowed to lead to neglect of the home market. It has great potentialities. If management and labour efficiency and diligence could be raised, these potentialities could be fully developed.

Successful Research

Successful research is another dream much less frequently realised than is commonly supposed. Brilliant and successful results are much publicised from time to time; but the many inevitable failures, frustrated hopes, and disappointments pass unnoticed. It has been stated recently in the U.S.A. that only one out of 20 research projects yields useful results. Sometimes the percentage is even lower. For example, in recent years it is estimated that more than 500 new compounds have been synthesised and thoroughly tested, to discover only one that satisfied a particular need; and even this fell short of the ideal.

Another authority has stated, in regard to industry generally, that nine out of 10 new products launched on the market fail to survive. But surely such a high casuality rate could be lowered by more efficient and better used market research.

Whether we call it market or 'marketing' research (as they seem to prefer in the U.S.A.), or omit the much overworked term 'research' and use simply study, survey, or fact finding, it is reasonable to expect that it will reduce the risks of laboratory research and lower costs; always provided it is properly done at a reasonable cost. Although it has been much talked about and written about in the U.S.A., including one or two recent symposia (for example of the A.I.Ch.E., at Atlanta), there are still people over there who are inclined to consider market research as mere humbug though they are almost certainly in the minority.

Attempts have been made on some sort of percentage basis to assess the extent to which market research is used in different industries; but the results are a little vague and inconclusive, and in any case not of great interest in this country.

In the United Kingdom market surveys in the export field must be very different from those possible or desirable in a huge and more or less homogeneous home-market such as the U.S.A. It must be realised also that while the big companies —like those in the U.S.A.—may wish to do much of the work on their own, it would in most cases be better to support and strengthen a joint effort, say through a trade association or some special organisation set up for the purpose; and, of course, with the goodwill and backing of the Government through the Board of Trade, Treasury, and so on.

An interesting example of such an organisation in Canada has recently been described in a booklet published under the title 'Successful Commercial Development.' (See *Can. Chem. Process.*, **35**, 792-5, 883-4.) In Britain there are also several organisations more or less busy on this job, and any number of publications—pamphlets, reports, and much else—with earnest exhortations and the like to 'export or perish.'

Not Enough Co-ordination

Is it not possible that there is too much overlapping and not enough co-ordination and concentrated effort? Do we need an information service to guide us amid the intricacies of export information services? Would this help to gain Government support or provide easier access to consultation with the Treasury? It is first of all necessary to appreciate fully the need for concerted effort.

In a report recently published by the British Council for the Promotion of International Trade it is stated that large orders from China for drugs, machinery and so on, are being lost to Britain and going to Germany and other countries; and that the Board of Trade, in refusing licences for exports to China, is interpreting far too widely the United Nations idea of strategic materials.

By way of example the case was cited of a large order for drugs and antibiotics placed with a London firm of chemical merchants by the China National Import-Export Corporation, that might ultimately amount to £2,000,000. The drugs apparently were in good supply in this country and export markets were badly needed; but export licences were refused and the merchants had to arrange with a German firm for supply. Evidently then China was not prevented from getting the drugs, but it only resulted in the trade being lost to Britain.

Another and still more disturbing report is that of the Credit Insurance Association Ltd.—a survey of current developments in Germany—with special reference to the effective help given by the West German Government to foster export trade to the utmost. The report was reviewed and summarised in a recent issue of the *British Trade Journal and Export World.*

Increases in cable and airmail charges, whether fairly described as Government discouragement or not, is definitely unhelpful, even though in some cases it may be a relatively small matter. But these relatively small matters mount up to a formidable aggregate. Then, too, there appears to be a hardening of the Inland Revenue attitude to exports liable to purchase tax.

Among these and other difficulties much could be said in support of the suggestion, by the *British Trade Journal,* for the creation of a powerful co-ordinating and representative body; or, as proposed by Sir John Barlow in the House of Commons, of a small commission to study various foreign markets; or for the suggested top level standing committee representing exporters generally.

Although there are already numerous organisations in Britain supposed to be dealing with these matters, there is no doubt that the whole field of export trading in all its aspects urgently needs strong and co-ordinated action. It need not be necessary to spend a lot of time and energy in presenting a case or protesting to the Government. On the contrary the Government should collaborate and lead.

X-ray Crystallography

Commencing on 15 January a series of ten lectures will be given at the Sir John Cass College, London, by E. G. Steward, B.Sc., A.Inst.P., of the X-ray section of the G.E.C. Research Laboratories, Wembley. These lectures, dealing with X-ray crystallography, will take place from 6 p.m. to 7 p.m. on Thursdays. The series finishes on Thursday, 19 March, 1953.

Australian Newsletter

From a Special Correspondent

THE Australian Minister for Supply announced recently the appointment of an Australian Atomic Energy Commission to control all the Commonwealth's activities in connection with uranium and atomic energy. The commission will begin its work shortly and the necessary legislation will be put through Parliament early in the New Year. The commission is charged with the duties of surveying and prospecting for uranium, mining and refining of uranium, scientific research and development of atomic energy for defence and industrial purposes. Its functions will not cover the Radium Hill deposits of South Australia but will be confined to the principal fields in the Northern Territory. The prospecting and surveying is undertaken by the Bureau of Mineral Resources.

Mining and refining aspects will be undertaken by agreement by the Zinc Corporation, Ltd., but will be subject to supervision by the new commission. On the research and development side, the Commonwealth Government will seek the permission of the British Government for a small group of Australian scientists to visit the establishments at Harwell. It is believed in knowledgable quarters that Australia's ultimate aim is to exploit uranium for defence and industrial purposes and that an atomic pile may be built within the next few years.

The commission will comprise Major-General J. E. S. Stevens, Secretary of the Department of Supply, as full-time chairman, with two part-time members, Professor J. P. Baxter, Professor of Chemical Engineering at the New South Wales University of Technology, Sydney, and Mr. H. M. Murray, general manager, Mt. Lyell Mining Co., Queenstown, Tasmania. It may be added that Professor Baxter, formerly research director of the general chemicals division of Imperial Chemical Industries, Ltd., was closely associated with the British Atomic Energy programme throughout the last war. The appointment of the Atomic Energy Commission, with its personnel, has been widely welcomed in Australia.

* * *

King Island is believed to be one of the biggest scheelite deposits in the world. To supply greater quantities of this strategic mineral, King Island Scheelite, Ltd., has recently made additions to its plant. These include a new bar mill and 20 James tables with necessary pumps to handle the throughput. While 14 of these tables have been set for concentration of feed, the rest will specially handle the slimes. It has been pointed out that upgrading the fine fraction is a real problem facing their operations. Though flotation forms part of their flow-sheet, apparently the fundamentals of flotation of scheelite are not well understood. The company is directing work along these lines to increase the efficiency of their operations and ultimately the output. According to the general manager, the present throughput is 4.000 tons of ore per week and the output is 20 tons of concentrate of about 60 per cent WO_3.

* * *

The Electrolytic Zinc Co. of Australasia, Ltd., according to its chairman (Mr. Harry Hey), will benefit by the large expansion programme under way, in spite of the recent reductions in metal prices. The expansion, which will be complete in about a year's time, is taking place on four main lines—increased mining and milling at Rosebery, Tasmania; expanded capacity of the zinc works at Risdon, Hobart; extended plant for recovering zinc from residue and the new sulphate of ammonia plant at Risdon.

At Rosebery the present mill capacity of 20 tons of ore per hour will be increased to 30 tons per hour. While no additions to primary grinding are proposed, there will be a new 7 ft. Hardinge mill in closed circuit with an 8 ft. Dupex Dorr classifier. A 100-ft. Dorr Torque type 4 thickener is under construction and can handle up to 40 tons an hour. In the flotation section 23 new standard MS cells of sizes will be added to the copper, lead and zinc sections. A 6 ft. diameter filter with one more vacuum pump will also be installed. The increased milling will come into operation in March, 1953. As of 1 July, 1951-30 June, 1952, the company treated 162,578 (long) tons of ore and recovered 4,828 tons (long) copper concentrate (8.1 per cent Cu), 9,569 tons lead concentrate (58.8 per cent Pb), and 46,286 tons

zinc concentrate (55.0 per cent Zn). There is a considerable amount of pyrites in the tailings. The tailings dump is believed to contain about 1,000,000 tons of pyrites and the company has no immediate plans for its recovery.

The electrolytic production of zinc was slightly low in 1952 compared to that of the previous year owing to rationing of electricity. The zinc production for the years (to June) 1951 and 1952 were 82,930 and 81,748 tons respectively. The plant capacity is 100,000 tons per year and with an increase in power supply the production is expected to be higher. The company uses zinc concentrates from its mines at Rosebery as well as from other mines on the mainland.

The zinc residue contains about 10 per cent Zn and is in a form which resists leaching in the normal working. Research has all along been conducted to recover the zinc from the residues which accumulate at the rate of about 42,300 tons per annum and it appears that the end is in sight. In this connection mention must be made of an up-to-date research laboratory which has been constructed at a cost of about £A200,000 and which was opened three months ago. The new research laboratory has an instruments, a physics, chemistry, metallography and pilot plants sections. The sections have excellent equipment and are well staffed.

Lastly, the plant now in the course of erection will produce initially 55,000 tons of ammonium sulphate per year. The process will comprise, in brief, electrolytic production of hydrogen from water, production of nitrogen by liquefaction of air and distillation, compression and catalytic combination of nitrogen and hydrogen to form ammonia, reaction of ammonia and sulphuric acid (made by contact process from SO_3 obtained by roasting zinc sulphide concentrates) to give ammonium sulphate and followed by drying, storage and bagging for sale. The company is already producing 67,246 tons of superphosphate per year.

* * *

At the North Broken Hill, Ltd., Broken Hill, N.S.W., there is a unique plant for floating lead sulphate, and it is believed to be the only plant to employ flotation of lead sulphate. The process which is used here has been patented in the U.S.A. by the American Cyanamid Corporation. The material treated is oxidised lead sulphide ore from a dump containing 320,000 tons carrying 5.7 per cent Pb and 3.0 per cent Zn. The dump resulted from unsuccessful attempts some time back to reduce the oxidised ore with sawdust in a furnace and then try to float the product. Consequently the dump is white grey in appearance and contains admixture of wood fibre. In view of the high cost of lead, experiments were made to recover the base metal and also the zinc. A plant was locally fabricated at a cost of £A50,000 nearly two years ago and is working satisfactorily. The process essentially consists in sulphidising the ore ground to 95 per cent −200 mesh with phosphorus pentasulphide and floating the lead at an acid *p*H. Sulphuric acid (about 7-9 lb. per ton) is used to give a *p*H of 4.8-4.9 and other reagents are Aerofloat 31, 1 lb./ton and xanthate 0.5 lb./ton. After floating the lead, zinc is floated with further reagent additions. The plant produces about 27 tons of concentrates per hour or about 3,000 tons per week.

Work is proceeding on the No. 3 shaft and North Broken Hill, Ltd., expects to expend a minimum of £A3,500,000. It will be ready for operation in five years time. The lead-zinc ore persists at depth as has been proved by prospecting and diamond drilling. This will be the first elliptical shaft in Australia and has the advantage of better ventilation.

Long Service Record

SEVEN employees of the Ruabon factory of Monsanto Chemicals Limited who received retirement presentations on the evening of 17 December represented a combined service of 266 years. The average length of service of each man was 38 years.

Dr. W. H. Garrett, M.B.E., a director of the company, referred to this remarkable record of service when making presentations to J. Price (50 years); W. Hughes (45 years); J. Harrison (37 years); T. H. Davies (36 years); J. Edwards (36 years); C. Jones (35 years); and L. Powell (27 years). He added that the 71 long-service employees of the factory attending the dinner at which the presentations were made had themselves a combined total of almost 2,450 years' service, averaging 34½ years each.

The strength of the Ruabon works was now more than 2,000 said Dr. Garrett compared with 250 in 1922. Thus one third of the number employed at Ruabon in 1922 was still working there at the present time.

American Chemical Engineers Meet

New Processes Described at Cleveland

THE 45th annual meeting of the American Institute of Chemical Engineers took place last month in Cleveland, Ohio. Many papers were read and new processes and products described. Following is an abridged selection of some of the papers.

A new process, developed to reduce the cost of gasoline and other fuels synthesised from coal, was reported by three engineers from the U.S. Bureau of Mines. As a result of research and development work on the production of synthetic fuels from coal, the U.S. Bureau of Mines Synthetic Fuels Laboratory at Bruceton, Pennsylvania, has developed a new and more economical process for the purification of synthesis gas made from coal. The gas, a mixture of hydrogen, carbon monoxide, and carbon dioxide, is scrubbed free of carbon dioxide by a new process which will greatly reduce steam and equipment requirements, with a subsequent reduction in the cost of gasoline and other fuels from coal.

In this process, according to the authors, the synthesis gas is treated under elevated pressure with a hot concentrated solution of potassium carbonate. This solution absorbs the carbon dioxide and it is then separated from the gas—from which the gasoline is made—and subjected to reduced pressure in a regeneration column. This causes the solution to boil, giving up the carbon dioxide and allowing it to be re-used in cleaning more synthesis gas. Because absorption and regeneration occur at the same temperature, no heating or cooling of the solution is necessary. This results in the conserving of large quantities of steam and cooling water and in the elmination of heat exchange equipment which is necessary in processes now in operation.

Developing Processes

Once the synthesis gas is purified of carbon dioxide and sulphur impurities, the gas is passed over catalysts to convert it to gasoline, oil, etc. The Bureau of Mines is engaged in developing processes to use the nation's large reserves of coal to augment the supplies of natural gas and petroleum. This method of CO_2-removal should be effective not only in reducing the cost of liquid and gaseous fuels from coal, but also in the other chemical processes for the manufacture of synthetic ammonia and other chemicals from coal and natural gas.

Another new process described was for acetylene. Though it was invented 25 years ago, it is only recently that chemical engineers have been able to make the process commercially feasible. The essence of the process is the treating of natural gas in a furnace in which the direction of flow of the gases is reversed every sixty seconds. The chemical reactions take place so rapidly at 2,200° C. that a vacuum is necessary to prevent the acetylene from reacting with itself to form useless by-products. This process, called the Wulff process, is claimed to lower costs of acetylene when compared with its production from carbide.

Continuous Laboratory Unit

A continuous laboratory unit was described for studying solvent polymerisation of ethylene at pressures up to 20,000 p.s.i. The products ranged from oils to hard waxes. The system included a 360-cc. steam jacketed reactor, solvent and ethylene pumps, semi-automatic let-down valves and suitable metering equipment. The ethylene was continuously recycled along with the required make-up at a total rate up to 400 gm./hr. Solvent up to 1,000 gm./hr. was used on a once-through basis.

The study was limited to 1,000-8,000 p.s.i., 120-190° C. polymerisation of ethylene, in the presence of methyl, ethyl, *iso*propyl and *tert.*-butyl alcohols, with di-*tert.*-butyl peroxide as the initiator. Analyses of the products indicated that only the primary and secondary alcohols were active chain transfer agents, and that the products comprised the original alcohols, with one or more molecules of ethylene entering between the hydroxyl carbon and any or all hydrogens on that carbon. *tert.*-Butyl alcohol did not enter into the polymerisation reaction. Polymerisation rates increased with increasing temperature, pressure, ethylene purity, and peroxide concentration. The rates were also much higher with the primary and secondary alcohols than with tertiary butyl alcohol. Molecular weight increased with

the pressure and with a decrease in temperature and peroxide concentration.

A report on a study of one of the factors causing high fuel consumption in jet engines was given by a chemical engineer on the National Advisory Committee for Aeronautics. He said that the inefficient evaporation of the liquid fuel in jet engines, in forming combustible vapour and air mixtures, contributed to high fuel consumption. His study of the effect of pressure on evaporation rate of drops in gas streams, under conditions simulating the operation of a jet engine from sea level to altitudes of 60,000 feet, and from take-off to supersonic flight speeds, would be used in future research to develop better jet engines.

The meeting also heard of the commercial development of a product of academic research at the Polytechnic Institute of Brooklyn. The 'Scheibel Column' for liquid separation, named after its inventor, is a laboratory tool originally intended for the separation of small quantities of very expensive liquids like fish oil vitamins, but it has now been made large enough for use in the production of superior lubricating oils, edible vegetable oils, or plastic raw materials.

Norsk Hydro's Expansion

DEVELOPMENTS being carried out by the Norwegian chemical concern, Norsk Hydro, were outlined by its director-general, Bjarne Eriksen, in a lecture delivered recently at the Polytechnic Society, in Oslo.

Since the war, he said, Norsk Hydro had invested £20,000,000 in new plant, while installations now under construction would cost another £6,000,000, and improvements were being planned estimated at another £10,000,000.

Heavy water was now being supplied for atomic piles to Britain, France, and Sweden, and at a cost of 1s. 6d. a gram or £75,000 a ton, and provided Norway with a not inconsiderable foreign income.

Production of magnesium steel, begun experimentally last year, was now running at an annual rate of 5,000 tons, which it was hoped to double before long. Production of complete fertiliser was to be increased as soon as possible from 40,000 tons to 150,000 tons a year. Future projects included the production of potash from sea-water.

At the annual general meeting of Norsk Hydro held recently it was revealed that sales in the 1951-52 financial year amounted to £16,150,000 compared with £13,800,000 in the previous 12 months. Net surplus was £680,000. The good results would normally have justified a bigger dividend, said the chairman, Professor J. Bache-Wüg, but in view of the official policy of limitation it would again be 6 per cent on ordinary and 8 per cent on preference shares.

Donations of £75,000 to various purposes had been agreed by the board. Most of this was to augment the Norsk Hydro scientific research fund which now amounted to £187,500.

Programme Enlarged

AN enlarged programme of activities relating to safety and health in the chemical industry is announced by the Manufacturing Chemists' Association, Inc., of New York. The Association has also reorganised and increased the membership of its safety and medical committees, who will be jointly responsible for carrying out the new programme.

In addition to a broadening of its activities in the collection and dissemination of statistics and general information on chemical plant safety, the Association contemplates specific action in the fields of fire prevention and fire fighting.

There will also be a step-up in the publication schedule of the MCA Safety Data Sheets to keep pace with the increasing rate of introduction of new commercial chemicals. The data sheets, of which 49 have been issued thus far, are recognised as authentic sources of information on how to handle and store chemicals safely.

Other activities will include issuance of reports on accident trends, details of unusual accidents, and general information to assist member companies in increasing the effectiveness of their safety programmes.

Mr. Robert H. Albisser, safety manager of Merck & Co., Inc. has been named chairman of the enlarged General Safety Committee, and Mr. S. M. MacCutcheon, The Dow Chemical Co., has been named vice-chairman. A. Girard Cranch, M.D., Union Carbide & Carbon Corp., is the new head of the Medical Advisory Committee.

Use of Science & Technology in Industry

Need for Greater Appreciation by Management

FAILURE of management in some industries to appreciate the importance of applying scientific methods and of giving sufficient weight to the advice of scientists and technologists on its staff was the subject of discussion at a meeting of the Parliamentary and Scientific Committee held at the House of Commons, on Tuesday, 18 November, 1952.

Opening the discussion, Sir Ewart Smith, technical director, Imperial Chemical Industries, Ltd., said a major factor in dealing with the problem of industrial efficiency was, in his opinion, the realisation that change and progress were natural and essential.

Application, rather than the production of knowledge was what was needed today. Since the war, undue emphasis had been placed on scientific research, but it was no good producing fresh knowledge, unless at the same time, and approximately the same rate, it was used and applied to practical ends. This was not sufficiently appreciated in Britain, with the result that in a number of instances other countries were using her basic knowledge.

The matter could be approached from two angles. First, the long-term aspect—process study, covering the fundamental and broad applicaton of knowledge. This led to the development of new processes and types of plant and equipment. It inevitably took a long time and required a great deal of capital, but if properly carried out, the results were in effect limitless.

Quick Return

Secondly, came the short-term approach employing the analytical method known as work study. This might involve minor modifications or improvements of plant and equipment, but broadly speaking it did not require heavy expenditure. A good return in a short time could be obtained from this line of attack, particularly if management could be educated in the available techniques and if it possessed the emotional as well as the intellectual belief in the possibilities.

The main point he wanted to make, said Sir Ewart, was that to be able to use either the long or short term method of improvement required the right sort of people in management. They must understand what was possible and how to go about it; they must be able to talk to the scientist in his own language, to appreciate the potentialities of the knowledge that he was producing; and they must have the training, experience, ability and the urge to use it effectively. Whether they were called applied scientists or technologists, it was people of this kind of whom there was a desperate shortage.

Wrong Idea

This shortage arose from a variety of causes. Among them was the general attitude of otherwise informed opinion towards industry, which was still regarded in many homes, schools, and even universities, as being ' below the salt' somehow less important or less noble than the work of the man in the research laboratory producing new knowledge. This was completely wrong because there should be no break between the laboratory and ultimate application, and because the one job was no more or less important than the other. To take research knowledge and apply it, as the designer and developer had to do, was very often far more difficult than the research job itself, and could be just as interesting.

By the term ' designer,' was meant the man who stood between the research man, the man who makes the plant, and the man who uses it, and who was capable of integrating conflicting requirements and possiblities into an entity which was the best that current knowledge could achieve. The people to do this should be of the technologist type, including the scientific engineer, the applied physicist, the industrial chemist, the chemical engineer and the metallurgist.

Britain was falling sadly behind other nations in her output of technologists. But if she was to survive, effective steps must be taken to secure, within the next few years, an appreciable and continuing increase in the numbers of soundly trained technologists.

Importance of fostering increased productivity and the valuable rôle being played by industrial consultants, were stressed by Mr. Norman Pleming (Associated Industrial Consultants, Ltd.) who considered that the limiting factor would not be the rate at which

men could be trained but rather the rate at which industry could use their work.

Expressing the trade union point of view, Mr. E. Fletcher (secretary, Production Department, Trades Union Congress) said that what was wanted as well as more machinery and more capital investment was the sincere co-operation of various sections and groups in industry. In the absence of good industrial relations it would be quite impossible to make the fullest use of the developments on the mechanical and technical side.

In the short discussion which followed, Mr. Austen Albu, M.P., asked if the difficulty was that the universities and technical colleges were not producing enough scientists and technologists, or was it that industry had not been creating a demand?

Sir Ewart Smith agreed that industry had in the past not asked for as many people of this kind as it might have done, but the position was rapidly changing, and it was now clear that the supply of men, particularly of graduate standard, fell far short of the demand. As more of such people got into industry, they would inevitably call for still more of the same kind. He believed that it was of the utmost importance to train more people of the right calibre to meet this growing demand.

If the required numbers and quality were to be obtained, it would be necessary to re-examine the national attitude to productive industry and to the standing of those who work in industry in comparison with those engaged in the other professions or in academic work. This was, he considered, a long term problem, and there was no simple answer.

Chilean Nitrate of Soda Price

THE industrial price of Chilean nitrate of soda for the season 1952/53 has been announced by the Nitrate Corporation of Chile, Ltd., London.

From 1 January, 1953, and until further notice, Chilean refined granulated nitrate of soda, over 98 per cent, will be sold, in lots of six tons or more, delivered carriage paid to any railway station in Great Britain, at £29 15s. net per ton of 2,240 lb. gross weight.

Surcharges for smaller lots delivered carriage paid remain unchanged. There are no surcharges for lots of 2 cwt. or more collected from the company's nitrate depots, but there is an allowance of 15s. a ton.

Terms are cash within 30 days from the date of despatch. Contracts for forward delivery are subject to supplies being available.

This price is subject to alteration or withdrawal without notice, and it is a condition of sale that goods will be invoiced at the price ruling at date of dispatch from the warehouse.

Price list dated 26 August, 1952 (THE CHEMICAL AGE, **67**, 334), is not effective after 31 December, 1952.

New Hand Cleanser

SKIN troubles among workpeople, which account for much absenteeism, are often caused or aggravated by irritation due to grease, grime, chemicals, or harsh cleansers incompletely removed from the skin after work.

Boraxo (Braxo), a powder hand cleanser, developed by Borax Consolidated Limited, introduces new principles in hand cleaning. The product contains no insoluble or abrasive fillers and the scouring action necessary to remove ingrained dirt, or to penetrate oily films, is provided by the small grains of borax, which slowly dissolve during the wash. Boraxo in water solution is mildly alkaline—much less so than soaps in general. It has a pH value of 9.3 which is claimed to be sufficiently low to ensure no chemical damage to the skin and to prevent undue removal of natural fats.

The most economical use of the powder is from the dispenser, obtainable from the manufacturers, which is so designed that a few upward taps of the plunger deliver enough Boraxo for each wash.

Executives responsible for welfare are invited to test the cleanser in their own works. A working sample and full information will be sent, on request, by the makers: Borax Consolidated Limited, Regis House, King William Street, London, E.C.4 (Telephone: MINcing Lane 7333).

Pipe-line for Haifa ?

An agreement concerning the future of its oil refineries is reported to have been signed by oil interests and the Israeli Government. Consideraton is being given to the practicability of laying a pipe-line from Haifa to Tel Aviv to save the costs of transport between the two towns.

Obituary

Professor M. G. Evans

We regret to announce the death of PROFESSOR M. G. EVANS on Christmas Day at his home at Sale, Manchester. Professor Evans, one of our most brilliant and promising physical chemists, was only 48 years of age.

Meredith Gwynne Evans was born at Atherton in 1904 and was educated at Leigh Grammar School. After graduating from the University of Manchester with first class honours in 1926 he held several junior university posts there and spent one year at Princeton on a Rockefeller Fellowship. In 1939 he was appointed to the Chair of Inorganic and Physical Chemistry in the University of Leeds when only 34 years of age. He was elected a Fellow of the Royal Society in 1947 and in the following year accepted the Chair of Physical Chemistry in the University of Manchester. In 1951 he was appointed to the Government's Advisory Council on Scientific Policy and to the Scientific Advisory Council of the Ministry of Supply. He was also a member of the Advisory Council on Scientific Research and Technical Development.

Professor Evans was perhaps best known for his research on polymerisation and on liquids and liquid mixtures but it was not only for his own work that he will be remembered and his death mourned for he had an influence far beyond the confines of Manchester University. He was an outstanding teacher as well as a brilliant research worker.

Britain in particular, but the world as a whole, will be the poorer for the death of this truly great mathematician and chemist but it is richer for the great contributions he made during his comparatively brief life.

Mr. J. W. Richardson

The death has taken place of MR. JOHN WILLIAM RICHARDSON, managing director of C. W. Field, Ltd., manufacturing chemists, Edwards Lane, Speke. Mr. Richardson, who was 72, collapsed at the wheel of his car on 23 December and was taken to Garston Hospital.

Mr. E. Twigg

The death occurred suddenly before Christmas of MR. ERNEST TWIGG, managing director of Robert Jenkins & Co., Ltd., Rotherham, since 1946, in his 65th year. Mr. Twigg began his association with the firm in 1901 as an indentured commercial apprentice to the late A. T. Jenkins. He was appointed secretary to the company on its formation in 1917, a position which he held for 29 years. He became a director in 1920, and was appointed managing director on the retirement of Mr. Edgar J. Jenkins in 1946.

Sulphur Allocations

THE allocation plan of crude sulphur for the first quarter of 1953 was announced by the Sulphur Committee of the International Materials Conference, Washington, on 23 December, 1952. The United Kingdom is allotted 83,000 tons, irrespective of stock adjustments, and an import quota of 48,500 tons.

A substantial improvement had taken place in the sulphur position over the last six months of last year (it was said). This had been brought about both by an increase in production, and by some reduction in demand resulting from the fact that the level of industrial activity in many countries was lower than previously anticipated, from the increased use of other sulphur-bearing materials, and from various conservation measures.

Export availabilities and import requirements for the first quarter of 1953 were approximately in balance.

Possible termination of international allocations was discussed by the committee, but it was considered that the improvement in the supply position might be only of a temporary nature. Furthermore, the committee recognises that in many cases the requirement figures for individual countries are based on a continuation of restrictions on the use of natural sulphur, and thus may not reflect a true estimate of world demand. In view of this, the committee had recommended the continuation of allocations for the first quarter of 1953.

The Committee agreed to make arrangements whereby domestic users in the U.S.A. and in other countries may purchase any sulphur allocated to other countries participating in the International Materials Conference and not used by any such participating country.

As on previous occasions, the committee dealt only with crude sulphur.

Metallurgical Section

Welding Stainless Steels

By An Engineering Correspondent

STAINLESS steels of various kinds are today used in the chemical, food and many other industries on such a large scale that some remarks on their welding may be of interest and commercial value.

Electrodes used for the electric arc welding of stainless steels are generally purchased on the basis of high quality rather than on that of price, but in order to understand something of this subject it is essential to know certain basic facts about stainless steels, their metallurgical properties and the problems involved in their successful welding. Although the recently introduced argon arc process of welding has made great strides, for many years to come most fabricators will continue to rely on the metallic arc electric process for the greater part of their welding work.

When chromium is added to a low carbon mild steel there is gradual but progressive increase in corrosion resistance of the steel. This increase does not become spectacular until about 12 per cent of chromium is present, when it is found that the steel will remainly reasonably bright under ordinary atmospheric conditons, whereas steels with lower chromium content will rust. By bringing the amount of chromium up to about 30 per cent further improvement in corrosion resistance is gained.

Chromium Steels

There are two groups of plain chromium steels. The first contains from 12 per cent to 14 per cent of chromium and up to 0.3 per cent of carbon, which is the familiar cutlery steel. It can be hardened by quenching in the same way as carbon steels and gives similar trouble in welding to that encountered with carbon steels, namely, the hard zone at the side of the weld, which may lead to cracking at this point. Hardness of this zone is due to the constituent known as martensite, the steels often being described as 'martensitic chromium steels.' These steels are not often welded.

The second type of straight chromium steel is in fact a group of steels with a chromium content varying from 12 per cent to 30 per cent and with carbon normally less than 0.1 per cent. These are known as chromium irons, because they are not appreciably hardened by quenching. They are generally fairly ductile but during welding a brittle zone forms at the side of the weld thereby introducing certain difficulties into the welding of these alloys.

Resistance to Wear

When nickel is added to iron containing 18 per cent of chromium it has little useful effect until it reaches about 6 per cent. This nickel has the effect of transforming magnetic ferrite into non-magnetic 'austenite.' The latter, with 6 per cent of nickel, is very unstable and with even slight cold working it will break down to magnetic ferrite. For industrial use, therefore, steels are normally produced with a minimum of about 8 per cent of nickel which gives reasonably stable austenite, although the steel will still harden rapidly and will become magnetic to a certain extent on cold working. This rapid increase in hardness on working gives this type of steel its valuable resistance to wear under impact loading.

The special virtue of austenitic stainless steels is that they are more ductile than the straight chromium ones, with less difficulties in welding. Corrosion resistance is only slightly better than that of the straight chromium type, but this can be improved for resistance against chlorides, acetic and sulphuric acids by addition of up to 4 per cent of molybdenum. In addition to the various types of 18 per cent chromium 8 per cent nickel steels, there are also available steels with higher chromium and higher nickel contents. These are mainly employed

in heat resisting applications. Principal types contain 25 per cent chromium, 20 per cent nickel and 25 per cent chromium, 12 per cent nickel with or without tungsten respectively.

With hardenable stainless steels the main problem is cracking at the side of the weld, which occurs for the same reason that cracks also occur in welding of armour, namely, presence of a very hard zone at this point. Some electrode makers put forward an electrode containing 12 per cent of chromium in its composition for welding stainless steels, but this is necessary only in rare cases when the weld has to be heat-treated to give the same hardness as the parent metal. In such cases the weld is brittle and there is little advantage in using this type of electrode.

Austenitic Electrodes

A better practice is to use an austenitic rod. It will be necessary to heat the joint to a temperature of about 450°C. during welding, depending upon the cross section of the metal, followed by tempering of the joint at about 650°C. Welds made with austenitic electrodes in this way cannot be heat-treated to give the same hardness as that of the parent metal, but they are nevertheless reasonably ductile.

Brittleness at the side of the weld is the main difficulty with chromium steels. This is increased according to the carbon content, but even with low carbon of about 0.08 per cent and less it is still there. These steels have previously been considered as not weldable, but shortage of nickel has brought more of them into use, so that it is necessary to know something about the best welding technique to be adopted.

It is important to realise that satisfactory welds can be achieved if the appropriate electrodes are used. Brittleness is not of serious importance for dairy and similar plant which does not have to sustain heavy loads This brittleness disappears at high temperature, so that it will not be important in such equipment as chemical and similar industrial plant.

Austenitic stainless steels are by far the most important commercially, and it is necessary that the problem of weld decay should be understood in this connection, although this trouble is comparatively rare nowadays. When a stainless steel containing 18 per cent of chromium, 8 per cent of nickel and about 0.1 per cent of carbon is heated in the range from 450 to 850°C., chromium carbide will be formed so that when the metal is subject to corrosion it will be attacked and in extreme cases it will fall apart, but in less severe cases it will suffer from perforation and disintegrate over small areas.

In welding, there must be an area alongside the weld where the above temperature range is reached, so that weld decay is visible as a corroded area running parallel to the weld and distant about half an inch from it. There are three possible ways of overcoming this problem.

First, annealing of the welded structure at about 1,100°C. and quick cooling, preferably by quenching, but this is generally impracticable for most large structures although it has occasionally been applied in the U.S.A. Secondly, carbide formation can be prevented by maintaining carbon content as low as possible, 0.03 per cent of this constituent giving complete immunity from weld decay. Finally, formation of chromium carbide can be avoided by using metal containing small amounts of elements with greater affinity for carbon than chromium. This is the most widely employed means of overcoming the trouble. For example, titanium of about five times the carbon content or niobium of ten times the carbon will provide virtual immunity from weld decay.

Correct Usage Important

Commercially, it is very important that those responsible for maintenance and repair of plant should know something about suitable electrodes, because otherwise much waste can occur through using rods which are not appropriate for the job. The type of electrode most widely used for stainless steel welding in the food, chemical and aircraft industries is of 18 per cent, 8 per cent chrome nickel steel stabilised with titanium and niobium. Another standard electrode deposits weld metal having 25 per cent chromium and 20 per cent nickel for heat-resisting applications.

Electrode manufacturers market a wide range of electrodes to cover most types of metal to be welded, but they are always prepared to produce special types to meet any particular problem and provide a reasonable solution.

Actual welding technique of stainless steel differs but slightly from that employed in good mild steel welding, but since greater

emphasis is placed on quality and it is difficult to remove defective weld metal for rectification, more care is necessary at all stages of making the joint. It is an advantage to position the heavier welds so that they can be executed in the downhand position, although most electrodes can be applied with equal facility in both vertical and overhead positions. Where alternating current plant is installed it can be used effectively for welding steel up to 12 s.w.g. in thickness, but it is an advantage to use direct current on all electrodes, particularly where the metal is thinner than 12 s.w.g.

Edge preparation of stainless steel is similar to that employed on corresponding thicknesses of mild steel. A square butt is used on gauges thinner than 10 s.w.g. with if possible a slight gap, thicker plates being chamfered according to applicaton. A single chamfer with an included angle of 60° is used for plates up to a thickness of $\frac{3}{8}$ in., while plates thicker than this are given a double chamfer with an included angle of 70°. Where a single chamfer is used, it is advisable to arrange that the backing run is on the side of the weld that is to be finally polished, since this will reduce finishing costs.

In welding, distortion is the main problem. A carefully designed welding sequence is helpful, particularly for thin plates, and it is sound practice to use a smaller electrode than with mild steel and at the same time to avoid heavy reinforcement. The arc should be short in order to reduce alloy losses to a minimum. With thin sheets, contrary to mild steel practice a run of weld metal should be deposited on both sides in order to achieve sound metal on the two faces.

Potentialities of Titanium

Extensive Research to Reduce Cost

RAPID development in the uses of titanium metal, its increasing production, and future potentialities were discussed by Mr. E. A. Gee, section manager in charge of the Titanium Metal Development Pigments Department, E.I. du Pont de Nemours & Co., Inc., in a paper presented to the Manufacturing Chemists' Association, Inc., at its semi-annual meeting held in New York, U.S.A., on 25 November, 1952.

There has probably been no metallurgical development in the past five years which has occasioned as much speculation as titanium metal, declared Mr. Gee. The underlying reason for this tremendous interest was the unique combination of properties exhibited by this new material of construction. Light weight, high strength, and good corrosion resistance had led to its wide evaluation in aircraft, chemical equipment, ordnance and marine structures. Over 90 per cent of the metal produced to date had been consumed in aircraft where its high strength-to-weight ratio offers new horizons to the aeronautical engineer. Production uses now exist in both civilian and military planes.

The outstanding corrosion resistance of titanium in chloride environments had led to numerous field tests in the chemical industry. In salt water titanium had been phenomenal; after three years of severe marine testing it remained unaffected.

Numerous reasons existed why titanium had not so far been produced commercially. These included inability to control the reaction, sensitivity of the metal to gases of the atmosphere, and lack of materials of construction. Notwithstanding these formidable obstacles, the economy of titanium was an expanding one; from the 20,000 lb. produced in 1948, production had increased to an estimated 2,000,000 lb. in 1952, and a forecast of over 14,000,000 lb. by 1955.

The basic problem in the future of titanium metal was the production of low cost sponge for melting stock and large sums were being expended by the chemical industry in this field. Drastic reduction in price were essential to a sizeable civilian market and Du Pont alone is spending over $1,000,000 annually in new process research.

Based upon advances to date and techniques now under investigation in the laboratory it would not appear over-optimistic to predict a tonnage titanium industry in the near future.

More Controls Relaxed

The Minster of Supply, Mr. Duncan Sandys, has made an Order removing from price control unwrought brass and scrap of gilding metal, cupro-nickel and brass. This is made possible by the improved supplies of these metals. Secondary copper and copper scrap remain subject to price control for the time being. The Order, The Copper, Zinc, etc., Prices (No. 6) Order, 1952, came into operation on 31 December, 1952.

French Metallurgical Research

Objectives of New IRSid Laboratories

THE new laboratories of the IRSid (Institut de Recherches de la Sidérurgie française) are situated in a park of about 15 acres on the outskirts of Saint-Germain and occupy 6,700 sq. m. or just over 72,000 sq. ft. There is also a semi-industrial pilot-plant at Saulnes and cost of the equipment was 1.5 milliard francs

A description of the official opening of the new buildings by M. J. M. Louvel, French Minister of Industry and Commerce, on 24 October, 1952, together with a survey of recent developments and the main objects of French metallurgical research by M. H. Malcor, president of IRSid, was given in *Chimie et Industrie* (**68**, 787-791).

Distinguished Guests

The ceremony was attended by a number of distinguished guests including M. Aubrun, president of the Chambre Syndicale de la Métallurgie, M. Le prince de Broglie, M. Portevin and M. Chevenard.

Total personnel of the laboratories numbers about 600. The organisation is under the control of the Ministry of Industry and Commerce, in close relation with the Chambre Syndicale de la Sidérurgie. Income is derived from an annual levy of 0.3 per cent on all sales of iron and steel and in 1951 amounted to 880,000,000 francs.

Main objects of research are study of: raw materials, for example, ores and coke; of methods of manufacture with a view to improving quality and lower costs; properties of the finished or manufactured products. IRSid has already undertaken a considerable amount of research in various French (and also some foreign) iron and steel works. At Saint-Germain the principal lines will be the mechanical properties, hot and cold, of different steels and forgings; including special studies on certain faults in rails and strip, viscosity and surface tension, effect of boron in steels and so on.

Close liaison is maintained with various national and international bodies in relation to particular fields and problems, including universities and special research institutes. At Metz a centre is maintained for advanced study and research by young engineers and metallurgists, namely the CESSid (Centre d'Etudes supèrieure de la Sidérurgie).

M. Aubrun, president of the Chambre Syndicale de la Métallurgie, stated that a seven-year plan had been studied under which it was intended that French and the Saar steel production should reach 20,000,000 tons (crude). This would mean making the utmost possible use of energy and funds, but he had little doubt these would be forthcoming, and enable France to take her proper place in the West European Coal and Steel Union (Communauté Européenne du Charbon et de l'Acier). He assured the Minister of Foreign Affairs, M. Robert Schumann—who was present—that the plan which bore his name should be a complete success, so far as France was concerned.

At the same time there were still some difficulties to be overcome, and certain changes had had to be made in the original arrangement. He discussed in detail some of these difficulties in the Schumann Plan, financial and otherwise, and the means adopted by the French Government to meet them. He thought these should include greater fiscal or other protection for the iron and steel industry.

A general description of the new buildings, including chemical and other laboratories, followed, based on a brochure compiled, with illustrations, by M. Georges Delbart, technical director of IRSid. Several novel and interesting constructional features were introduced.

British Aluminium's Output

THE arrangement under which the Ministry of Materials buys the output of virgin aluminium from the British Aluminium Company for resale along with imported metal was discontinued with the expiration of the contract at the end of 1952.

A joint announcement made by the Ministry of Materials and the Ministry of Supply stated that most of the metal the company produced would be used in its own works, but it had agreed to supply other users who required metal for special purposes, and such sales would be licensed by the Ministry of Supply.

Production of virgin metal by the British Aluminium Company is about 30,000 tons a year.

Niobium in Africa

Pyrochlore Deposits May Allow Fuller Use

A NUMBER of new potential sources of niobium (columbium) have been discovered in Nigeria, Uganda and Nyasaland during the last few years. Although investigations are still proceeding and it is as yet difficult to assess the economic possibilities until ore-dressing problems have been solved, it is already clear that the niobium resources of the African colonies are much greater than was hitherto known.

Details of the Nigerian pyrochlore occurrences published in June, 1952 (Mackay and Beer, 1952; Beer, 1952), provided a suitable occasion for a review of these developments and the following survey is abstracted from a report in *Colonial Geology and Mineral Resources*, Vol. 3, No. 1 (HMSO, 5s.).

Owing to its scarcity niobium (the name recommended by the International Union of Pure and Applied Chemistry in 1949 to replace columbium) has been severely restricted. Present total world consumption is probably only about 1,000 tons a year. These new resources may, therefore, ultimately allow of a considerable increase in its use so that full advantage can be taken of its valuable properties especially in the field of stainless steels and high temperature alloys.

The rise in price of niobium concentrates from 65s. in 1948 to 320s. per unit $(CbTa)_2O_5$ at the beginning of 1952 (equivalent to £1,040 per ton for average grade Nigerian columbite) has added stimulus to the search for new deposits, and further incentive was provided in May, 1952, when the United States Government offered a bonus of 100 per cent on deliveries of concentrates for the next three years.

Nigerian Columbite Main Source

Columbite produced from the alluvial deposits in the Nigerian tinfields (Jacobson *et al.*, 1951) has provided the bulk of the world's niobium supplies. Total production from this area in the 20 years since the mineral was first utilised now amounts to more than 15,000 tons of columbite concentrates, which have realised more than £3,500,000. Output reached its maximum of 2 055 tons in 1944, declined subsequently to 864 tons in 1950 but, responding to a rise in prices, increased to 1,078 tons in 1951.

Known reserves of alluvial columbite in Nigeria are unfortunately limited, being reported as 7,166 tons of proved and 2,624 tons of indicated columbite at 31 March, 1951 but it is to be hoped nevertheless, that the present level of output can be maintained for several years.

Discovery of rich primary deposits, in which the ore mineral is pyrochlore, associated with albite-riebeckite granites is of great significance to Nigeria, for it may allow her to expand niobium production despite the gradual exhaustion of her workable columbite deposits.

Only One Important

Pyrochlore, a complex fluo-columbate of calcium and sodium, is recorded from six of the albite-riebeckite granites of Nigeria, but only one of these, the Kaffo Valley occurrence near Liruei-n-Kano, appears to be of major importance. The Liruei Hills are an oval Younger Granite ring-complex, 9 by 7 miles in diameter, containing a central core of columbite-bearing biotite-granite, and a smaller mass of riebeckite-granites occupying some 4 sq. miles at the south-east corner of the complex, included within which, at the headwaters of the Kaffo Valley, is an area of half a square mile of albite-riebeckite-granite containing pyrochlore.

This granite contains about 0.5 per cent of pyrochlore, in yellow grains most commonly about $\frac{1}{4}$ mm. in diameter, and assays 0.26 per cent Cb_2O_5 and 120 g./ton U_3O_8. Another interesting constituent is cryolite, which is present to the extent of 2 to 4 per cent. Although the vertical extent of the deposit has still to be investigated, it is clear that reserves of pyrochlore-bearing granite probably amount to hundreds of millions of tons, so that it is possible to contemplate production of pyrochlore, if necessary, on the scale of several thousand tons annually.

At present prices (without bonus) the ore may have a gross intrinsic value of about £5 per ton, and the pyrochlore itself, which is reported to contain about 50 per cent $(CbTa)_2O_5$, 3 per cent U_3O_8 and 3 per cent ThO_2, appears to be worth about £1,000 per ton, niobium accounting for more than

80 per cent of its value. Cost of working this deposit must remain uncertain until data are available on the separation of the pyrochlore and the extraction of the niobium and uranium, but one is tempted to assume that eventually it should prove economic.

In East and Central Africa the new niobium discoveries are also pyrochlore deposits associated with alkaline ring complexes, but of a very different type. Here the mineral is found disseminated in carbonatite (limestone) plugs which form the cores of several eroded alkaline volcanoes. Analysis of the pyrochlore from the first known occurrence in the Sukulu carbonatite plug, near Tororo, Uganda, showed it to be a very promising mineral containing 68.7 per cent Cb_2O_5, but the problem of locating workable concentrations appeared formidable. This was because the pyrochlore is seldom visible in the field and, as the plug has an area of about 5 sq. miles, it would require a costly sampling and assay programme to cover it.

Radiometric Survey Unreliable

A radiometric survey, like that which outlined the Kaffo Valley deposit in a short time, could not be relied upon, as the Sukulu pyrochlore has a variable and relatively low radioactivity. Fortunately it was found that the red soil on the pediment which surrounds the carbonatite hills contains most of the valuable minerals of the carbonatite namely, pyrochlore, apatite, magnetite, baddeleyite and zircon. As this soil belt is usually at least 20 ft. deep, from 100 to 300 yd. in width and extends right round the 9½-mile perimeter of the hills, it should provide scope for several years mining by alluvial methods, and, although few details of the deposit have been published, the reserves of 87,000 tons of pyrochlore are very impressive.

It is hoped to make the exploitation of this soil one of the new industrial projects to utilise power from the Owen Falls hydroelectric scheme, pyrochlore and apatite production being first objectives, with the development of a small iron and steel industry and the production of zirconium minerals later possibilities.

For the present, the ultimate niobium reserves of the huge carbonatite mass of Sukulu remain speculative, but an opportunity of investigating them may be provided at a later stage when the new Tororo cement works gains experience in the beneficiation of the carbonatites for cement production. Pyrochlore also occurs in other carbonatite plugs in Uganda, but these are much smaller and less favourably situated than Sukulu.

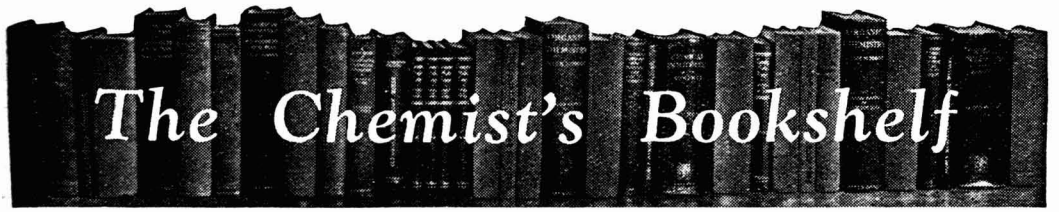
The search for pyrochlore was extended to Nyasaland in 1951, resulting in its discovery in several of the carbonatite-filled vents and dykes of the Chilwa Series, and an investigation of these occurrences is now in progress. In the largest Nyasaland carbonatite, which has an area of about 1¼ sq. miles and forms the mountain core of Chilwa Island in Lake Chilwa, the first samples suggest that the carbonatites may average about 0.2 per cent pyrochlore. Erosion has breached one side of the vent and left within it an accumulation of eluvial and alluvial soil probably amounting to several million tons, and, judging from a few samples, possibly averaging about 0.3 per cent pyrochlore. True residual soils on the plateau summit of the mountain contains as much as 2 per cent pyrochlore, but the tonnage of this material appears to be very limited.

Similar but apparently smaller deposits occur in the Tundulu vent near the southern shore of Lake Chilwa. The pyrochlore here contains about 65 per cent $(CbTa)_2O_5$ and has relatively low radioactivity.

Although a variety of minerals of possible economic interest, such as zircon, rutile, anatase, apatite, fluorite and some rare-earth minerals accompany the pyrochlore their value as potential by-products seems rather doubtful.

At Kangankunde Hill, however, which is another of the Chilwa carbonatite vents on the west side of the Shire Valley, there are deposits of low-thoria monazite which might prove workable as sources of cerium metals, in which case a little by-product pyrochlore might also be recoverable.

SIR ERNEST CANNING has announced that as from 1 January he has relinquished his office of joint managing director of W. Canning & Co., but will continue as chairman of the board. MR. G. A. POPE, joint managing director, has been appointed deputy chairman as from 1 January and will continue in his present office. MR. F. H. EWENS, financial director, has been appointed joint managing director from the same date. MESSRS. E. G. CATTON, H. C. CLEMENTS, G. G. DAWSON and E. L. MASEK took seats on the board on 1 January.



AN INTRODUCTION TO DRYING OIL TECHNOLOGY. By M. R. Mills. Pergamon Press, Ltd., London. 1952. Pp. 251 + xi. 45s.

This book is stated to be 'the first of a number of monographs treating various phases of . . . the technology of fats and oils' and deals with the manufacture and modification of drying oils and with certain industrial applications. If subsequent monographs maintain the high standard of this text the series will be a welcome addition to technical literature. The book is divided into two parts. The first part contains chapters on 'Manufacture and Refining, Segregated Oils, Equipment for the Modification of Drying Oils at High Temperatures, Boiled Oil and Driers, Bodied Oils, Isomerised Oils, Esters of Fatty Acids, Modification with Resins and Chemical Modification.' The second part introduces the drying oil industries, with chapters on Paint Manufacture, Printing Inks, Linoleum and Miscellaneous Industries. A brief introduction is given concerning the nature of drying oils, the principal sources of the more important oils and their physical properties. The subsequent chapters of Part I are concerned with the underlying technical principles and equipment used rather than the chemistry of the processes, although sufficient chemistry is given to enable the reader to follow the technical details involved.

Chapter III, of particular interest to chemical engineers, describes the equipment used in the industry with particular reference to materials of construction, heating methods and fume disposal. Although many of the processes have been developed by experience and much of the equipment has a traditional background there is an increasing use of scientific control and development as indicated by the use of venturi scrubbers for fume removal. In the chapters on Boiled Oil, Driers, Bodied Oil and Isomerised Oils the method of preparation and properties of the oils and driers are stressed. Some comment is made on the chemical reactions involved, but only as a background to the general technology. Chemical modification of oils is similarly treated, the important properties and uses of sulphurised oils, maleic treated oils and urethane oils being fully discussed with brief reference to the chemistry involved.

Part II, the Drying Oil Industries, is perhaps less well developed than Part I, but nevertheless presents a concise and authoritative account of the manufacture of paint, printing ink and linoleum. Again the emphasis has been placed on process methods and equipment with some discussion of the effect of the many variables upon the quality of the finished paint or ink.

The book is well produced with excellent illustrations and drawings. Although primarily intended for technicians within the drying oil industry, to whom it should prove of great value, the book is recommended for general reading by chemical engineers and chemists. References to current technical literature are given at the end of each chapter and the book is well indexed.—F.M.

THE PHYSICAL CHEMISTRY OF SURFACE FILMS. By W. D. Harkins. Reinhold Publishing Corporation, New York; Chapman & Hall, Ltd., London. 1952. Pp. xvi + 413. 80s.

As is evident from the detailed list of the author's publications given at the end of this book, the late Professor Harkins was a most remarkable and talented scientist. Of the 270 publications credited to his name, all except seven were written when the author was over forty years of age, and no less than eighty were written after his formal academic retirement in 1939. Most of his research investigations were connected with various aspects of surface chemistry and as these developed in scope and importance it became clear that a unified treatment of his contributions on this subject would be extremely valuable.

The present volume is the result of these endeavours and it is fortunate that the

author was able to complete the writing of this book before his sudden death in 1951. Apart from the last chapter, which was written by Dr. Verwey, of Eindhoven, on the role of the electric double layer in the behaviour of lyophobic colloids, the book is based very largely on research work carried out by Professor Harkins and his co-workers.

The five sections into which he has divided his own contributions to the consideration of surface chemistry are (1) the nature and energetics of surfaces, (2) films on liquids, (3) films on solids, (4) properties of soap solutions, and (5) the mechanism of emulsion polymerisation. Some of the material described in this book has previously appeared in the series of volumes entitled 'Colloid Chemistry' edited by Jerome Alexander, but where this is so it has been modified to bring it into accord with the author's more recent opinions, and to include new experimental results. Surface phenomena play an important part in many technical processes, and such substances as emulsions, detergents and lubricants are only a few of the products whose action depends upon them. This book will be of undoubted assistance to workers concerned with the production and application of these products.—G.S.E.

AN INTRODUCTION TO THE CHEMISTRY OF THE HYDRIDES. By D. T. Hurd. John Wiley & Sons, New York. Chapman & Hall, London. 1952. Pp. v + 231. 44s.

The importance of such hydrides as ammonia, water and the hydrogen halides is well known. In recent years knowledge of hydride chemistry has been considerably extended and substances such as lithium aluminium hydride are becoming common laboratory reagents. In this book the term hydride is used in its widest sense as meaning a compound of hydrogen with any element and not restricting it to compounds in which hydrogen is combined with a metal. The author has aimed at the provision of an ordered, critical presentation of hydride chemistry which will be of value to both research and industrial chemists. The hydrides are divided broadly into ionic, covalent and transitional metal hydrides.

A useful account of chemical bonding is given, with particular reference to the types of bonding met with in hydrides and including the metallic bonding of hydrogen and hydrogen-bridge bonds. The ionic, covalent and transitional metal classes are dealt with in turn, a general consideration of each class being followed by details of the hydrides formed by each of the elements concerned. Structures, methods of preparation, properties and uses of the hydrides are given together, in certain cases, with appropriate methods of handling. Research and industrial applications are given. Thus, under calcium hydride are found uses as an analytical reagent, as a drying agent and as a reducing agent in the preparation of metals. Under boron hydrides uses in metal coating and in polymer chemistry are given. A brief account of the hydrogen halides is given, these being regarded as a separate class characterised by their high solubility in water and ionisation in aqueous solution. A short account of acids and bases is included.

Compounds containing more than one element in combination with hydrogen are considered under complex hydrides, these including such mixed hydrides as hydroxylamine, coordination complexes as the diborane-amonia complex and the important group of hydrides, such as lithium aluminium hydride, with a complex hydride anion. Detailed references to the use of lithium aluminium hydride are given. Hydrides of copper, silver, gold, zinc mercury and thallium which might be expected to show behaviour intermediate between that of ionic and transitional metal hydrides are briefly discussed as borderline hydrides. The book includes a chapter on the nomenclature of the hydrides.

It is, in general, well balanced. While it would have been undesirable to have included the detailed chemistry of water, ammonia and hydrocarbons, the book includes a discussion of their places in the family of hydrides and their reactions as such. In spite of the author's interest in the boron hydrides the space allotted to them is not out of proportion. Perhaps more space might have been given to the palladium-hydrogen system. Appendices include brief accounts of the deuterides, the toxicology of the hydrides and the vacuum manipulation of volatile compounds, important in some experimental studies of hydrides. This latter section could profitably have been extended. The book is well documented and will be of interest to all those interested in hydrides.—W.R.M.

X-RAY CRYSTALLOGRAPHIC TECHNOLOGY. By A. Guinier. Translated by T. A. Tipple. Hilger & Watts, Ltd., London. 1952. Pp. 330 with numerous plates and diagrams.

Dr. Guinier's 'Radiocristallographie' has been translated under a perhaps less elegant but more informative title. The original work was addressed not to specialists in crystal structure, but to all who use X-ray crystallography in industrial or other laboratories as an auxiliary method. Nevertheless it is of the greatest use to these specialists as well. There are sections on the generation and general properties of X-rays, crystallography and theory of X-ray diffraction, experimental methods for obtaining diffraction patterns including patterns with strictly monochromatic radiation and a review of problems for which X-ray crystallographic methods are useful. A further part deals with crystal imperfections amorphous substances, and low angle scattering by small particles.

As a companion to practical work the text is not burdened with non-essential mathematical material but the appendices give a theoretical treatment of diffraction, and some useful tables. The importance of the idea of the 'reciprocal lattice' is pointed out. Some of those for whom the book is primarily intended may find this section difficult, and the subject might have been dealt with first in a more rough and ready manner with a practical example as bait to draw the reader on to the niceties of Ewald's treatment. Dr. Guinier's method is the reverse, logical and polished. Any one in difficulty is recommended to become familiar with the practical use of reciprocal lattice methods for indexing, which he may do from other sources, but to be sure that he comes back to this section.

The author's aim has been not to discuss results but to give practical instruction in the methods of using X-rays. Concrete examples worked out in detail include determination of particle size, orientation of a single crystal from Laue photographs and from back reflection Laue patterns. The orientation of crystallites in polycrystalline specimens is discussed with reference to fibres and to drawn metallic wires or other specimens of interest to metallurgists, and examination of strain in metals is considered. X-ray crystallographic procedure as a main or auxiliary method of chemical analysis is dealt with in a concise manner. In all sections both the power and the limitations of the techniques are explained.

The translator has followed his copy very closely but the reader is rarely aware of his intervention. The heading 'Crystals with Base' and the use of 'Crystal base' indicate that there is no sure way of translating the idea that is sometimes rendered as 'basis,' e.g., in 'The Crystalline State, Vol. II,' or described as crystal pattern or motif. In the case of 'structure factor' it seems certain that it should not be qualified as 'crystalline.'

The work is warmly recommended to all who are interested in X-ray crystallography in any way.—H. M. POWELL.

THE ALKALOIDS. Vol. II. Chemistry and Physiology. Edited by R. H. F. Manske and H. L. Holmes. Academic Press, Inc., New York. 1952. Pp. viii + 587. $13.50.

The editors, both well-known alkaloid chemists, are attempting to offer a comprehensive survey of the chemistry and physiology of the alkaloids in five volumes. In the present volume, the following alkaloids are discussed: the morphine alkaloids; sinomenine; colchicine; alkaloids of the Amaryllidaceae; acridine alkaloids; indole alkaloids; Erythrina alkaloids; and Strychnos alkaloids. The different chapters are by well-known workers in the fields covered and offer an exhaustive account of the subject. However, some of them deal with groups of alkaloids of as-yet unknown structure, and will be of limited interest. Others, concerned with alkaloids of well-established structure, offer a survey of the chemistry of the compounds in terms of the latest theories of organic chemistry, as in a chapter by H. L. Holmes and G. Stork, on the morphine alkaloids, which will probably prove the most interesting for the general reader. The last chapter surveys the very important developments in the field of the Strychnos alkaloids since Volume I appeared; it is unfortunate that these alkaloids were discussed in the first volume at a time when the final details of their structures were being elucidated; a later survey would have enabled their chemistry to be described more clearly and compactly. But these difficulties are inherent in any attempts to survey an active field of research.—J.T.E.

• HOME •

London Section's Buffet Dance

A buffet dance will be held by the London Section of the Society of Chemical Industry and the London Section of the Royal Institute of Chemistry, at Caxton Hall, Caxton Street, London, S.W.1, on Saturday 28 February, from 7.30 p.m. to 11.45 p.m. (Evening dress optional.) Early application for tickets (12s. 6d. each) should be made to Mr. G. H. Edwards, Allied Bakeries Research Laboratories, Ltd., Kemp Road, Dagenham, Essex or to the Assistant Secretary, Society of Chemical Industry, 56 Victoria Street, London, S.W.1.

Chemicals and Overseas Trade

Chemicals, drugs, dyes and colours exported in November were valued at £10,914,397 which was slightly higher than the level maintained during the last few months but was nearly £3,000,000 less than the figure for November, 1951. Total value of exports for the 11 months ended 30 November, 1952, was £128,335,186 compared with £131,675,082 in the same period of 1951.

Zinc Control Ends

The Minister of Supply has announced that from 1 January, 1953, the provisions of the Copper, Lead and Zinc Distribution Order, 1951, ceased to apply to zinc. The removal of this control means that licences are no longer required for the purchase or sale of zinc; it arose from the decision to re-open the London Metal Exchange on 2 January, 1953. Lead was decontrolled in October last. Licences will now only be required for the purchase of copper.

U.K. Steel Output Forecast

Production of steel in the United Kingdom in 1953 is estimated at 17,500,000 tons compared with just over 16,000,000 tons this year, according to the statistical bulletin published by the British Iron and Steel Federation. The 1945 plan for expansion and modernisation is now nearing completion and a second development plan to raise output to 20,000,000 tons a year has already been submitted to the Government.

Proposal Approved

Merioneth Planning Committee at Dolgelley on 15 December approved a proposal to establish a factory for the production of sodium chlorate, together with an administrative building at Cwmnantcol, Llanbedr, for Mr. R. T. Cooke. Mr. C. J. Tuck (county planning officer) said Cwmnantcol was a beautiful valley and there was controversy as to whether this project would harm the amenity. He was satisfied that Mr. Cooke was anxious to avoid any injury to the amenity and it had been clearly understood that no substance should be thrown into the river. He recommended approval, subject to condition, and this was agreed.

Change of Address

Since 1 January the address of the Standardization of Tar Products Tests Committee has been Oxford Road, Gomersal, near Leeds, to which all communications and orders for publications, etc., should be sent. As from that date the honorary secretary has been Mr. P. V. Watkins.

Polymerisation Plant Started

The catalytic polmerisation plant at the Esso refinery at Fawley, near Southampton, has gone into operation, it was announced last week. The plant will help boost Britain's output of premium grade petrol which goes on sale to motorists on 1 February.

Paper Mills Closed

Two Devonshire paper mills recently closed down, temporarily, because of the current recession in the industry. Between 80 to 90 employees at the Cullompton Mills of Reed, Smith & Co., Ltd., were warned just before Christmas that the mills would be closed for a while through lack of orders. At Stoke Canon some 60 workers were involved when Tremlett & Co., closed their mills. The manager explained that there had been a general falling off in trade since last May but said that it had been hoped that when customers reduced their stocks the position would be improved. This has not proved the case and conditions had grown progressively worse.

OVERSEAS

New Oilfield in Pakistan

A new oilfield has been indicated at Chak Naurang, near Chakwal in the Punjab, with the success of the first well drilled there by Pakistan Petroleum, Ltd. Drilling was begun in March this year and by the end of November the oil bearing limestone had been reached at about 7,700 ft. The extent of the pool has yet to be determined so that it is too early to assess the full significance of the find.

Location Decided

The Indian Minister of Commerce and Industry, Mr. T. T. Krishnamachari, recently said in the House of the People, that the proposed aluminium factory was likely to be located in the Sambalpur district of Orissa where the Hirakud Project was being constructed. Mr. Krishnamachari said that the country's requirements of aluminium were estimated at 15,000 tons and when the proposed plant, with an installed capacity of 10,000 tons was in production, the country would be self-sufficient.

Titanium Ore Find

Titanium ore has been found in Northern Newfoundland and a smelter is planned to be built within three years to handle the ore.

Canada's First 'Cat-cracker'

The $5,000,000 catalytic cracking plant of the Imperial Oil Company has begun operation at the Edmonton refinery. It is the first unit of its kind in Canada to use the catalyst principle in transforming low-grade fuels into high-octane petrol. It will also produce raw materials for the expanding petrochemical industry in Alberta.

Venezuelan Sulphuric Acid Project

A modern plant to produce sulphuric acid and its derivatives is being installed by the Inca company near Maracay, Venezuela, at an estimated cost of 800,000 bolivares. The factory will be able to produce 15 metric tons of sulphuric acid a day, as well as a number of derivatives and by-products which will be used on a large scale in many industries. The company has also undertaken to help the Venezuelan Government in establishing a steel industry.

IMC Copper Allocation

Allocation of 723,080 metric tons of copper between 40 countries for the first quarter of 1953 was announced by the International Materials Conference, Washington, on 17 December. The quota for the United Kingdom will be 100,000 metric tons, compared with 101,800 tons in the last quarter of this year. A review of the copper situation will be made by the Copper-Zinc-Lead committee of the IMC at the end of January, 1953, to see if the allocation need be continued for the remainder of the quarter.

Lignite as Source of Power

The new Rockdale, Texas, smelter of the Aluminium Company of America has begun operations with capacity output of primary aluminium of 85,000 tons a year. The plant will use lignite to produce its own power. This is said to be the first use of the sub-bituminous fuel as a source of power for the aluminium industry.

U.S.A. Junior Award

Dr. Thomas Baron, Shell Development Company Emeryville, Carifornia, and Dr. Lloyd G. Alexander, Oak Ridge National Laboratory, Oak Ridge, Tennessee, were presented with the 1952 Junior Award in chemical engineering at a dinner of the American Institute of Chemical Engineers held in Cleveland, Ohio, on 9 December. The award is made annually for 'the paper judged most outstanding of those published by Junior members of the Institute during the last three years.' The two young chemical engineers collaborated in a study entitled, 'Momentum, Mass and Heat Transfer in Free Jets.'

Chemicals in Five-Year Plan

General approval to India's first Five-Year Plan, was given by the Indian Council of State, Parliament's Upper Chamber, on 18 December. Under the £1,550,000,000 plan development of the basic capital goods industry will have a higher priority than the consumer goods industry. In terms of outlay 8 per cent will be on heavy chemicals, fertilisers and pharmaceuticals, 26 per cent on the metallurgical industry, 20 per cent on petroleum refining, 16 per cent on engineering, and 15 per cent on the textile, cement, and paper industries.

PERSONAL

MR. GEORGE WILLIAM RILEY, director of George Scott and Ernest Scott and Company Ltd., has been appointed to the board of Henry Balfour & Co., Ltd. This is a very popular appointment, for few people have a wider knowledge of chemical engineering, or have enjoyed longer consecutive service. Mr. Riley joined George Scott & Co., Ltd., in 1899, while the firm was still in Christian Street, Whitechapel. He has witnessed the steady rise of Ernest Scott & Co., Ltd., the firm's great expansion during World War I and, finally, their amalgamation with Balfours, which took them to Leven, in Scotland. He was made a director of the Scott companies in 1936, and in 1946 celebrated his half-centenary with the firm.

Mr G. W. Riley

DR. H. E. NORTH, who has been works manager at the Prudhoe (Northumberland) Works of Imperial Chemical Industries, Ltd., is to be transferred to the firm's Billingham-on-Tees Works. His successor at Prudhoe will be MR. J. RIGG, a former deputy-works manager.

MR. LOUIS CHESNER, chief chemist of Armoride, Ltd., Earby near Colne, is one of three West Riding men to be elected to the Associateship of the Textile Institute.

MR. ROBINSON ORD, of St. Louis, Mo., has been named vice-president of Canadian Chemical & Cellulose Co., Ltd., and vice-president and general manager of Canadian Chemical Co. Ltd., it is announced by Maxwell W. Mackenzie, executive vice-president of the two companies, subsidiaries of Celanese Corp. of America. Mr. Ord, who will take over his new duties on 1 January, and make his headquarters in Montreal, has been general manager of sales for the organic chemicals of Monsanto Chemical Co., since 1945.

RICHARD H. WILHELM, professor of chemical engineering, Princeton University, has been chosen to receive the 1952 Professional Progress Award in Chemical Engineering, sponsored by Celanese Corporation of America, and administered by the American Institute of Chemical Engineers. The award, which carries with it a prize of $1,000 was presented to Professor Wilhelm during the annual meeting of the A.I.Ch.E. last week at Cleveland, Ohio.

Professor Wilhelm, who only last year was honoured by the American Institute of Chemical Engineers when it bestowed upon him the William H. Walker Award, was cited 'For his distinguished contributions to the theories and experimental data of fluid mechanics, mass and heat transfer, and reaction rates, and for his special applications of these theories to fluidised solid systems and to biochemical and textile processing.'

Following practically 30 years of work on the production, marketing and utilisation of fuels, MR. J. BASIL MASON is joining the board of Judd, Budd, Ltd. as technical director. Educated at Queen Elizabeth School, Wakefield, and Sheffield University, Mr. Mason commenced his career with Barnsley Main Colliery Co., Ltd., and the Thorncliffe Coal Distillation Co., Ltd. Subsequently, he was connected for a number of years with the development of the Tilmanstone Colliery, near Dover, and its associated interests. In 1942 he joined the Fuel Efficiency Branch of the Ministry of Fuel & Power, where he became the Chief Engineer in 1945, resigning that position in 1948 to join Powell Duffryn Technical Services, Ltd., as the chief engineer of the Industrial Section.

MR. W. F. WHELAN, B.Com., A.C.A., is also joining the board of Judd, Budd, Ltd. He was educated at the Christian Brothers College, Cork, and the London School of Economics. In 1939 he became secretary to the Cardigan & Fishguard Gas Co., Ltd., which office he held till shortly before the nationalisation of the Gas Industry became effective. Mr. Whelan was appointed secretary to Judd, Budd, Ltd., and associated haulage, shipping and chartering companies in 1947.

Publications & Announcements

EXAMPLES of its wide range of products will be shown by Walker Ward (High Wycombe), Ltd., at the Packaging Exhibition to be held in the National Hall, Olympia, London, from 20-30 January. Equipment to be displayed will include: Mark IV packaging and weighing machine; bag opening device; metal detector for tablets, granules, and so on; level controls; tablet counter; vibratory feed; turntables; and component counters.

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OUTPUT, materials, stocks, average employment, capital expenditure and so on in the chemicals and allied trades are set out in the 'Report on the Census of Production for 1949,' (Volume 2), issued by the Board of Trade (HMSO, 2s. net). The trades are divided into the following groups: A, coke ovens and by products; B, dyes and dyestuffs; C, fertilisers, disinfectants and insecticides; D, coal tar products; E, chemicals (general); F, drugs and pharmaceuticals; G, toilet preparations and perfumery; H, explosives and fireworks; I, paint and varnish; J, soap, candles and glycerine; K, polishes; L, inks; M, matches; N, mineral oil refining; O, oils and greases; P, seed crushing and oil refining; Q, glues, gums, and pastes. The number of persons employed in the various groups by firms employing on an average more than 10 persons, are also set out in table form for the week ended 24 September 1949.

* * *

TEMPERATURE indicators which give a rapid and distinct colour change when a predetermined level of temperature is reached are the subject of two illustrated brochures issued by R. H. Cole & Company, Ltd., London, which has the concession for marketing two new products, Thermocroms and Thermocolours, for the plastics and surface coating industries. Thermocroms are in the form of crayons simply applied to the particular apparatus or machinery under test. They are made to cover 15 registration stages and so far embrace the following temperature range: 65°-200° C. (149°-392° F.) for paper, rubber, textiles and artificial substances, chemical and electrical engineering industries, inspection of steam boilers and motors; 200°-450° C. (392°-824° F.), zinc foundries, aluminium and glass industries; 350°-670° C. (662°-1238° F.) iron and steel industries, welding foundries and enamelling works. Thermocolours are supplied in powder form and are easily soluble in industrial methylated spirits and can then be applied by brush to give an adhesive paint film. There are 13 numbers with one colour-change; five with two colour-changes; five with three colour changes; and two with four colour changes. Temperatures covered range from 40° C. (104° F.) to 820° C. (1508° F.). Among the many possible uses of these products are testing the thermal efficiency of laboratory apparatus, radiators and so on. Other uses are the detection of cracks in structural machinery for weld testing and as a means of warning when there is danger of exceeding a critical operating temperature.

* * *

DESIGNED to meet the most exacting requirements of the micro-analyst, the Hosli combustion apparatus is becoming the accepted standard equipment for carbon and hydrogen, nitrogen, halogen and sulphur determinations by the methods of Pregl. An illustrated article describing the Hosli Combustion furnaces, which are made in Switzerland, forms part of the wide range of all types of scientific equipment covered in 'Towers Laboratory News,' No. 8, now obtainable on request from J. W. Towers & Co., Ltd., Victoria House, Widnes, Lancashire.

* * *

FLAME-PLATING, a new method of applying hard, thin, precise coatings of powdered metals, such as tungsten carbide on metal parts, has been developed by the Linde Air Products Company, a Division of the Union and Carbide Corporation, New York, U.S.A. One of the main features of this new method is that the temperature of the base metal does not exceed 400° F. during the plating operation, thus reducing to a minimum the chances that the part might warp. Steels, cast iron, aluminium, copper, brass, bronze, titanium, and magnesium are all reported to have been successfully coated by flame-plating. Full details of the method may be obtained on application to Linde Air Products Company, 30 East 42nd Street, New York, 17, New York, U.S.A.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

MAGNESIUM ELEKTRON, LTD. (formerly MAGNESIUM (ELEYTRONMETALL) CO., LTD.), Clifton Junction (Lancs.). (M., 3/1/53.) 20 November, £1,350 charge, to Heritable Securities & Mortgage Investment Association, Ltd.; charged on 91 Canterbury Road, Davyhulme. *Nil. 6 August, 1952.

Satisfaction

TURKDEAN DEVELOPMENT, LTD., London, E.C., chemical manufacturers. (M.S., 3/1/53.) Satisfaction, 3 December, of debenture registered 17 March, 1950, to the extent of £3,580 2s.

New Registrations

Collite (G.B.) Ltd.

Private company. (514,282). Capital £100. Manufacturing chemists and importers of sterile organic root products, fertilisers, etc. Subscribers: G. Conrad and P. G. Medcalf. Solicitors: Clifford-Turner & Co., 11 Old Jewry, E.C.2.

Ford, Jackson & Co. (Sales) Ltd.

Private company. (514,456). Capital £1,000. Wholesale and retail dealers in and distributors of chemical products. Directors: S. Z. Jackson and D. Ford, 7 Hope Place, Leeds, 12. Reg. office: 27 East Parade, Leeds.

Changes of Name

The following changes of name have been announced: Q. S. SOAP PRODUCTS, LTD., to SOAPS AND DETERGENTS, LTD., on 11 December, 1952; THAMES SOAP CO., LTD., to JOSEPHINE KELL, LTD., on 2 December, 1952.

Company News

Murex Ltd.

Disregarding fortuitous profits contained in the two previous years, trading results for the six months to 31 October, 1952, of Murex, Ltd., have been maintained at the 1951 level. Interim dividend for the year ending 30 April next on the company's £2,000,000 ordinary capital existing prior to the recent rights issue, is being maintained at 6 per cent. The result of the recent rights issue of 200,000 ordinary shares of £1 at 48s. per share was that holders had applied for 192,096 shares, leaving 7,904 to be taken up by the underwriters.

Market Reports

LONDON.—The industrial chemical markets have been very quiet following the Christmas holiday, and the customary period of stock-taking occupies chief interest. A fair amount of inquiry for contract replacement business has been reported but buyers appear to be in no hurry to enter into forward commitments, although the outlook for the coming year is far more optimistic than it was several months ago. At the time of this report few price changes have been notified, and the latest basis prices for dry white lead and red lead are £154 5s. and £139 per ton respectively. These higher prices came into effect on 31 December. Quiet conditions have been reported from the coal tar products market, and trade is unlikely to expand until the new year.

MANCHESTER.—Most sections of the Manchester chemical market during the past week have been relatively quiet after the holiday break and it is likely to be some days yet before trading conditions get back to something approaching normal. New bookings have been only moderate both on home trade account and for shipment, but there has been a fair movement of supplies of the soda compounds and other heavy products. Little buying pressure has been experienced in the market for the tar products since last report, while in fertilisers conditions in most sections at the moment are on the quiet side though a steady seasonal improvement in activity is looked for.

Next Week's Events

TUESDAY 6 JANUARY

Institute of Metals

Oxford: Black Hall, St. Giles, 7 p.m. Dr. J. W. Christian: 'Recent Advances in Alloy Chemistry.'

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C., 7 p.m. Discussion: 'The National Fuel Policy.'

Reinforced Concrete Association

Manchester: College of Technology, Sackville Street, 6.45 p.m. Dr. A. Godenir: 'The Parabolic Silo at Heysham.'

Institute of Metal Finishing

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. E. C. Marsh: 'Contact Potentials.'

WEDNESDAY 7 JANUARY

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. H. H. Burton: 'The Manufacture of Large Forgings, including Crankshafts, by C.G.F. Process.'

Incorporated Plant Engineers

Southampton: Polygon Hotel, 7.30 p.m. J. Porter (Metallising Equipment Company): 'Metallising in Relation to Plant Maintenance.'

Institute of Welding

Manchester: College of Technology, 7.15 p.m. W. A. Woolcott (The British Oxygen Co., Ltd.): 'Recent Developments in Argon-arc Welding.'

Reinforced Concrete Association

Liverpool: Liverpool Engineering Society, Dale Street, 6.30 p.m. T. Alun Hughes: 'The Design and Construction of Gas Holder Foundations.'

THURSDAY 8 JANUARY

Society of Chemical Industry

Nottingham: Nottingham and District Technical College, 7.15 p.m. D. Ambrose: 'Industrial Oxygen.'

The Chemical Society

Dundee: University College, 5.15 p.m. Lecture by Professor R. M. Barrer.

Oil & Colour Chemists' Association

London: 26 Portland Place, W.1, 7 p.m. A. Pass (Zinc Pigment Development Association): 'Co-operative Research.'

Hull Chemical & Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. Joint meeting with RIC local section. Dr. R. A. Mott: 'Science and Domestic Heating.'

Institute of Metals

Birmingham: Visit to metallurgical laboratories, University, Edgbaston, 10.30 a.m. Birmingham University, Edgbaston, 2.30 p.m. Informal discussion: 'Rolls and their Maintenance in the Non-Ferrous Metals Industry.'

Incorporated Plant Engineers

Newcastle-on-Tyne: Roadway House, Oxford Street, 7.30 p.m. T. C. Robinson (Imperial Chemical Industries, Ltd.): 'Preventive Maintenance.'

FRIDAY 9 JANUARY

Society of Chemical Industry

Glasgow: Royal Technical College, 7.15 p.m. W. A. Caldwell: 'Cellulose Ethers and their Application.'

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 7 p.m Professor E. R. H. Jones (Manchester University): 'New Routes to Cortisone.'

Oil & Colour Chemists' Association

Manchester: Grand Hotel, 2.30 p.m. A. E. Hurst: 'Colour and Lighting in Interior Decoration.'

Society of Glass Technology

St. Helens: Gas Showrooms, Radiant House, 6 p.m. Dr. S. A. Burke (BCURA): 'The Efficiency of Gas Producers.'

Scots Synthetic Rubber Project

ESTABLISHMENT and maintenance of a synthetic rubber industry in Scotland is being investigated by The Scottish Council (Development and Industry). Discussions have been held with the Ministry of Supply, the National Benzole Association and other large industrial concerns.

The Council states that 'it became apparent that no single oil refinery or plant engaged in the production of petroleum chemicals could supply all the raw materials required by the minimum size of general purpose synthetic rubber plant. A combination of interested firms—on the lines of the recently formed corporation to produce sulphuric acid from anhydrite—might be envisaged, however, and discussions are being continued on these lines.'

Potash Exploratory Work Completed

Imperial Chemical Industries Ltd., has announced that the experiments at Upgang (Whitby) for the winning of potash by the brining method have been completed. An exploratory borehole at Upgang had been operated borehole at Upgang brine well to obtain technical information on winning potash by dissolving it as brine out of the deposits which had been proved to exist 4,000 ft. below the ground. The exploratory work having been completed, the surface plant will be dismantled.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

UNIVERSITY OF LONDON. A course of three lectures will be delivered by Professor J. Cathala (Toulouse), at 5.30 p.m., on 12, 14 and 16 January, at University College (Anatomy Theatre), Gower Street, W.C.1.

12 Jan.: Fundamental Concepts in Chemical Engineering.

14 Jan.: Methodological Approach to solutions of Chemical Engineering Problems with reference to Fluidization.

16 Jan.: Estimation of Physical Data for Chemical Engineering Design.

ADMISSION FREE, WITHOUT TICKET

JAMES HENDERSON,
Academic Registrar.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

APPLICATIONS are invited from qualified **CHEMISTS** by **VACUUM OIL COMPANY LIMITED,** now undergoing expansion, for a most responsible position in its **TECHNICAL DEPARTMENT.** Minimum qualifications, Honour Class I or II Chemistry, but some research and/or engineering experience would be a definite advantage. A sound knowledge of modern techniques applying to the analysis of lubricants and allied petroleum products, together with the ability to

(i) develop new techniques
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is essential to this post, which carries major responsibility for the Company's Technical Service. Prospects for promotion are good, and the salary will reflect the qualifications and experience of the successful candidate. Pension and Life Assurance, Sickness Benefits. Applicants should write, giving full details of experience and quoting reference L.S.A. 680, to **INDUSTRIAL RELATIONS DEPARTMENT, VACUUM OIL COMPANY LIMITED, CAXTON HOUSE EAST, WESTMINSTER, S.W.1.**

BRITISH GEON LTD. have a few vacancies in their factory at Barry, South Wales, for **SHIFT CHEMISTS** to supervise plant, manufacturing vinyl polymers. Applicants should be between 25 and 30 years, preferably, and should possess a degree in chemistry. Salary will depend on experience and qualifications. Apply: **STAFF MANAGER, THE DISTILLERS CO., LTD., 21, ST. JAMES'S SQUARE, LONDON, S.W.1.**

CHEMICAL MANUFACTURERS in the Home Counties invite applications from **ASSISTANT CHEMISTS** for positions in Research Laboratories. Duties will include shift operation of experimental units (42-hour week basis), for which special shift payment is made. Preference will be given to candidates possessing Intermediate B.Sc., but applications will be considered from unqualified assistants with experience. The Company operates a Pension Scheme. Write Box No. C.A. 3187. **THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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LAPORTE CHEMICALS LIMITED require assistant chemists for their Central Laboratories at Luton. Positions are available in **RESEARCH, ANALYTICAL, EXPERIMENTAL PLANT AND SALES SERVICE LABORATORIES.** Preference will be given to candidates with Intermediate B.Sc. to B.Sc. (General) or higher according to the nature of the individual posts. All the above positions are permanant and progressive. The Company operates a Pension Scheme. Apply to the **CHIEF CHEMIST, LAPORTE CHEMICALS, LIMITED, LUTON.**

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

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4—Recessed Plate **FILTER PRESSES,** 30 in. square, 70 plates in each, centre fed.

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

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

Johnson Oil **FILTER PRESS,** Premier type: plates 2 ft. 8 in. by 2 ft. 8 in., of which there are 45, with angle lever closing gear.

Johnson Experimental **PRESS,** fitted 11 plates, 19 in. square, with feed pump, reduction gearbox and electric motor.

Steam-heated **FILTER PRESS,** Premier type, 32 in. square, with 30 recessed plates.

Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

48 in. Hydro **EXTRACTOR,** self-balancing, wan-neck type. self-emptying bottom.

2—30 in. Swan-neck **HYDROS.**

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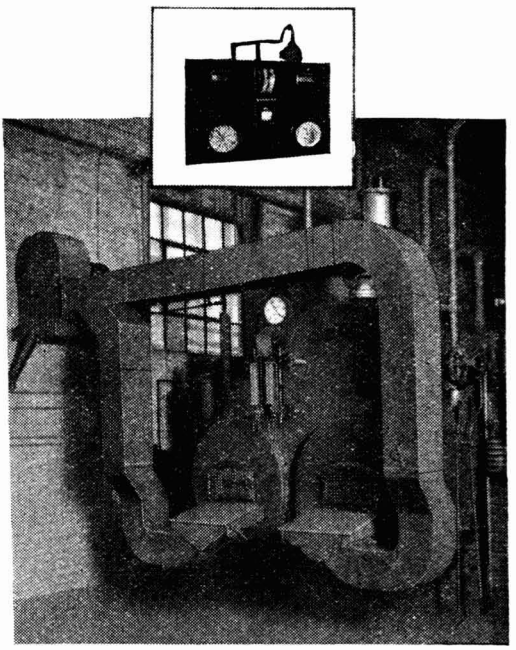

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