THE Chemical Age

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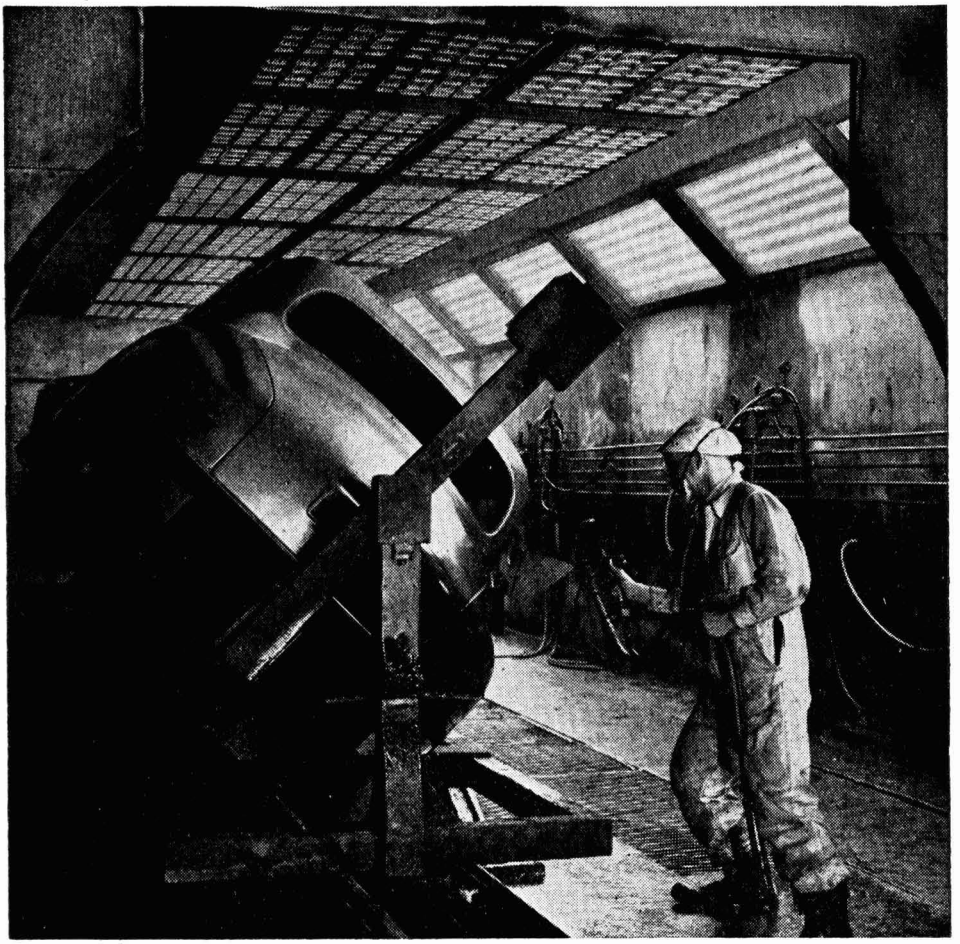

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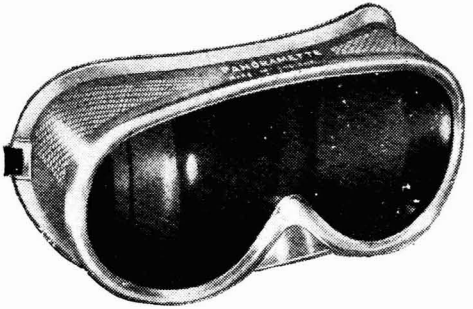

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The Giant Look

IN the appendix to Imperial Chemical Industries' annual report for 1953, this passage will be found: 'The exceptionally high tides and heavy seas at the end of January, 1953, which did so much damage to the East Coast, displaced the pipes of the Billingham to Wilton Link and also caused flooding in the riverside area of Billingham Works, but the damage was not serious and production was not interrupted. When the extensive flooding further south had subsided, nearly 50,000 tons of gypsum (a by-product from the Billingham phosphate plant) were supplied to the Ministry of Agriculture to recondition large areas of agricultural land which had been damaged by salt water.' Of such is the kingdom of industrial size and diversity! In the changes of fortune or of misfortune, the prospects of ICI are virtually self-insured—what is lost on the swings is gained by the roundabouts. Comment with much the same flavour can be made about the review of the company's overseas interests in 1953, also to be found in the annual report. Moderately good progress in Africa, continued success in Canada; but a somewhat difficult year in the USA. Exports to Brazil at a standstill through sterling shortage; substantial increases in exports to Western European countries. Difficult trading in the Near and Far East; but substantial increase in trade with Japan, and a year that began unpromisingly in Australia, New Zealand, and India nevertheless finished with excellent maintenance of 1952 standards.

It is difficult to realise that ICI, as such, is still under 30 years of age. The merging of Brunner Mond, Nobel, United Alkali, and British Dyestuffs took place only in 1926; then, perhaps, the principal aim was 'rationalisation' and size achievement to gain benefits of low-cost flowlines and widely spread overhead charges. The original thesis has been amply justified but this is only a partial explanation of the ICI success story; size has been one factor but versatility has been another. 'Research and development' has never been a starved or semi-starved branch of ICI activities; and time, without unreasonable delay, has brought great harvests of reward. ICI is 27 years old; the ICI agricultural research station, Jealott's Hill, reached its silver jubilee during 1953. ICI's outstanding contributions in the field of fertilisers and agricultural chemicals largely rest upon that early foresight; nor have these contributions, at home or abroad, yet reached their peak. Perspex, Alkathene, Terylene, Ardil, Melinex (due for 1954), polyvinyl chloride, fluorocarbons, silicones (a plant to manufacture a wide range has been designed), synthetic rubbers, etc., etc.—the list could be greatly lengthened—are all products of research and development, and only indirectly the products of rationalisation. 'The company's research and development activities continued on much the same level as in the past two or three years and involved expenditure in 1953 of roughly £7,500,000, which is equivalent to rather more than 3 per cent on turnover. Altogether about 6,600 people, including some 1,700 graduates, are engaged in research and development.'

Admiration, nevertheless, is not the only reaction that industrial giantdom and diversity calls into existence. Apprehension comes too, for where there is mystery there is always the root-system of fear. It is not the company's fault that an atmosphere of mystery tends to hover over its operations; rather, it is the consequence of a size that cannot easily be visualised by the ordinary man and of a product range whose beginning and end can be estimated no more readily. ICI has shown great wisdom recently in broadening the nature of its annual reports. They no longer follow the tradition

of 'balance sheet plus minimal statement of progress and prospects', and by far the larger portion of space is devoted to a broad description of the company's activities. The report for 1953, running to 48 pages, is a remarkably bold and imaginative attempt to dispel mystery and put the cards of reality in its place. Some may cynically attribute this solely to the nationalisation threat that is implied in the Labour Party's latest challenge to Britain, but this does less than justice to a trend that has been steadily increasing in ICI's policy for the last 10 to 12 years. Secrecy, the old and false god of the chemical industry, has long been banished.

One of the outstanding matters in the new report is the introduction of a co-partnership scheme. Broadly, employees of over 21 years of age and of about 2½ years' minimum service will receive 1 per cent of their gross salary for each 1 per cent by which the ordinary dividend (after the one-for-one share bonus distribution) exceeds 5 per cent. The sums given will, of course, be taxable but what is left will be used to purchase shares at the market price; until an employee has 25 shares to his credit, these will be held by trustees but at the 25-share holding stage there will be individual transference with the unqualified right to sell. The scheme does not apply to employees whose engagements are on terms longer than three months—in effect, therefore, higher management is excluded. It is estimated that the scheme will cost about £1,000,000 a year, but it is allowable for tax as an expense of trading so its cost to the company will be about half this sum, or 1½ per cent of the annual trading profit at its present level. This is to some extent a revival of one of the earlier hopes of the first Lord Melchett, who introduced in the 'twenties an instalment-plan scheme by which employees could buy shares, but this did not survive the depression of the 'thirties; the new co-partnership plan is, of course, much bolder and the shares are given. The motive also differs. In the 'twenties the motive was curative, for relations between capital and labour had been soured by the General Strike and its aftermath. The new plan has no 'medicinal' purpose; rather, it is nutritional, a fortification of already satisfactory labour relationships in ICI. Of ICI's present 107,000 employees, about 75,000 will be qualified to enter the co-partnership scheme. Incidentally, existent welfare and pension schemes already cost the company some £4,500,000 per annum or about 6 per cent of the trading after allowing for tax relief. It would insult both the employees and the company to glamorise this new development as a piece of benevolence. It is a managerial operation and one of inestimable long-term value. Who can measure the real value to a great organisation of a staff of many thousands whose general opinion is 'that they're good people to work for'? And, as is known to anybody with close contacts with ICI, that opinion is already widely and firmly held.

The question-mark of monopoly must always intrude itself in any discussion of industrial operations on so huge a scale. Enlarging size is in any case inevitable for many new chemical processes can be economic only with large-scale production for a large share of the immediate market. There is, too, the question of patent rights; without protection for the first few years how many entirely new processes, needing huge initial outlays of capital, would be brought into existence? The charge of total monopoly in any field has been well enough refuted by ICI's own reply to the Labour Party's nationalisation day-dreams (see THE CHEMICAL AGE, 1954, **70**, 507). Unavoidably in some markets ICI is in a position of enjoying near-monopoly conditions. To what extent is any of the company's prosperity attributable to the unfair exploitation of these circumstances?

This is the acid test for judging whether great size in the industrial unit is a national asset or a long-term national danger. Some simple figures in the 1953 Report provide an excellent answer:—

	Price Index for raw materials purchased by ICI	Board of Trade Wholesale Price Index	Price Index for ICI Home Sales
1938	100	100	100
1948	251	216	145
1953	366	323	190

Who with any honesty could say that the consumer has been exploited? Where is the nationalised industry that could produce comparable figures?

Notes & Comments

Expansion Problems

A RECENT article in *The Economist* (1954, **171**, 551) discussed the post-war expansion achieved by the British chemical industry. Continued expansion in the next few years, even greater than the amount known to be planned, is predicted. The uncompleted portion of 1948 plans involves further capital expenditure of from £50,000,000 to £80,000,000. *The Economist* suggests that £100,000,000 to £120,000,000 will prove a more likely requirement. An increasing scarcity of bulk intermediate chemicals is foreseen. Recent expansion has centred upon new and refined products, particularly organic chemicals, and appreciably less attention has been paid to enlarging production lines for older and more elementary chemicals. Indeed, the prices of these may be artificially low today for much of their output is based upon plants whose cost has been heavily written off; this in itself tends to deter new investment. Also, when large companies introduce new plant and new products, they tend to use more of the bulk intermediates they themselves produce and in consequence have less to offer to other manufacturers. Continued expansion will thus slow down unless a greater proportion of the new plant is devoted to bulk chemical production, an investment field which offers a somewhat lower rate of return than most of the new organic chemicals.

Interesting Campaign

THE expansions since 1948 of (a) heavy organics, and (b) sulphuric acid capacity are interestingly compared. Only 30 per cent of the expansion plans for sulphuric acid had been completed by 1952; and the original estimate for 100 per cent completion had then been £11,000,000. But 60 per cent of the heavy organics expansion had been completed by 1952 and here the estimate for 100 per cent had been about four times as large—£43,000,000; moreover, £30,000,000 worth of plant was still in 1952 being constructed, indicating some enlargement of the 1948 programmes. There is certainly evidence of disparity in this, and *The Economist* may not be far wrong in suggesting that in the immediate years ahead vigorous expansion in new types of production will have to be accompanied by less attractive expansion in older types of production. So far the industry's problem in obtaining fresh capital has been simple; dividend obligations have been amply covered in advance. Slightly less 'cover' and a slightly increased element of speculation may enter the future picture. No shortage of capital for investment in the industry's further expansion is predicted, but the terms might stiffen.

Clearing the Air

TWO independent methods for measuring chlorophyll's odour-absorbing capacity have recently been developed and, applied to a sample of potassium copper chlorophyllin, have produced results in fairly good agreement. This was reported to the American Chemical Society, at its recent Kansas City meeting (*Ind. Eng. Chem.*, 1954, **46**, [5], 11A). One method is based upon titrating the chlorophyllin in solution with various substances; the other upon measuring the adsorption of gases by the solid chlorophyllin in dry, powdered condition. An interesting consequence of the closeness of results from the two methods is the suggestion that the solution is in fact an aqueous dispersion, offering about the same surface area as that of the powdered solid; dialysis tests have confirmed this. It is now believed that chlorophyll's deodorising property is based upon both physical and chemical surface adsorption effects. The former type of adsorption is reversible. The latter is not, but will not occur at all at lower temperatures. It is clear therefore that experimental results from different tests are likely to be discordant unless conditions are strictly comparable. It remains to be seen whether these new methods of measuring odour adsorption by chlorophyll can be used to predict a

chlorophyll derivative's effectiveness in 'dealing with bad smells'. Much depends, apparently, upon knowing the concentration of an odorous substance required for perception. If the amount present in the air exceeds the minimum for perception by more than enough substance to form a monolayer on the chlorophyllin surface available, deordorisation will be incomplete. Nevertheless, these investigations have certainly done something to clear the air.

Boron from Glassware

ABSOLUTE purity is one of life's unattainables, but in the study of plant nutrition by the solution culture method the quest for purity must be idealistic rather than realistic. Trace element effects cannot be isolated and measured if trace contaminations intrude into the delicately formulated solutions. If laboratory glassware made of boronated, heat-resistant glass is used as the solution container, the test plant's minute requirements of boron may be derived from the glass; indeed, quite significant amounts of boron can pass from the glass to the growing plant. Some newly reported research from Wye College (*Nature*, 1954, **173**, 957) indicates that the flow of boron from heat-resistant glass into solutions is measurable even when the contact is of relatively short duration. Glassware of this type does not have to be present throughout an experiment to produce a significant amount of contamination. Two brands of heat-resistant glass were tested. Distilled water boiled in flasks of these glasses for one hour contained 0.074 and 0.070 ppm. boron. Further experiments showed that the addition of distilled water with this history to boron-free nutrient solutions readily produced 'boron effects' in the growth of flax seedlings: rather less than 5 per cent additions (by volume) of heat-resistant glass distilled water led to measurable improvements in plant-growth. It is possible that a good many past studies of boron's trace effects in plant nutrition have been partially disturbed by this source of boron intrusion. Trace impurity of this micro-order is unlikely to impair the accuracy of other kinds of chemical analysis; indeed, to avoid the presence of boron the chemists who study plant nutrition must use soda glass vessels and deal instead with culture solutions that become contaminated with sodium. In other fields of research these are purely academic problems. But we are at least reminded that pure water is still a conception of relativity rather than reality.

Injections in 'Pyrex'

A BIG order was recently placed with James A. Jobling & Co. Ltd., of Sunderland, for some hundreds of yards of Pyrex tubing for ampoules. It is only recently that Joblings have been able to 'draw' Pyrex tubing with a thin enough wall to make this possible. Ampoules have hitherto been constructed of neutral glass, but with Pyrex there is less chance of them cracking under the stresses of sterilisation, with consequent danger to the patient from contamination of the drugs inside.

Drugs Free from Import Control

THE Board of Trade have announced that drugs, raw or simply prepared, from any country or territory, will be admissible under Open General Licence from 3 June, and no individual licence will, therefore, be required. Schedule III, Group 5, of the Open General Licence covers, subject to certain specified exceptions, synthetic organic chemicals which are liable to Key Industry Duty under the Safeguarding of Industries Act, 1921. On 3 June, 17-hydroxycorticosterone and 17-hydroxycorticosterone acetate will become liable to Key Industry Duty and would, therefore, be admissible under the Open General Licence in its present form. It is not intended, however, to make any change in the present licensing arrangements for these items.

Cosmetic Chemists' Golf

In the golf tournament organised by the Society of Cosmetic Chemists on 19 May, the winner of the medal round was M. F. Landon, runner-up R. Evans. Winners in the afternoon foursome against bogey were K. Bohemen and N. C. Chandler, runners-up being F. R. Mansfield and E. Fairbanks-Smith.

Royal Opening for Coryton

Example of Anglo-American Comradeship in Industry

ON a day of sunshine which hardly could have been surpassed, Queen Elizabeth the Queen Mother last week sailed down the Thames in the PLA steam yacht *St. Katharine*. The occasion was the official opening of the Vacuum Oil Company's refinery on 27 May, and Her Majesty was accompanied by a number of distinguished guests, including the US Ambassador and Mrs. Aldrich; the Minister of Transport, the Rt. Hon. Alan Lennox-Boyd, and Lady Patricia; Viscount Bruce of Melbourne (chairman of the Finance Corporation) and Viscountess Bruce; Mr. J. C. Gridley (chairman of Vacuum Oil Co.) and Mrs. Gridley; Mr. B. Brewster Jennings (president of Socony-Vacuum Oil Co.) and Mrs. Jennings; Sir Herbert Merrett (chairman of Powell Duffryn Ltd.) and Lady Merrett; Mr. A. L. Nickerson (vice-president of Socony-Vacuum Oil Co.) and Mrs. Nickerson; and Viscount Waverley (chairman of PLA) and Viscountess Waverley.

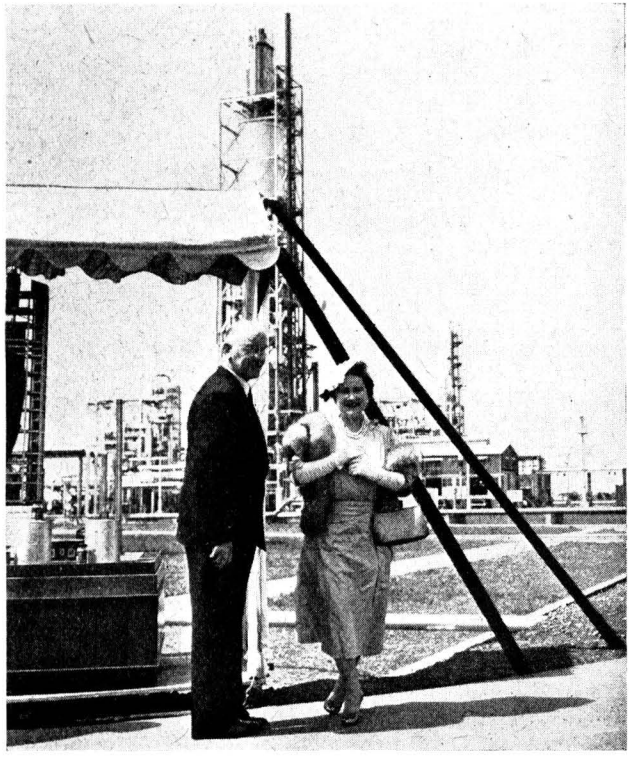
A Guard of Honour was mounted at the refinery by the 57 HAA Regiment, Royal Artillery, who had given assistance at the time of the floods in February. 1953.

Welcoming Her Majesty, Mr. Gridley said that her visit had conferred distinction, not only on those concerned with the building and operation of the refinery, but also upon the whole of the industry. He continued:

'This industry of ours, including our own company, is not restricted by national boundaries, and our own very strong American associations are emphasised by the presence of the US Ambassador and Mrs. Aldrich, as well as by that of the president of Socony-Vacuum, Mr. Brewster Jennings, and Mrs. Jennings. On behalf of my colleagues, I thank them and also the other directors of Socony-Vacuum in America and those of its affiliated companies in Europe, for their presence at this opening ceremony. Finally, I also thank Sir Herbert Merrett, the chairman, and his colleagues the directors, of Powell Duffryn, for their support on this as on so many other occasions.

'Our company is an Anglo-American enterprise which commenced to operate in this country nearly 70 years ago. The refinery which is laid out around us is the product of a pooling of Anglo-American resources in men, ideas, money and material. According to modern refinery standards it is not a large refinery, but it does incorporate certain units and processes which are entirely new to this country, and which add materially to its resources and to our national productivity.

'This dynamic and progressive petroleum



The Queen Mother with Mr. B. R. Fraser, manager of the refinery

industry, spurred by the incentives of enterprise and competition, sees to it that no refinery is ever complete, in the finite sense of the word. This particular one has come into production by stages since the early part of last year, and the first phase of construction is now complete: but we hope for extensions and enlargements of our operations at Coryton, and it is with that in view that particular care has been given to the layout of the plant and equipment and to the best utilisation of the large site area.'

Her Majesty, before unveiling a commemorative tablet, said that it was hard to imagine that it had been possible in so short a time to turn what had been marsh land into the throbbing heart of a great industry. This was a great achievement, but it marked only the beginning of a new chapter in the history of that industry. Referring to the presence of representatives of the United States, she said that we welcomed them as warmly as comrades in industry as we did when they were brothers in the field of battle.

Mr. B. Brewster Jennings, saying that it is not often that a refinery is built brand new from the bare ground right through to the maze of complex units, revealed that in more than thirty years this was only the second time that he had attended a refinery opening. As a particular indication of the rapid way in which the industry was growing, it was less than three weeks since he had attended his first opening, in Durban.

The refinery, built at a cost of £15,000,000, has risen from the Essex marshes after three and a half years' work. It will process about 1,000,000 tons of crude oil a year. Deep water berthing ensures that the largest of tankers can unload at any time of the day or night.

Special items of plant and new installations at Coryton Refinery were described in THE CHEMICAL AGE *for 22 May, p. 1139.*

OCCA Elections

THE annual general meeting of the Oil & Colour Chemists' Association was held at Manson House, W.1, on 26 May, with Mr. H. Gosling, the president, in the chair. Under the new rules of the Association, a president designate must be appointed, and Mr. C. W. A. Mundy was elected. Mr. G. Copping, Mr. T. A. Fillingham, and Mr. H. C. Worsdall remain vice-presidents, their term of office not yet being completed, and Mr. J. Hesketh, Mr. R. S. Law and Mr. G. A. Campbell were elected at the meeting.

Mr. Law continues as hon. secretary until the appointment of a successor; hon. treasurer is Mr. N. A. Bennett, and hon. research and development officer is Mr. P. J. Gay.

Elected to council for 1954-5 were Dr. J. O. Cutter, Mr. A. T. Rudram and Mr. G. W. Whitfield. Named as chairmen of sections to serve on council for the session 1954-5 were: Mr. H. G. Walker (Bristol); Mr. G. E. Gray (Hull); Mr. R. F. G. Holness (London); Mr. T. E. Johnson (Manchester); Dr. A. I. Escolme (Newcastle); Mr. S. A. Ray (Midlands); Mr. K. R. Boland (New South Wales); Mr. S. E. Long (New Zealand); Mr. R. E. Sim (Scotland); Mr. R. Jones (South Africa); Mr. L. M. Grosser (South Australia); Mr. J. H. Hesketh (Victoria); and Mr. D. R. Gray (West Riding).

The president presented to Dr. R. F. Bowles the scroll of honorary membership of the Association in recognition of his outstanding services as hon. editor from 1947 to 1954 and his interest in the Association for many years.

Rubber Conference

THE Third Rubber Technology Conference will be held at the Church House, London, S.W.1, from 22-25 June when rubber technologists from 12 different countries will discuss latest advances in the application of research. The conference is being organised by the Institution of the Rubber Industry.

Fifty papers will be discussed in the field of developments in natural rubber, the production and use of synthetic rubber, the chemistry and physics of rubber, investigations into compounding of rubber, development in methods of testing rubber, the influence of high energy radiations on rubber, etc. An exhibition of new testing equipment will be held throughout the conference.

Among the social arrangements will be a Government reception at Lancaster House, a reception by Cyanamid Products Ltd. at the Savoy Hotel, a reception by Dunlop Rubber Co. Ltd. at Claridges Hotel, and a cocktail party and banquet by the Institution of the Rubber Industry at the Trocadero Restaurant.

Indian Newsletter

FROM OUR OWN CORRESPONDENT

'DURING the year 1953 the chemical industries as a class made fairly good progress,' records the 1953-54 annual report of the Ministry of Commerce and Industry of the Government of India. In an overall picture of the position of chemical industries in India during the year, the report says, 'There was a striking increase in the production of ammonium sulphate, soda ash, liquid chlorine, bleaching powder, benzene hexachloride and dyestuffs. The production of sulphuric acid, bichromates, caustic soda, copper sulphate, photographic chemicals and sandalwood oil also showed some increase. The production of superphosphate, however, declined owing to a fall in consumption. The production of calcium lactate and sulphathiazole showed an increase, as also phenol formaldehyde moulding powder. Among new items produced for the first time in the country during the war were isonicotinic acid hydrazide, aureomycin, sodium salicylate, saccharine and triple superphosphate.' The Ministry has already approved plans for increasing the production capacity of soda ash by 36,000 tons and caustic soda by 7,000 tons in the course of the next year or so. The production of sulphuric acid and ammonium sulphate is also expected to increase materially. A number of solvent extraction plants for extracting oil are expected to start operation shortly.

* * *

A new chemical concern, the Indian Dyestuff Industries Ltd., Bombay, with an authorised and issued capital of Rs.3,000,000 (£225,000) has been formed with support from leading textile magnates. The consent of the Government of India has been obtained for starting this new venture. The company proposes to locate the factory near Bombay and will undertake manufacture of vat dyestuffs, such as vat jade green, dark blue, blue and black. It will be necessary to import from abroad in the initial stages some organic chemicals required for the manufacture of dyestuffs but the company will aim at meeting all the requirements from the country itself in course of time. The company is expected to go into production in about a year's time and will reach full capacity in about three years' time. The present consumption of vat dyes in India is of the order of 170,000 lb. and the company hopes progressively to meet the country's needs in this regard and will also extend manufacture to other vat dyes. In this connection mention should be made of another reported move by the Tatas to manufacture dyes at Jamshedpur, in collaboration with Bayers of Germany. It has been stated that Jamshedpur will ideally be suited for making dyes from coal, because of the large quantities of coal gas available from the coke ovens of Tata Iron and Steel Co., and that Tatas propose to manufacture all intermediaries also. It may also be remarked here that there is at present one dye factory at Bulsar (Bombay) which depends on imported materials.

* * *

As a result of negotiations conducted by the Bombay Dyeing and Manufacturing Co. with Laporte Chemicals Ltd., an agreement has been entered into for starting a new company known as National Peroxide Ltd., for manufacture of hydrogen peroxide for textile bleaching purposes. The Government of India have given permission for this concern which will have a subscribed capital of Rs.3,600,000 (£270,000). The factory will be located in Bombay and will initially produce about 720 tons per annum.

* * *

The Hindustan Antibiotic Ltd. has been registered under the Indian Companies Act and will take over the control and management of the State-owned penicillin factory at Pimpri, near Poona. It has an authorised capital of Rs.40,000,000 (£3,000,000) and the factory, which is almost ready, will go into production in the latter half of the year. The factory is planned to produce 3,600,000 mega units of penicillin per year, gradually stepping production to 9,000,000 mega units per annum.

* * *

The Central Salt Research Station, the twelfth national laboratory, was declared open by the Prime Minister of India recently at Bhavnagar (Saurashtra). India

has now become an exporter of salt after having been an importer for a long time. The station has already done work on the manufacture of high purity salt and a standard has been laid down that only 94 per cent purity salt will be the commodity on the market. Steps will be taken to upgrade the standard, and research will be aimed at manufacture of chemicals from salt and recovery of by-products. It may be mentioned that Saurashtra is a big producer of salt and two soda ash plants are located in that region. It is reported that the industrial group of Birlas are contemplating the starting of a chemical factory in that area with salt as the raw material. Meanwhile all is not well with the supply, distribution and marketing of soda ash in the country, the prices having shot up suddenly by over 50 per cent. The Government of India have therefore recently increased the value of imports by 25 per cent to meet the increasing demand for the chemical. Incidentally the Government have freed imports of calcium carbide.

* * *

The committee headed by Sir Alfred Egerton, after reviewing the research and other work of the Council of Scientific and Industrial Research, India (already reported), has unanimously expressed appreciation of the work done during the last five years in the eleven national laboratories of India. In the chemical field the committee has complimented the work at the National Chemical Laboratory, Poona, relating to both pure and applied work. It has made some general and particular recommendations on this and other laboratories. These include choosing eminent directors, if necessary, from abroad, giving them greater freedom of administration, providing fresh blood in research from time to time, releasing staff for foreign visits, co-operating with universities and the setting up of research centres for subjects not yet covered.

Montecatini's London Office

As from Saturday, 29 May, the London office of Montecatini Societa Generale per l'Industria Mineraria e Chimica, of Milan, is located at 10 Upper Grosvenor Street, London, W.1. The telephone number is Grosvenor 5189. The firm's United Kingdom representative is now Dr. Antonio Giachin.

Glue from Tree Waste

THE possibilities of utilising tannin waste from a number of local trees have been opened up in Australia by the manufacture of cold glue for the furnishing trades by officers of the Australian Commonwealth Scientific and Industrial Research Organisation.

Furniture makers use large quantities of glue for bonding plywood and veneers. Use was made formerly of animal glue, made from slaughter-house waste, and applied hot. This was followed by cold casein glue (made from waste skim milk) and synthetic resins were other types. But success with some of the enormous quantities of tannin-containing bark has opened the way for preparation of a cheap and useful type of cold glue.

It has been found that tannins from black wattle and black and white cypress pines make the best cold product. Preliminary work showed that these glues set too quickly, and hardened before machine rollers could set them. Recently research workers have found a way to slow the setting of the glues without spoiling their bonding strength. Consequently, the glues are expected to be of importance to the furnishing manufacturers, and to other industries which use plywood and veneer.

London Section of BAC

MORE than 30 members of the London Section of the British Association of Chemists spent an interesting and enjoyable time on Sunday, 23 May, when they were shown over the Oxford colleges by members of the Alembic Club, with the kind co-operation of Dr. G. T. Young, Fellow and Tutor of Jesus College, and Dr. J. Barltrop, president of the Alembic Club.

Dr. Young and Dr. Barltrop were guests of the Section at lunch, together with the student guides, at a local restaurant. Following tea in the hall of Jesus College, the bursar, Mr. Baker, outlined the history of the college. He also showed the visitors the college plate and arranged for an inspection of the historic library, which is not often accessible to visitors.

The visit was organised by Mr. H. Warson, hon. editor of *The British Chemist*, who is in charge of the research laboratories at Vinyl Products, Ltd.

South African Newsletter

FROM OUR OWN CORRESPONDENT

SOUTH Africa may be on the verge of finding rich new deposits of uranium and thorium over a wide area in the North-West Cape and South West Africa. The secretary of the Atomic Energy Board, Mr. C. C. P. Wagener, said recently that the Board's geological unit would make a survey of the area, from where reports had been received of deposits of radioactive materials, later this year. Indications at present were that similar deposits to those found in massive rock formations near Van Rhynsdorp might be found in the area surveyed. The production of monazite had begun at a mine in the Van Rhynsdorp area. The mine was being operated by Anglo-American Corporation interests. Prospecting was also being carried on in four other farms in the area. Mr. Wagener said that 23 mines on the Rand were at present producing or would soon produce uranium. The Minister of Mines had stated recently that the value of the production of these mines would eventually reach about £30,000,000 a year. The Minister of Mines had so far granted permission to about 40 mining companies and individuals to search for radioactive materials in South Africa. As a result a great deal of valuable information about possible sources of uranium and thorium had been collected and it was some of these sources that the geological unit, headed by Dr. S. H. Haughton, would investigate.

* * *

Western Reefs Exploration and Development Co. Ltd. has borrowed £500,000 from the National Finance Corporation, against the issue of unsecured registered debentures, to finance capital expenditure. The uranium plant will be regarded as being in full production from 1 January this year for purposes of sale and loan arrangements. The ten-year contract operates from that date, the loans being repayable, with interest, in equal instalments over that period. The estimated final cost of the uranium and acid plants is £5,290,000, excluding interest, of which £5,091,428 had been spent by the end of 1953. Accrued interest was then £229,208. The uranium capital programme now being practically completed, the annual redemption allowance for tax purposes will be reduced substantially and higher lease-tax provisions must be expected. Consequently a further £350,000 was appropriated to uranium reserve account in 1953.

* * *

Thanks to the start of uranium production last year, the total value of the Union's mineral production reached a new record level in 1953, according to an economic review published by the South African Reserve Bank. In 1952, when no uranium was produced, the value of the country's mineral production reached a record level of £210,700,000. In 1953 the total value of mineral production, excluding uranium, dropped slightly to £210,400,000. Though figures for uranium production are secret, this slight drop was more than covered by the value of uranium production, according to the Bank's statistician. With the number of producing mines in the Orange Free State increased from two to five, gold production in that area rose from 224,000 fine oz. in 1952 to 431,000 fine oz. in 1953. Largely because of the continued labour scarcity, however, production dropped from 11,595,00 fine oz. to 11,510,000 fine oz. The Union's total gold output thus increased from 11,819,000 fine oz. in 1952 to 11,914,000 fine oz. in 1953, but the value increased only by about £500,000 because of a drop of nearly 22d. an oz. in the average price. Copper sales, because of a lower average price realised, dropped from £11,600,000 to £9,300,000, although the quantity sold dropped only 100 tons to 37,600 tons. The combined sales of all other base minerals dropped from £17,800,000 to £16,500,000. The sales of precious metals other than gold increased from £4,800,000 ot £6,700,000. Output of base metals increased by about 10 per cent from 1952 to 1953, but that of other base minerals dropped by about 6 per cent, largely as a result of a sharp drop in the output of asbestos. Taking into account the increased output of gold and diamonds, however, the total volume of all mineral production increased by about 3 per cent.

* * *

The Chamber of Mines states that the March, 1954, value of Transvaal and Orange Free State gold production at £13,306,182 is

a record for the industry. The previous record was £12,737,809 in October, 1952. Gold output in March was the highest monthly figure for nearly eight years. Total output was 93,491 oz. more than that of February and value was up by £1,158,262.

* * *

According to White's South African Portland Cement Co. Ltd., the Associated Portland Cement Manufacturers state that investigation of the raw materials for cement making close to Salisbury, Southern Rhodesia, has proved that these exist in suitable quality and quantity and it is proposed to form a company to build a works there to produce 120,000 tons of cement a year. The project will be sponsored by the Associated Portland Cement Manufacturers group.

* * *

The aggregate proceeds from sales of chrome ore in South Africa during 1953 improved mainly as a result of an increase in prices. The 596,067 short tons sold during 1953 were worth £2,661,067, as compared with a sale of 458,755 short tons, worth £1,716,408 in 1952. Sales of manganese ore in 1953 totalled 816,189 short tons worth £4,370,706, an improvement over the 1952 totals of 709,248 short tons worth £3,796,779.

* * *

The expanding demand for steel and steel products by industry in the Union was reflected in the steady increase in sales of iron ore, reaching 2,136,576 short tons in 1953, worth £1,156,269. In 1952 total sales were 1,933,186 short tons worth £1,040,152.

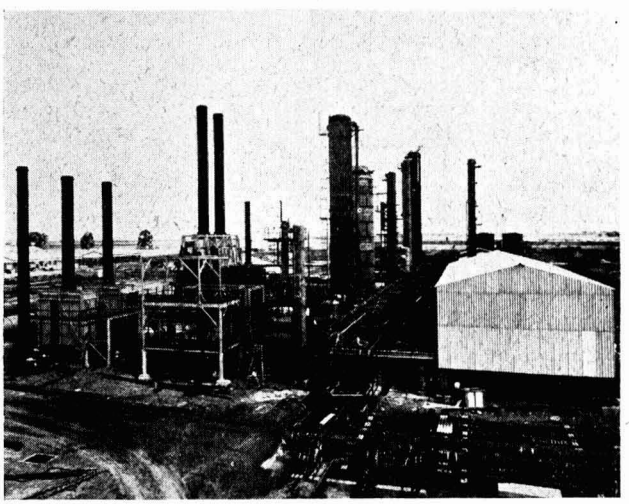
New Glass Industry Centre

FOUNDED in 1926 as the national organisation for British glass manufacturers, the Glass Manufacturers' Federation now has headquarters which are more commensurate with the importance of the industry than the former centre in Manchester Street, London, W.1.

The new centre is not far away at 19 Portland Place, a late 18th century house which has been admirably adapted to suit its new purpose. The house is constructed in the style of the day with a large L-shaped room on the first floor. This has been converted into meeting rooms, in two of which are magnificent Adam ceilings.

The extensive basement has been devoted to an exhibition (believed to be the only one of its kind in Europe) showing the history, raw materials, processes and products of British glass-making. On the ground floor are the members' room and the library, to be used by students and others seeking information about the industry, while in another room on this floor exhibitions will be held from time to time.

The current exhibition, opened on 24 May by the President of the Board of Trade, Mr. Peter Thorneycroft, endeavours to show how the British glass industry contributes to the country's exports by supplying, directly and indirectly, many millions of pounds' worth of its output. A carboy, the largest type of glass container made in Great Britain and used particularly in the chemical industry, dominates one display.



The huge gasoline-from-coal synthesis plant now being built for the South African Coal, Oil and Gas Corporation is roughly 60 per cent complete, according to The M.W. Kellogg Company of New York, which has designed and engineered many of the individual process units involved. The photo shows the hydrocarbon and chemicals recovery section where ethyl, propyl and butyl alcohols, acetone and methyl ethyl ketone will be separated from the water soluble stream

Record Attendance at Safety Conference

by ALEC WEBSTER, M.Sc., M.I.Chem.E., A.R.I.C.

ABOUT 620 delegates attended the National Industrial Safety Conference of the Royal Society for the Prevention of Accidents at Scarborough, 14-16 May. This was a record since the conference was first held independently of the National Safety Conference. It was the original intention that Sir George Barnett, HM Chief Inspector of Factories, should be the chairman for the working sessions, but he was unavoidably absent, and his place was taken at very short notice by Mr. A. G. Palmer, of the North Thames Gas Board, newly-elected president of the Institution of Industrial Safety Officers.

Sir George Bartlett, the chairman of the Royal Society for the Prevention of Accidents, was unable to be present, but he sent the delegates a message of good wishes. In this Sir George stated that Parliament's decision not to proceed with the Safety in Employment (Inspection and Safety Organisation) Bill but to continue to leave the matter to the good offices of the Factory Department and the voluntary organisations, was one with which he was in complete agreement.

It is usual to invite an industrialist of considerable standing and of an established reputation in accident prevention to address the conference, and Sir George Earle, chairman of Associated Portland Cement Manufacturers Ltd. spoke on 'The Executive and Accident Prevention.' He maintained that it was the duty of the executive to foster accident prevention in every way as, without this fostering, success would be difficult.

Tidy & Attractive Works

He commented on the value his company placed on tidy and attractive-looking works. Both he, individually, and his company, were very much in favour of competitions, and he quoted some examples of positive and negative character. Of negative character was one he had seen on a production line in a factory, where a token was hung on a man's machine if he had a job rejected, and it was kept there until it was 'won' by another man. He said that his company were willing to present a trophy in an annual competition on accident reduction. He also expressed the view that, where a claim for damages was justified, the settlement should be more than generous, but in the case of an unjustified and frivolous claim, all possible steps should be taken to fight it.

The first working session began with a paper by Mr. S. J. Emerson, HM Deputy Senior Electrical Inspector of Factories, whose paper on the safe use of electricity covered the field very fully and, when published, it will undoubtedly form a sound basis for the guidance of any safety officer. Statistics were given to show that the most common source of electrical accidents was portable equipment. All electrical equipment should be soundly constructed, properly fitted and adequately maintained, and this, which was in effect Regulation I of the appropriate Statutory Instrument, covered the whole field.

Installation and Maintenance

So far as electrical equipment was concerned, one need need go no further than the appropriate British Standard Specification, which gave all the guidance necessary. In the question of adequate installation, the main thing was for the safety officer to ensure that the work was done by competent persons. Once installation had been carried out, maintenance must not be forgotten, and it was very necessary that this maintenance should be systematic. Should evidence be available that systematic maintenance was carried out properly, it would prove a probable defence against almost any legal difficulty which might arise.

Whether the equipment in use was fixed or portable, the wiring should be at least rubber sheathed cable and preferably with some further protection. It was important at all times to ensure that the earth wire was adequate and the earth circuit complete. This was of particular importance in the case of old installations, where the insulation might have worn or even disappeared, with the consequent possibility of arcing. This would inevitably cause over-heating and it had been traced, in some cases, as the cause of a fire. The author pointed out that devices such as the well-known 'megger' were not always satisfactory, and it was far better to have a recording instrument for earth leakage.

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The effect of an electric shock can be muscular contraction which, in the case of AC, prevents the conductor being released, or a ventricular fibrillation which, in effect, means that the pumping action of the heart stops and death is almost certain. In the former case, unless the contact has been long, artificial respiration, if started quickly, stands a reasonable chance of restoring the injured person. Ventricular fibrillation is only likely to occur if the current has passed directly through the heart.

Low Voltage for Portables

In the case of portable equipment, the best answer is to reduce the voltage, and a number of low voltage systems are available. In dealing with such systems, fusing is important as, if standard fuses are put in, the current may not be strong enough to melt them, but may cause the actual conductors to become over-heated with a consequent risk of fire.

The lecturer went on to deal with fire and explosion, and discussed the general properties of flame-proof and intrinsically safe apparatus. The safest method of protection is by pressurising the conduit and, in specially hazardous conditions, this should be done not by air, but by an inert gas. In the case of large apparatus, it is preferable to do this ventilation or pressurising by drawing the gas from a source outside the building and leading it away to outside the building. The risk can, of course, be minimised by having the prime mover outside the building and running the shaft through a standard flame-proof gland, but it is important that any such gland is properly earthed so that there is no likelihood of sparks through the formation of static electricity.

The lecture was supported by some excellent practical demonstrations, and was completed by a discussion on the satisfactory treatment of such matters as crane trolley wires.

Following this paper, Mr. L. Bingham, solicitor, spoke on the legal duty of the employer to prevent injury to his workmen. Mr. Bingham discussed the various statutory requirements of the Factories Acts, and spoke particularly on the absolute requirement to fence a machine. In reply to a question, Mr. Bingham pointed out again that this requirement was absolute and, if the complete fencing meant that the machine could not be used, the statutory and absolute requirement to fence was still there, and he suggested that this point could possibly be overcome by the issue of a code of regulations having statutory force, which might soften the position.

The question of Common Law responsibility as between master and servant was discussed, and Mr. Bingham dealt with this very fully, giving a very clear exposition of the true meaning of the term 'master' in this respect. He also spoke of the duties of the employed person.

The Saturday afternoon session started with a paper on docks, wharves and railway sidings by Mr. H. W. J. Bown. This was a review of the nature of the risks attendant on the various types of work carried out in such places which, Mr. Bown said, could be materially reduced if tidiness were regarded as essential and all equipment were properly maintained, and if the operatives received proper instructions on the safe way to carry out the work required of them.

Dangerous Chemicals

This session concluded with a paper by Mr. H. Pirie on dangerous chemicals in common use in industry. The author stressed the point throughout that the hazards of any particular chemical should be made known very clearly to the people who were using it, and then suggested methods for dealing with the following groups of chemicals—compressed permanent gases, liquified gases, solvents, acids and other corrosive liquids, and solids.

In the case of liquified and permanent gases, the correct type of container, correctly marked and maintained as required, should always be used. It was important that the cylinders be properly made and adequate guidance was available in governing publications. The number of liquified gases was increasing rapidly, particularly if one included modern refrigerants and fire-extinguishing liquids. In handling these liquids, the important thing was to remember not to fill the container completely, but to leave such a space as would ensure that under no circumstances would the liquid occupy the whole of the space, so that there would

be no chance of the container being ruptured through the expansion of the liquid.

Solvents, in general, had a slight toxic risk, although, generally speaking, the first effect was one of narcosis, which should act as a warning. In dealing with solvents, the important consideration was to have adequate ventilation, and also, in any storeroom or building where they were handled or used, there should be two means of escape in case one became blocked through fire. The author stressed particularly the need for scrupulous cleanliness in handling chemicals, and also that all containers of whatever size should be adequately marked, and that there should be sufficient working instructions to cover their use.

So far as solids were concerned, the main difficulty was with dusts, although there were quite a number of highly corrosive solids, such as caustic alkali. When using corrosive solids, it was desirable to have plenty of water available. The author mentioned sodium as a very strong exception to this general rule.

Flame Failure Devices

The last paper on Sunday morning was by Mr. R. C. Haslock, on flame failure devices for industrial gas equipment. This paper reviewed the present position regarding these devices and indicated that the gas industry had laid down the following requirements for any flame failure device:—it must have a definite schedule for the lighting-up of the apparatus; it must not be possible to turn on the main supply of gas until the pilot burner is fully established; in the event of flame failure, the gas supply must be turned off quickly; the device must be incapable of re-setting itself and only be re-set manually; it must be capable of compensating for reasonable pressure variations, and it must be sufficiently robust to stand normal handling.

This paper was very well illustrated by lantern slides, and the advantages and disadvantages of the various types were discussed at some length. Bi-metallic devices have the advantage of cheapness, as do liquid expansion types, but these both suffer from the disadvantage of being somewhat slow in action. Thermo-couple devices are speedy, but require some form of thermionic valve to amplify the current sufficiently to operate the valves. This same remark applies to those devices which are governed by the luminosity of the flame. These latter cannot be used with aerated burners, as the flame is non-luminous, and they must be compensated for variations in gas composition which may cause differences in the colour of the flame.

All this apparatus needs regular and careful maintenance. For example, bi-metallic elements should be replaced every six months, and thermo-couples every 12 months; thermionic valves and other equipment should be tested weekly, and this testing may usually be carried out without shutting off the furnace. The author went on to discuss other ancillary features such as non-return valves and their use, and quoted a number of typical examples.

A feature of the conference was the trade exhibition which, this year, was showing some very attractive styles in safety footwear, and it appears that there is a definite attempt to popularise this type of protection. There seems to be a growing tendency to produce hand-cleaners and liberal samples were being made available. There was a very interesting fibre glass protective helmet on show, which one distinguished member was allowed to jump on. It seems now that the current trend of development is away from such things as machine guards, which are becoming standardised, to the more ancillary types of equipment such as those mentioned.

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Gas Industry Centre

THE Gas Council, by agreement with the North Thames Gas Board, is assuming responsibility for the Watson House Centre. The centre will be administered by the Board on behalf of the Council. Mr. L. W. Andrew, B.A., B.Sc., A.R.I.C., who has been senior technical officer at the centre, has been appointed its director.

The Watson House Centre deals with the design and performance of appliances for the combustion of gas and coke in domestic, commercial, industrial and public buildings. An important function of the centre is the testing and approval of appliances. Hitherto the North Thames Gas Board has made the Watson House technical advisory services available to all area boards and the new arrangements will ensure continuity in the national character of the work of the centre.

Fire Equipment for Oil Refineries

by A. G. THOMSON

EXTENSIVE research and practical experience have shown that the most effective method of extinguishing oil fires is to smother them with a blanket of foam. Carbon tetrachloride, methyl bromide, carbon dioxide and other media are used by the oil industry for first-aid protection, but, in view of the difficulty of storing these in large quantities, they are only effective against small fires in the early stages. On the other hand, foam has the effect of progressively cooling and blanketing vapour burning fires. Applied correctly and in adequate quantities, foam forms a growing blanket which insulates the oil surface from radiant heat, slows down the emission of vapours, and ultimately seals off the area against further combustion.

Foam may be either chemically or mechanically produced. Chemical foam results from the reaction of acid and carbonate solutions in the presence of a foam stabiliser, while mechanical foam is produced by incorporating air in a foam-making solution with water. A foam that is efficient for fire-fighting purposes must flow freely so that it can spread quickly over the burning liquid and must retain its water content as long as possible. The expansion ratio must not be too high, because foams with a low water content per unit volume have very low heat resistance.

For many years all foams used in fire-fighting were chemically produced, but since 1935 much progress has been made in the development of mechanical foam, which is now regarded in Britain as the most effective and economical medium for extinguishing oil fires. When mechanical foam leaves the branch pipe it is still rather wet and fluid, but after it leaves the jet a physical change occurs which considerably strengthens the whole body of the foam as it flows over the liquid.

A mechanical foam now extensively used in oil refineries is made by the alkaline hydrolysis of hoof and hornmeal to form a protein degradation product, which is subsequently neutralised with hydrochloric acid and stabilised with ferrous chloride. This compound is non-reactive except to zinc and certain aluminium alloys and does not deteriorate in storage, provided it is kept in air-tight containers. It is used as a 3 per cent solution with water, 100 gal. of water mixed with 3 gal. of air foam compound producing 800 gal. of foam.

The mechanical foam equipment now generally used in oil refineries may be of either the foam-making branch pipe or the mechanical foam generator type.

One of the earliest methods of pre-mixing foam compound and water was the in-line inductor, which was standard equipment at the outbreak of the second world war. Water under pressure from hydrants or pumps is passed through the inductor and creates a small pressure drop at the throat, where the foam compound is induced. Between inlet and outlet there is a pressure drop of 25-35 psi., depending on conditions. The size of the throat is determined by the known

A 'Shell' photograph

The central fire station and fire-fighting equipment at Stanlow refinery. A foam truck and tower are at the left-hand side of the picture

volume of water to be handled, the inductor being designed to operate accurately on 100 gal. of water per minute when the pressure at the final foam branchpipe is between 80 and 100 psi.

Since a reduced or increased water flow results in less or more compound being induced, the apparatus can only be used in association with the size of foam-maker for which it was designed. Another weakness, revealed during the war, was a tendency for the non-return valve inside the inductor to be blocked by extraneous matter from the air foam compound, but this limitation has been partially overcome by filtering the compound through fine mesh strainers.

Because of the limitations of the in-line inductor and the need to attack oil tank fires from the start with a predetermined quantity of foam per minute, multi-jet inductor equipment has proved more practical and effective, particularly for large fires involving a variety of foam-makers and long periods of use. It has given very satisfactory results under the most exacting and difficult fire conditions and is incorporated in several of the principal refinery fire fighting appliances.

About 28 gal. of water per min. at approximately 100 psi. pressure is passed through four small inductors, each one calibrated to feed the equivalent of a No. 10 size foam-maker and having its own stopcock. An important advantage of this equipment over the in-line type is that the main body of liquid is not passed through an inductor system, so that no pressure loss takes place and inductor conditions can be more closely controlled. Owing to its great mobility and easy working conditions, a 20 gal. multi-jet inductor, in conjunction with a 500 gpm. trailer pump, became the most popular fire-fighting equipment during 1941, since it could produce approximately 3,200 gpm. of foam from any source of static water supply.

Among the principal fire-fighting appliances used in oil refineries is a 350/500 gpm. pump together with a mechanical foam storage tank of 250 gal. capacity, a multiple inductor being installed on the left-hand side of the pump. The unit is equipped with four foam branchpipes and can produce 3,200 gpm. of foam, operating for 20 min. without being recharged. A hand operated rotary pump allows recharging of air foam compound to take place while fire-fighting operations are in progress.

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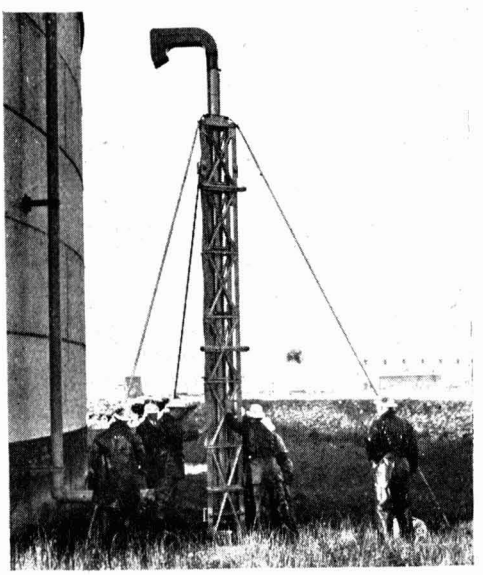
Another major unit is a 500 gal. foam storage tank fitted with twin multi-jet inductors, which is designed to operate with two 350/500 gpm. trailer pumps and can produce 6,400 gpm. of foam. There is also a 500 gal. unit, designed for use with water taken directly from high pressure fire mains, which has been fitted with two positive rotor-plunge pumps for introducing foam compound into a high pressure water line. These pumps are driven by small internal combustion engines and are designed to deliver 18 gpm. of foam compound each, at a pressure of 140 psi., using 1,200 gpm. of water and producing 9,600 gal. of foam. A control device fitted to each pump enables the number of branchpipes to be varied in accordance with the particular fire requirements.

First aid knapsack mechanical foam equipment has proved very valuable for use by plant staff before the arrival of the larger units. All fixed hydrant boxes in plant areas are equipped with a complete knapsack outfit, so that immediate action can be taken should fire break out. A typical unit



Fire-fighting at Shell Haven refinery: the foam tower in position. The fireman on the right is about to connect the 6-inch canvas hose to the tower

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consumes between 1¼ and 1½ gpm. of foam compound according to the cock setting on the branch pipe and produces approximately 450 gpm. of foam.

A more recent development is the mechanical foam generator, which offers important advantages. In contrast to the branch pipe type of foam-maker, the foam and water mixture is aerated immediately after the point at which the foam compound is induced, the aerated foam being forced through the delivery line to the point of application, which may be 400 ft. away. The various sizes of generators are very compact and easy to handle, an important consideration being that they can be operated direct from hydrants with pressure water at 135-150 psi. A small tube acting as a venturi induces the necessary quantity of foam compound in a very positive manner with a negligible pressure drop.

The most satisfactory and reliable method of applying foam to a large tank is by means of fixed foam inlets of sufficient capacity to provide a satisfactory foam cover in the shortest possible time. When in-line or multi-jet inductors are used, it is necessary to have fixed branch-pipes on each tank at two, three or four points, depending on the size of the tank. The foam inlets on tanks must carry a glass seal for low flash-point products. When mechanical foam generators are used it is unnecessary to fit each tank with air foam branch pipes, but dry foam riser pipes complete with seals are required.

For use where foam inlets are unavailable or damaged, telescopic foam towers made of light alloys are carried on all refinery major units. They are readily transportable and are fitted with various sizes and types of pouring heads, enabling foam to be applied to the burning surface by the most satisfactory means.

ABCM Safety Conference

THE Fifth Chemical Works Safety Conference which the Association of British Chemical Manufacturers is arranging to hold at Harrogate from Friday afternoon, 5 November, until Sunday morning, 7 November next, will be on novel lines. Instead of following the usual pattern of papers being presented and discussed, it will consist of works visits to Wilton and Billingham, where, by the courtesy of Imperial Chemical Industries Ltd., safety methods and devices will be seen in practical operation. The conference should, therefore, be of particular interest to works managers, plant superintendents and others responsible for production, as well as safety officers.

The detailed programme of the conference will be issued in July. People interested should make application direct to the Intelligence Officer, ABCM, Cecil Chambers, 86 Strand, London, W.C.2. As accommodation may prove to be limited, applications will be treated in strict rotation.

[*A 'Shell' photograph*]

Spraying foam mixed with water during a fire-fighting display at Houston refinery, Texas. The foam unit consists of two 900 gal. trucks and a trailer with a 900 gal. storage tank. Hoses are connected to the nearest hydrant and foam compound pumped in at a steady rate

Atmospheric Contamination in Industry

by R. J. SHERWOOD, B.Sc., S.M., A.C.G.I.

ON 6 April the British Occupational Hygiene Society held a conference at the London School of Hygiene and Tropical Medicine, which was devoted to the discussion of problems of atmospheric contamination in industry, and its effects on the health of workers. The conference was attended by 150 members and visitors.

The first paper, 'The Investigation of Atmospheric Contaminants in Factories,' was presented by two authors, Dr. M. W. Goldblatt, head of the Industrial Hygiene Laboratories, Imperial Chemical Industries Ltd., and Dr. J. C. Gage, head of the Biochemical Section of those laboratories.

Dr. Goldblatt introduced his paper by stressing the need for more adequate supervision of the working environment. Although we in this country proceeded with caution—for example 58 years had elapsed from the time that a certain occupational disease had first been described until it was included in the list of industrial diseases—it was high time that investigation of industrial atmospheres was generally introduced.

Barely Adequate Supervision

At the previous conference Dr. Bedford had pointed out a number of principles on which we should work. Among other things, he said that it was our business to do everything possible to maintain full bodily efficiency and safety of the people in our charge. Dr. Goldblatt wondered how far this principle was really applied in industry. To what extent did factories go beyond the minimum requirements of the law? He suggested that medical supervision was barely adequate in the 240,000 small factories employing less than 100 workers. In practice their only contacts with the medical profession were the appointed factory doctors whose visits were very infrequent, unless special processes were in operation which legally required periodic medical examinations of workers.

While medical supervision was minimal, Dr. Goldblatt suggested that industrial hygiene supervision by the employment of health engineers was practically non-existent, possibly due to the inherent difficulties in establishing such a function in small works. Dr. Goldblatt asked his audience to consider to what extent their organisations were fulfilling their moral obligations to their workers.

Small Number of Cases

Turning to the particular problem of air contamination, Dr. Goldblatt presented tables showing the reported number of cases and deaths due to exposure to fumes and gases, and also cases of notifiable occupational diseases. These showed that the numbers notified were not great. The data were frequently used as an argument that the time and money necessary to eliminate toxic hazards in industry were not justified. However, there was no relation whatever between this data and the actual position of the factory population in this country. The tables showed, for example, that in 1951 five people were notified as suffering from aniline poisoning. Yet, there were factories in this country that he had visited where the men were always 'blue' and were daily absorbing small quantities of various volatile or powdered amines.

Dr. Fullerton also reported recently having found that among people working in factories which she visited there were many cases of chronic plumbism which were never notified at all. Dr. Goldblatt said that it was impossible to go into a factory, except the most modern, without being conscious of some contamination of the atmosphere by substances which we had no right to ask people to absorb. On the whole the workmen would do what they were told and were bound to depend on what was provided for them. If the atmosphere contained substances which they might absorb, the employer must be able to assure them that they would not be affected adversely. This was frequently difficult to do as there was very little knowledge of the ultimate effects of the daily absorption of small quantities of materials in industrial atmospheres.

Dr. Goldblatt then considered an analogy with the toxicity of certain substances in our foodstuffs which were foreign to our organism. It was possible to determine what concentration of such a substance would be tolerated in food from a knowledge of the average amount of food ingested and the toxicity shown by the substance in animal

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experiments. A factor of perhaps 10 or 100 would be introduced to take into account differing tolerances to the material.

In the industrial field it was not possible to say how much of a given atmospheric contaminant was absorbed by men, and therefore it was far more difficult to say that a given concentration was, in fact, harmless. Attempts have been made to do this by applying the concept of 'maximum allowable concentrations.' Dr. Goldblatt stated that the only concentration that could be considered allowable was zero. He realised that it was essential to use a 'design concentration' for the use of the engineer constructing the equipment, to be used only as a guide. Every attempt should be made to reduce the concentration in the atmosphere to zero.

Equi-toxicity

In applying tables of maximum allowable concentrations which have been drawn up in various countries, there was danger that the lay mind would compare compounds having similar limits. Drinker and Cook, in particular, had divided tables into zones of equi-toxicity. Dr. Goldblatt then showed that the substances listed in one of the zones varied widely in their physiological and pathological effects, and suggested that they were by no means equally hazardous. When a substance is present in the atmosphere of a factory, it must be considered individually and not as a number of a zone.

He also gave a warning against the use of chemical analogy in industrial toxicology. Pharmacologists had not yet been able to associate chemical structure with toxicological effect and similar substances can have vastly different effects.

In presenting the second part of the paper, Dr. Gage discussed the problem of defining the atmospheric concentration of contaminants in an industrial atmosphere. It would vary both in space and time, and to determine the average value or the greatest risk both specialised knowledge and common sense were required of the investigator. Unlike studies of atmospheric pollution in towns, the nature of the hazardous material was usually known. The majority of tests at present in use were of short duration; the air was sampled for not more than a few minutes and it was necessary to make a number of successive tests. Some authorities preferred, however, a test of long duration, lasting perhaps the whole of the working shift; a procedure that had practical advantages, although the integration of a possibly widely fluctuating concentration may be open to toxicological criticisms.

The chemical industry differs from other industries not only in having a wide variety of atmospheric hazards, but also in having a greater population of chemists who are adequately trained to determine and report on them. Other industries are not so fortunate, and a prime consideration in the design of an analytical method for general application is that it should be sufficiently simple to permit its use by a foreman or laboratory assistant with little or no analytical training.

Even within the chemical industry a simple method is to be preferred if it avoids demands on the time of a skilled analyst. Other requirements of a method for general use are that it should be unobtrusive, inexpensive, self-contained and give an immediate result. The last requirement is particularly important for testing air purity in a tank or enclosed space before men are permitted to enter. The tests should be reasonably accurate and not affected by the presence of other materials in the atmosphere.

Determination of Toxic Gases

Dr. Gage then summarised some of the main types of methods that are now in use. In particular he outlined the DSIR 'Methods for the Determination of Toxic Gases in Industry' which employ a simple hand pump and produce a colour stain on a filter paper or a coloured solution in a bubbler; either of which may be matched against a standard. He also mentioned the use of indicator tube methods. These are a promising new development and he predicted that they would have a wide use in the future. Dr. Gage also described some of the sampling instruments used in his laboratories, and made reference to more complex instrumental methods—for example, the mercury vapour detector using ultra-violet light absorption, or the infra-red analyser which could be used for a number of different materials. These instruments are capable of giving a written record of atmospheric concentrations over a long period of time and can be designed to give an automatic warning if safe limits are exceeded, but their

use in occupational hygiene is rather limited.

Dr. B. M. Wright, of the Pneumoconiosis Research Unit, presenting a paper entitled 'The Measurement of Dust Exposure for the Control of Pneumoconiosis,' said that the present lack of agreed safe limits of dust exposure is due partly to lack of agreement on the methods of making the measurements which are required to establish such limits, and partly to lack of facilities for making measurements on a big enough scale.

The factors which require to be measured are:—

1. The concentration and composition of the respirable fraction of the airborne dust to which the workers are exposed.
2. The duration of the workers' exposure.
3. The incidence and severity of pneumoconiosis among the workers so exposed.

Once these factors have been satisfactorily measured and compared with one another, the relationship between a certain level of exposure and the incidence and severity of pneumoconiosis resulting from it can be established. The level of exposure which will be accepted as 'safe' will then depend on what incidence and severity of pneumoconiosis among the workers is considered tolerable.

Many methods of dust sampling in common use do not measure the concentration and composition of only the respirable dust, but are affected also by the presence of particles which are either too large or too small to be of importance.

Separation of Particles

A sampler for measuring the concentration or composition of airborne dust must not be appreciably affected by the presence of airborne particles or aggregates above 5 microns in average diameter; such particles or aggregates are not retained in the lung and their concentration in the air is not constantly related to the concentration of respirable dust. A satisfactory sampler should, therefore, either separate off the respirable fraction at the time of sampling, or collect the sample in such a way that particles and aggregates are not broken up, but can be recognised and given due weight when assessing the sample.

The only instrument in common use which has this property is the Thermal Precipitator. Instruments such as the impinger and the konimeter break up large particles and aggregates which then contribute unduly to the count.

Industrial Safety

Particles less than 1 micron in diameter occur in large numbers in ordinary industrial atmospheres, but they seldom amount to more than a few per cent of the weight or surface of all particles below 5 microns. Their inclusion in a routine dust count leads to technical difficulties and often masks significant changes in the concentration of the larger respirable particles.

Estimate of Exposure

Dust concentration and composition vary widely from place to place and from time to time, but the development of pneumoconiosis results from prolonged exposure to such varying environments. A satisfactory estimate of exposure therefore requires the integration of samples taken over a long period of time. Instruments in present use are hand-operated and take relatively short term samples. Such samples are therefore very expensive to obtain and evaluate and each one gives relatively little information.

An instrument is required which is robust, portable, self-contained and automatic, so that it can be carried by the worker wherever he goes, and which gives a single sample over a period of at least a week, representing his average exposure. The sample should give a measure of the concentration of respirable dust, and some estimate of its composition. The instrument should be relatively cheap and easy to produce, so that it can be used on a wide scale as a routine sampler.

Until such an instrument has been produced and used over a period of many years, safe limits of dust exposure cannot be established with any precision.

The present lack of definition of such limits is due mainly to lack not of fundamental research but of sufficiently prolonged and careful use of existing knowledge.

Dr. W. G. Marley, Head of the Division of Health Physics Atomic Energy Research Establishment, Harwell, read a paper on 'Permissible Levels of Exposure to Ionising Radiations and Radioactive Materials.'

Dr. Marley first emphasised that with the introduction of a wide range of isotopes and the ever increasing use of equipment emitting X-rays and gamma-rays it had become necessary to re-examine early information

Industrial Safety

on permissible levels of exposure and to extend their applicability.

The work in various countries had been reviewed by the International Commission on Radiological Protection. At the 1953 meeting of the International Congress of Radiology, the Commission recommended values for the maximum permissible body burden of a wide range of isotopes and of the corresponding levels in air and drinking water. These were to be published shortly.

Dr. Marley discussed the methods of arriving at these recommended values. Wide experience with X-rays and gamma-rays had made it possible to define a basic tolerance for external irradiation and this had been set at 0.3 roentgen/week in the tissue (corresponding in certain circumstances to approximately 0.5 roentgen/week measured with back-scatter on the surface of the body). A further basic tolerance figure from human exposure had been derived from the study of the effect of radium ingestion by radium dial painters, namely, 0.1 microgram of radium fixed in the skeleton, which was thought to be safe over a working lifetime.

Allowing for RBE

By making allowance for the Relative Biological Effectiveness of the different types of radiation or isotopes it had been possible to determine permissible levels of exposure to a wide range of substances. The RBE was usually determined from animal experiments but there was also a limited experience arising from accidental exposure of men. Parameters that affected the calculation of permissible levels included the fractional uptake from lungs or gut, the metabolism of the element, the organ of concentration, the biological half-life and the over-all relative toxicity.

These had been determined from animal studies and from a limited experience of accidental exposure in men.

To achieve agreement between the various laboratories undertaking research in this field, it was found necessary to define a 'standard man' for whom the weight and constitution of various organs had been set.

The levels recommended by the International Commission were intended for application to individuals who were exposed in their occupation. Should more than a small fraction of the population be exposed, the genetic effects must be considered.

Dr. Marley also discussed problems arising as a result of exposure due to accident or emergency, where a much more intense level had occurred for a short period.

Editor's note: Copies of the proceedings will be available from the Hon. Secretary, Mr. Peter C. G. Isaac, Public Health Engineering Laboratory, King's College, Newcastle-upon-Tyne.

The next conference of the Society is to be held on 1 *November,* 1954, *at the London School of Hygiene and Tropical Medicine. This will be devoted to discussion of the hazards associated with radioactivity and the use of X-rays in industry.*

Fire & the Atomic Bomb

SINCE the first atomic bombs were dropped eight years ago there has been much speculation as to the effects of an atomic explosion on a Western city. The Fire Research Station has been investigating the likelihood of fires being caused by such an explosion. 'Fire and the Atomic Bomb,' recently published by HMSO, is a first bulletin limited to discussion of the fire effects of the flash.

According to published information the flash of a bomb of this type can be divided into two periods. The initial flash is blue-white and lasts about a hundredth of a second. The longer flash which follows lasts for three seconds during which it changes its colour from blue-white to cherry red. One second after the exploding of the bomb the fire ball would appear at a distance of one mile to have a diameter twenty times that of the sun. It would have a peak temperature of 7,000°, i.e. 1,500° higher than that of the surface of the sun. The heat given off would be sufficient to cause fires up to a distance of two miles.

As the heat radiations would travel in straight lines the lower floors of buildings in a city would be protected to some extent by surrounding buildings from heat radiation given off by a bomb exploded over the city. Precautions would have to be taken in all rooms having a view of the sky. The bulletin shows that it would be desirable to remove all paper, textiles, upholstery and other easily combustible substances from the danger area near the windows where radiations from the sky might fall.

SPOT TESTS. VOLUME I: INORGANIC APPLICATIONS. By F. Feigl. Translated by R. E. Oesper. 4th English edition, 1954. Elsevier Publishing Co., Ltd., Amsterdam. Distributed by Cleaver-Hume Press, Ltd., London. Pp. xii + 518. 45s.

No analytical chemist today needs an introduction to the name of Professor Feigl, nor does the latter's practical work on spot tests as an analytical aid, of which this volume forms part of the fourth edition, really need any recommendation other than to say that the present work shows the same high standard of care and precision, and the same wide and scholarly grasp of the field which we have long associated with the name of the author.

In an earlier edition it was found necessary, because of the wealth of material on the practical side and the increasing maturity of the theoretical approach, to treat these two aspects in separate volumes. Further growth of the applications of spot test techniques, particularly on the organic side, has now made it necessary to subdivide the practical treatment into two separate and essentially independent volumes dealing respectively with inorganic and organic applications.

Although the major expansion has been in the organic applications, much new work in inorganic analysis has also appeared, and the inclusion of this has increased the space devoted to this branch by something like one-fourth over the space allotted to it in the previous edition.

The introductory chapter, dealing with the development, present state and prospects of inorganic spot test analysis, has been written in collaboration with Professor P. W. West, and is an admirable essay on the nature and scope of spot reactions together with a critical survey of their whole past, present and future place in analytical chemistry. Professor West has also re-written Chapter II, describing the techniques used in spot testing, in a competent fashion which fully maintains the high standard of the remainder of the book. Otherwise the book follows the pattern of the inorganic part of the previous edition, and it is undoubtedly the first source to which the analyst will turn for information on how to solve any particular problem of inorganic identification. The references are as completely up-to-date as possible, numerous references to publications appearing in 1953 being included. The great mass of material covered may be deduced from the fact that the subject index occupies almost 50 pages.

The binding, limp cloth, is substantial, but only time will tell whether it is sufficiently so to stand up to the continued use that the book will receive. The general standard of production is excellent, typography and paper being a notable improvement on the previous edition. All told, by present day standards the price of the book is, in the reviewer's opinion, reasonable.—CECIL L. WILSON.

THERMO-MIKRO-METHODEN. By L. and A. Kofler. Verlag Chemie, Weinheim. 1954. Pp. xi + 608. DM. 39.80.

With the growing interest in micro methods of chemical analysis, the appearance of a new addition of this book, dealing with characterisation of organic substances and mixtures, is to be welcomed. An organic substance can be characterised in terms of four experimentally determined quantities—its melting point, the eutectic temperatures of mixtures with two standard substances and the refractive index of the melted substance—all of which can be determined using small quantities and the aid of the microscope. The book deals exhaustively with the techniques and apparatus used in such characterisation and includes sections on the application of the methods to mixtures, molecular weight determination, thermal analysis, and the crystallisation of cooled mixtures. A table by means of which organic substances

can be identified occupies nearly half the book.

The first hundred pages deal with apparatus and technique. The former, much of which has been developed by the authors, includes micro melting point and micro cooling apparatus, varying temperature blocks and the thermo-microscope. Details of technique include comments on the effects of sublimation, decomposition on heating and water of crystallisation and methods for determining melting points of very volatile substances. Methods of determination of refractive index include one involving observation of the disappearance of the Becke line at the boundary between the melted substance and glass powder of known refractive index. Tests of purity are discussed and some methods of purification given. Methods are also given for the characterisation of organic liquids and others which assist in the identification of such organic-inorganic substances as the metal salts of fatty acids.

Nearly a third of the book is devoted to micro-thermal analysis and includes a discussion of various aspects of polymorphism and methods of obtaining phase diagrams for binary systems from microscopic examination. These latter include the Kofler contact method and examples of its use in typical two component systems. Three component systems, the analysis of mixtures, orientated growth and the crystallisation of cooled melts are also considered. Results of micro-thermal analytical work by various workers are reviewed. There is a short section on optical crystallography which includes brief accounts of crystal systems, the preparation of specimens and the use of the polarisation microscope.

The remainder of the book consists of over 200 pages of tables for the identification of organic substances preceded by some typical examples illustrating the use of the methods described. The four physical quantities are given in the tables together with additional data assisting in identification. Many of the 1,200 substances listed are of medical or pharmaceutical interest, not always easily characterised by the usual methods. While micro-thermal methods are unlikely to largely supplant more usual chemical methods, for substances such as these they may offer certain advantages.

Descriptions are supplemented by photographs of apparatus and micro-photographs illustrating typical cases and there are many clear diagrams. Over 700 references are cited. The book provides a very useful account of a comparatively new analytical technique and should be of considerable interest to organic and analytical chemists and to those interested in chemical microscopy.—W.R.M.

METHODEN DER ORGANISCHEN CHEMIE (Houben-Weyl, 4th edition). Edited by E. Müller with the collaboration of O. Bayer, H. Meerwein and K. Ziegler. Volume VII, Part I: Sauerstoffverbindungen II, Aldehyde. By O. Bayer. Georg Thieme Verlag, Stuttgart. 1954. Pp. xxiii + 556, moleskin DM. 82.

A striking illustration of the rate at which organic chemistry has expanded in the last 25 years is provided by the fact that the editors of the new 'Houben-Weyl' have found themselves forced to issue the volume on carbonyl-compounds in two separate parts. The aldehydes, which shared a modest 100 pages with the ketones in the 3rd edition, now take up an entire book of over 500 pages. More than 400 of these are devoted to methods of preparation. The rest of the book deals with the reactions of aldehydes, the discussion being limited to those derivatives which are of value in the isolation, separation, purification and characterisation of this group of compounds.

The author of this volume, Dr. Otto Bayer, of Farbenfabriken Bayer, has approached his gigantic task with a keen critical sense and a happy gift for classification, which have enabled him to produce a comprehensive survey of remarkable clarity. The literature has been covered up to October, 1953. Special attention has been paid to the patent literature, and many previously unpublished observations made in the laboratories of IG-Farben have also been included. This volume is more than a mere list of facts and literature references, it is a stimulating exposition of the subject in which the reader can browse with pleasure as well as profit.

The complete 4th edition of 'Houben-Weyl' will consist of about 15 volumes. Vols. II and VIII have already appeared. A price reduction of 10 per cent is offered on volumes which are ordered before publication, and also on the complete work if this is ordered before the publication of the last volume.—J.C.P.S.

Driver-Harris 'International-Gathering'

THE 5th International Gathering of the Driver-Harris organisation, arranged by British Driver-Harris Co. Ltd., of Manchester, was held at Alderley Edge, Cheshire, 11-14 May. The chairman of the conference was Mr. R. M. Parry, managing director of British Driver-Harris, supported by Mr. W. M. Kay, M.Sc., A.R.I.C., technical director, and Mr. W. F. Marsh, production director, together with Mr. F. L. Driver and Mr. S. M. Tracy, of the American Company.

The programme for the Gathering was largely of a technical nature and a principal aim was to review the unprecedented growth in the variety and number of applications for specialised nickel-containing alloys, particularly in electronics and instrumentation. Particular attention, for instance, was given to the ever-widening demand for wires of fine sizes (from 0.002 in. downwards) and a comprehensive exhibition showed the many end-uses for Driver-Harris alloys.

At a farewell dinner on the last night of the conference Mr. Parry welcomed the principal guest, Mr. Lance H. Cooper, M.B.E., chairman of Mond Nickel Co. Ltd. and vice-president of the International Nickel Company of Canada Ltd. Referring to the world nickel situation, Mr. Cooper said that International Nickel Company of Canada, the world's leading nickel producer, was placed in a difficult position due to the demand for the product exceeding the present supply. He gave a few facts to show the extent of the efforts of the company to raise the level of supply.

British Driver-Harris have recently completed a carefully phased programme of expansion. The latest additions at their Cheadle factory include several new wire shops and extensive new plant to secure a greatly-expanded output of super wires in 'Nichrome V,' 'Nichrome,' 'Advance' and 'Karma' alloys. Another new building is a magnificent two-storey research laboratory, almost ready for occupation, which will provide much-needed extra capacity and every possible facility for research and testing. There is in addition a large new modern-type warehouse.

Part of the 5th International Gathering of the British Driver-Harris Organisation. The four-day conference was held at Alderley Edge, Cheshire, in May

Canadian Prices Stable

CHEMICAL price stability in Canada seems to be fairly well assured for the summer months reports the Ontario Purchasing Agents' Association. Current competitive conditions will inevitably give birth to many minor fluctuations. Nevertheless, it is very unlikely that the overall chemical price index will vary by 1 per cent up to and including August, 1954.

Spectacular progress still highlights the Canadian scene. North American Cyanamid's new thiourea plant at Welland, Ontario, is an unusual example of a chemical plant built in Canada which is likely to export most of its production to the United States. It is reported that thiourea will be used in production of sulphathiazole and other sulphonamides. It will also be used as a corrosion inhibitor against synthetic detergents, in the manufacture of various rubber chemicals and as a base material for some plastics.

• HOME •

Breakaway Proposal Defeated

A proposal that the British Association of Scientific Workers should break away from the world federation was defeated at the association's annual conference in London on 23 May.

Chelsea Show 1954

A scientific section was included in the 1954 Chelsea Show of The Royal Horticultural Society held in London, 25-28 May. Prominent among the exhibits in this section was that of the Shell Petroleum Co. Ltd. which consisted of a series of colour photographic studies of insect pests and a review of the chemical control methods available today.

Textile Institute Conference

The Textile Institute is to hold a conference at Ghent in September which will be the first Institute conference to be held overseas since 1928. It will take place from 9-13 September, and the subject is to be 'Fibre Friction.' Co-operating with the arrangements are the Centre Scientifique et Technique de l'Industrie Textile Belge, the University of Ghent, and the organisers of the Ghent International Trade Fair, which will be in progress at the time.

New Badge for Glass Society

The Society of Glass Technology have received the gift of a new badge from Professor W. E. S. Turner, F.R.S., of Sheffield. It consists of a disc of glass engraved with the badge of the society and mounted in silver in which are set some small pieces of turquoise glass of approximately 140 B.C. The badge was designed, and the glass engraved, by Mrs. Turner (Helen Monro).

New London Office

F. Haworth (A.R.C.) Ltd., the chemical engineers, of Ramsbottom, Lancashire, announce the opening of a London Office at 40 Buckingham Palace Road, London, S.W.1. (Telephone: Tate Gallery 3861). The new office will facilitate business with an increasing number of customers in London and the Southern Counties, who are interested in the use of special acid and alkali resisting cements, and the erection of chemical brickwork structures. The office will be controlled by Mr. D. P. Hulbert, a director of the company.

Employment in Chemical Industry

According to statistics in the May issue of the Ministry of Labour Gazette, the total number of persons employed in the chemical and allied trades in Great Britain at the end of March was 503,300, compared with 501,800 for the previous month. Of these, 359,300 were males and 144,000 were females. The number of persons unemployed at the end of March totalled 5,257.

Paint Company Centenary

Robert Morrison & Co. Ltd., paint manufacturers, of Glasgow, have celebrated this month the centenary of the establishment of the firm. The firm was founded by Mr. Robert Morrison in premises in Bridgegate, Glasgow, and later moved to Howard Street, before transferring on 1914 to their present premises. The firm's employees last week had an anniversary sports outing to North Berwick at which each received a centenary gift from the company.

Thiourea in Oranges

At Dronfield, Derbyshire, on 24 May, magistrates dismissed a case against Guerra & Co. (Liverpool) Ltd., who were alleged to have sold oranges containing thiourea. A sampling officer had bought 18 oranges from a Dronfield greengrocer; three of the oranges were analysed and found to contain thiourea —40 ppm. in the edible portion of the fruit and 125 ppm. in the peel. For the defence it was claimed that they had bought and sold in good faith, and it was said that the Spanish Government were taking steps to prohibit the future export of oranges sprayed with the chemical.

Fertiliser Agreement

Agreement has been reached on the formulae for compound fertilisers for the 1954-5 season following on a meeting of the Fertiliser Manufacturers' Association, the National Association of Corn and Agricultural Merchants and the Colleges of the N.F.U., meeting in Edinburgh and Glasgow. A similar meeting is being arranged for Aberdeen to decide on North of Scotland needs. No changes have been made in the number or composition of compounds but it has been agreed to give the plant food ration in addition to the analysis which has been normally given.

• OVERSEAS •

New Columbite Deposits

Rich columbite deposits have been found in the Mazaruni district of British Guiana.

New Rodenticide

Pivalyn, a new water soluble anticoagulant rodenticide formulated in a sugar base for exposure as a liquid bait, has been released for general sales (following 15 months of laboratory and field experimentation) by Motomco Inc., 10 Murray Street, New York 7, New York.

Uranium Ore in Saskatchewan

Officials of La Ronge Uranium Mines have announced that Saskatchewan's first low-grade uranium ore processing mill will start operating early this summer. The company, which will mine ore from its 154 claims, states that there is a supply of 15,000,000 lb. of uranium in the region.

Higher Carbon Black Sales

Sales of carbon black in the USA in 1953 totalled 1,559,000,000 lb., an increase of 8 per cent compared with 1952, according to the Bureau of Mines. Production in 1953 was less than 1 per cent above 1952, having been cut to bring it into closer alignment with sales. Production exceeded sales by only 51,000,000 lb. in 1953, compared with 157,000,000 lb. in 1952.

Swedes Prepare New Isotope

A new isotope of element 100 has been isolated at the Nobel Institute of Physics at Frescati, Stockholm. Element 100 was first reported from the University of California, where it was produced in a uranium reactor. The new isotope was isolated after a cyclotron bombardment of uranium with carbon and oxygen nuclei. Californium, element 98, was produced at the same time.

Chemistry on Show in Belgium

Belgium's chemical industry, which before the war was one of the most important of that country's activities, will be comprehensively represented at the International and Technical Industrial Exhibition at Charleroi from 18 September to 3 October. Mineral chemistry, nitrogen, organics, pharmaceuticals, rubber and photographic chemicals will be some of the principal branches of the industry represented.

Danish Rise in Alcohol Output

A considerable increase in the production of both alcohol and yeast is reported from Denmark. During 1953 yeast production exceeded 9,000,000 kg.—an increase of 3 per cent over 1952, attributable in part to increased exports to Sweden. Alcohol production exceeded 13,000,000 l. (100 per cent).

Water Pollution Decree

The Hungarian Government has issued a decree declaring no new industrial enterprise may be established without provision for purification of any polluted water emitted in an industrial process. Existing industries are directed to install or modernise equipment as required with the aid of £7,500,000 State credit.

Natural Gas to be Exported

Trans-Canada Pipe Lines has been granted a permit by Alberta's Petroleum & Natural Gas Conservation Board to export natural gas from Alberta to eastern Canada and the mid-west United States. The gas is to start moving across the Alberta border not later than 31 December next year, at a maximum rate of 540,000,000 cu. ft. daily.

Rising Production in India

During 1953, the salt and cement industries in India showed notable increases in production and established new records. Salt production rose from 80,400,000 maunds to 86,000,000 maunds—2,300,000 maunds more than the Five-Year Plan target for 1955-56—and cement production increased by 200,000 tons, reaching the record level of 3,730,000 tons.

Canadian Sales Satisfactory

A commodity report of the Purchasing Agents' Association of Toronto states that there is a continuing satisfactory sales volume of Canadian chemical products and this volume is holding up prices of most domestic products. Keener competition exists for many lines, but the accent has so far been on better service rather than lower prices. With the possible exception of some grades of polyethylene, most plastics are in good supply, although the busy season for moulders is yet to come. Volume production has reduced the US price of vinyltoluene and this material will become widely used in the coatings field this year.

• PERSONAL •

MR. H. CURTIS, B.Sc., A.R.I.C., A.M.I.Chem.E., has been appointed a director of Leda Chemicals Ltd., Eley Estate, Angel Road, Edmonton, London, N.18. Mr. Curtis, who was formerly the firm's chemical engineer, will be in charge of all plant design, installation and operation.

DR. W. B. PEUTHERER has been appointed general manager of the Grangemouth Petroleum Refinery Ltd. Manager at the refinery since 1947, he has also had a long period of service with the associated company, Scottish Oils Ltd., at Uphall. He has taken a leading part in trade activity in the East of Scotland, is an active member of the Institute of Petroleum and has just been elected president of the Grangemouth Chamber of Commerce.

At the annual congregation of the University of Sheffield on 3 July, the honorary degree of D.Sc. Tech. will be conferred upon EMERITUS PROFESSOR W. E. S. TURNER, F.R.S., formerly Professor of Glass Technology.

In view of his many other commitments and the increasing demands on his time that proposed expansion of the company would involve, GENERAL BOND has resigned his post as chairman of Murgatroyd's Salt & Chemical Co. His place has been taken by MR. E. J. BARNSLEY, and SIR ROBERT ROBINSON has joined the board.

Officers and members of the council elected at the annual general meeting of the Society of Cosmetic Chemists on 21 May were as follows: *President*, R. H. MARRIOTT; *vice-president*, R. T. DOBSON; *hon. secretary*, S. J. PALLING; *hon. treasurer*, P. J. FOWLES; *members of council*, H. W. AVIS, J. BATHER, P. GUGENHEIM, H. W. HIBBOTT, W. P. PEPPER and F. RILEY.

MR. L. J. ATTWELL has been appointed a director of the Electrical Apparatus Co. Ltd.

The following officers and executive committee will serve the Industrial Pest Control Association for the year 1954-55:—

President, MR. DUNCAN R. LEITCH (Ratsouris Ltd.); *vice-president*, MR. K. F. GOODWIN-BAILEY (Cooper McDougall & Robertson Ltd.); *hon. treasurer*, MR. S. W. HEDGCOCK (Disinfestation Ltd.); *hon. auditors*, MR. S. BREMER (The Ideal Insecticide Co.), and MR. R. A. H. FREEMANTLE (Stemco Ltd.); *executive committee*, MR. C. A. E. STUART KREGOR (W. Edmonds & Co. Ltd.), MR. A. FRASER MCINTOSH (Thomas Harley Ltd.), MR. I. A. MACKAY (Imperial Chemical Industries Ltd.), MR. G. P. POLLARD (Petrochemicals Ltd.), and MR. S. F. SPRANGE (The London Fumigation Co. Ltd.). The secretary is MR. W. A. WILLIAMS, M.B.E., B.Sc., Cecil Chambers, 86 Strand, London, W.C.2.

The title of Professor of Chemical Pathology in the University of London has been conferred on DR. F. T. G. PRUNTY in respect of his post at St. Thomas's Hospital medical school. The title of Reader in Chemical Biophysics has been conferred on DR. R. A. KEKWICK in respect of his post at the Lister Institute of Preventive Medicine.

Obituary

DR. C. M. A. STINE, the American pioneer in industrial organic chemistry research, and formerly adviser on research to the Du Pont organisation, died at Wilmington, Delaware, last Saturday, at the age of 71.

The death after a road accident has been reported of PROFESSOR CHARLES ROBERT SYDNEY TENNISWOOD, M.Sc., Professor of Chemistry and Dean of the Faculty of Science in Makerere College, University College of East Africa. He was 47. After taking first-class honours in chemistry at Armstrong College, University of Durham, he became head of the chemistry department of Wandsworth Technical Institute in 1932, and remained there until he joined the directorate of projectile development at the Ministry of Supply in 1941. He went to Makerere in 1945 and had the longest record of service among the present teaching staff of the college. In 1948 he was appointed to his Chair and became Dean of his Faculty last year.

Publications & Announcements

IN a statement accompanying the directors' report and accounts for the year ended 31 July, 1953, the directors of Charles Winn & Co. Ltd. gave notice of the acquisition of all rights in the Wynn Patent Straight-through Diaphragm Valve and of the formation of a subsidiary company to carry on and develop the sale of this valve. It has now been announced that the whole range of valves of this type is being manufactured by the parent company at their works at Granville Street, Birmingham, and that a substantial increase in production and sales is being achieved. Additional manufacturing space has been provided in close proximity to the main works and not only is the company able to cope with present needs, but some future expansion is possible. Output of the company's well-known range of Winn valves and fittings for steam, water, oil, etc., and other products, will also benefit from this extra space.

* * *

OPERATION of the S.E.I. electro-magnetic transducer system is described in a publication recently issued by Salford Electrical Instruments Ltd., Peel Works, Silk Street, Salford 3, Lancashire. The system, which enables a reading to be taken at a distance of up to 1,000 yd. from the point at which the actual measurement is made, is highly versatile. It is used in plastics production, in rolling mills and in coal bunkers, as well as for many other applications. The new publication includes a general description, describes the standard heads and indicating instruments used with this system, and shows six typical applications in diagrammatic form.

* * *

UNDER the title of 'Disposal of Waste Waters from Industrial Premises,' a handbook published by the FBI brings together for the first time in one publication all the complicated legal provisions affecting the disposal of trade effluent. It gives an idea of the magnitude of the problem which industry has to face in carrying on its job with the minimum of damage to fisheries and public amenity, and of the amount of research which is now being done on the technical aspects of the problem. Copies are obtainable from the FBI, 21 Tothill Street, London, S.W.1 (2s 6d. post paid).

LATEST issue of 'Wiggin Nickel Alloys' (No. 26), published by Henry Wiggin & Co. Ltd., contains the usual range of articles dealing with some of the varied applications of wrought high-nickel alloys in industry. Of special interest are two short articles dealing respectively with thermometer bulbs and orifice plates made in Monel, a nickel-copper alloy widely used in chemical plants, oil refineries and gas works, where corrosion-resistance is important. A further example described in this issue is a solution reboiler used in an amine treating unit for the removal of hydrogen sulphide in feed gas. The 48-in. diameter shell was made of Monel-clad steel while, virtually, all other fittings, including the 492 tubes, were made of Monel. Copies of 'Wiggin Nickel Alloys' may be obtained free of charge on application to the publications department of the company at Thames House, Millbank, London, S.W.1.

* * *

RESISTANCE strain gauges are solving contents measurement and other weighing problems in a number of UK chemical plants. They can in some cases be applied to existing steel or concrete structures supporting tanks and pressure vessels, and their use is particularly helpful in cases in which high temperatures, high pressures, or safety considerations preclude the use of ordinary tank level indicators. They can also be used as very quick response weighing devices, thus increasing the speed at which materials can be dispensed. The illustration shows the layout of the Saunders-Roe Technograph

foil strain gauge; this possesses special advantages such as resistance to fluids and high temperatures. It is applied to a load-carrying structure by suitable adhesives: strain variations due to load changes are accomplished by corresponding variations in the electrical resistance of the gauge pattern. These resistance variations can be detected and made to operate indicators, recorders, material feed controllers, or alarm circuits.

Law & Company News

Changes of Name

The following changes of name have been announced: BODDY & GREAVES LTD., to W. HARLEY GREAVES LTD., on 13 April, 1954. HEKLA PRODUCTS LTD., to S.D.C. PRODUCTS LTD., on 23 April, 1954. NEW METALS & CHEMICALS (SALES) LTD., to NEW METALS & CHEMICALS LTD., on 26 April., 1954.

Increases of Capital

The following increases of capital have been announced:—SANDIL LTD., from £100 to £1,000; ASPRO LTD., from £1,000,000 to £1,500,000.

Amber Chemical Industries Ltd.

Amber Chemical Industries Ltd. report a group net profit for 1953 of £20,615 (against a loss the previous year of £83,000) after tax and after crediting provision for anticipated losses on sale of fixed assets no longer required. No ordinary or preference dividends (same as the previous year) are being paid.

Murgatroyd's Salt & Chemical Co.

The production capacity of the Murgatroyd's Salt & Chemical Company's plant at Elworth, Cheshire, is to be enlarged at a cost of approximately £1,500,000 spread over the next two years. It is intended to double the company's present output of chlorine and to increase production of high purity caustic soda. Arrangements have again been made for the Finance Corporation for Industry to lend the necessary additional finance needed for the expansion programme.

Potter & Clarke Ltd.

The accounts of Potter & Clarke Ltd., manufacturing chemists, show a loss for 1953, of £19,585 (against a loss the previous year of £115,075). As in the previous year, no ordinary dividend is being paid.

Powell Duffryn Limited

Powell Duffryn Ltd. announce a dividend of 2⅜ per cent actual, less income tax at 9s. in the £, on the £3,600,000 4¾ per cent cumulative preference stock for the six months ending 30 June, 1954. Payment to be made on 1 July, 1954, to holders registered on the books of the company at close of business on 1 June, 1954. Transfer books to be closed for one day on 2 June, 1954.

Next Week's Events

THURSDAY 10 JUNE

Royal Institute of Chemistry

London: 30 Russell Square, 12 p.m. Leave by motor-coach for visit to Kent Oil Refinery Ltd., Isle of Grain, Rochester, Kent.

Institute of Metal Finishing

Manchester: Engineers' Club, Albert Square. North West branch annual general meeting.

Market Trade

LONDON.—A good demand has been reported from most sections of the industrial chemicals market during the past week. The movement on home account has covered good quantities and the call for export has been maintained at recent levels. There has been an increase in the basis prices of dry white lead, litharge and dry red lead. The following prices came into operation on 1 June: dry red lead £125 15s. per ton, litharge £127 15s. per ton and dry white lead £131 15s. per ton. Conditions on the coal tar products market remain firm, and there has been an increase of 3d. per gal. in the price of *meta*-cresol.

MANCHESTER.—Values have been maintained in pretty well all sections of the Manchester market for heavy chemical products during the past week. Home-trade users in the textile and allied industries, as well as other leading outlets, are specifying for good contract deliveries, and a fair number of fresh inquiries have come on to the market. Quieter conditions, however, are looked for during the next few days as a result of the holiday stoppages. Shipping business has been on a fair scale. Fertiliser materials continue to move in seasonally smaller quantities, but a steady call for most of the light and heavy tar products has again been dealt with.

GLASGOW.—In general, business has remained fairly steady and the usual run of chemicals are in steady demand. There has been a slight hold-up owing to the present difficulties with regard to rail transport. Export business continues steady.

CLASSIFIED ADVERTISEMENTS

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.

ACID PLANT SUPERVISOR.

APPLICATIONS are invited from experienced and qualified Industrial Chemists for the position of Acid Plant Supervisor at our Chemical Fertiliser Works, Westfield, near Auckland, New Zealand, where two lead chamber sulphuric acid plants are operated.

The position carries a satisfactory salary and a new three-bedroom house will be available.

Full details of duties will be supplied on application. All correspondence will be treated as strictly confidential.

THE GENERAL MANAGER,
KEMPTHORNE PROSSER & CO.'S,
NEW ZEALAND DRUG COMPANY, LTD.,
CENTRAL OFFICE,
10-12, CUSTOMS STREET EAST,
AUCKLAND C.I.,
NEW ZEALAND.

A **RESPONSIBLE POSITION** at Hayes, Middlesex, is open to a Young Man of Inter. B.Sc. standard for laboratory work in connection with the manufacture and impregnation of carbon and graphite for chemical engineering applications. Industrial experience is essential as the work involves close liaison with the various production departments. The successful applicant will be admitted to the Superannuation Scheme and salary will be in accordance with experience and qualifications. Apply, in writing, in confidence, to the **SECRETARY, POWELL DUFFRYN CARBON PRODUCTS, LTD., SPRINGFIELD ROAD, HAYES, MIDDLESEX.**

ASSISTANT CHEMISTS, all grades, are required by **LAPORTE CHEMICALS, LIMITED,** for their Research Department at Luton. There are vacancies for men and women with General Certificate, National Certificate in Chemistry, Inter. B.Sc., or a Pass or General Degree including Chemistry; also for a few without qualifications. The positions are well paid and pensionable, and there are good laboratory facilities. Apply **RESEARCH CONTROLLER, LAPORTE CHEMICALS, LTD., KINGSWAY, LUTON.**

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKS, requires **EXPERIMENTAL OFFICERS OR ASSISTANT EXPERIMENTAL OFFICERS,** to assist in Chemical Engineering investigation and development work. The minimum qualification is Higher School Certificate (Science) or equivalent, but for Experimental Officer a pass degree in Chemical Engineering or Applied Chemistry is desirable. The salary range (male) for Experimental Officer (minimum age 26), is £690 to £850, and for Assistant Experimental Officer, £276 (age 18), to £615. Houses available within a reasonable period for married staff who live outside the Establishment's transport facilities. Application form from **ADMIN. OFFICER (RECRUITMENT), A.W.R.E., ALDERMASTON, BERKS.** Quote Ref. 74/W.G.E./38.

SITUATIONS VACANT

BRISTOL WATERWORKS COMPANY

SENIOR ASSISTANT CHEMIST

(Amended Advertisement)

A SENIOR ASSISTANT CHEMIST is required in the Company's laboratory in Bristol. Candidates, within the age group 28-35, and preferably with Waterworks experience, should be members of the Royal Institute of Chemistry or possess an Honours Degree in Chemistry. The commencing salary is within the range £700-£800 per annum, according to experience. The appointment is to the Company's permanent and pensionable staff and is subject to a satisfactory medical examination. A small flat is available in Bristol.

Applications, with the names of three referees, should be sent to—

R. W. MELVIN, GENERAL MANAGER,
BRISTOL WATERWORKS COMPANY,
TELEPHONE AVENUE, BRISTOL, 1.

BRITISH GEON, LTD., have vacancies in their factory for **CHEMISTS** or **CHEMICAL ENGINEERS** to undertake supervision of continuously operating plants producing vinyl polymers. Age 23-30 years. Applicants should have a Degree in Chemistry, Chemical Engineering or equivalent qualification. Salary according to qualifications and experience. Non-contributory pension scheme. Apply **STAFF MANAGER, BRITISH GEON, LTD., HAYES ROAD, SULLY, NR. PENARTH, GLAM.,** quoting reference BG.19.

CHIEF ENGINEER required by a Company producing Purified and Chemical Cellulose. This is a senior staff position and involves complete charge and responsibility for all matters mechanical, maintenance, mechanical improvements and expanding instrumentations and controls. It is a new position created by the expansion of the plant and offers excellent scope to an engineer who may feel his present position limited. Experience in paper machine maintenance an advantage. Applicant should hold a degree in Engineering and have had considerable experience in plant maintenance. Age 35-45. Salary commensurate with position. In first letter, state complete record of education and positions held, plus personal data including a small photograph. Reply to **THE GENERAL MANAGER, THE HOLDEN VALE MANUFACTURING COMPANY, LIMITED, HOLDEN VALE WORKS, HASLINGDEN, ROSSENDALE, LANCS.**

GENERAL MAINTENANCE ENGINEER required for **LONDON PLASTIC MOULDING CO.** Experience of manufacture of Hydraulic Presses, Pumps, and Resin-impregnating Plant essential. Salary, £1,000 and upwards according to qualifications and experience. Write full details to **BOX No. C.A. 3324, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SITUATIONS VACANT

GRADUATE CHEMICAL ENGINEER required, having one to two years' industrial experience. The position involves technical and commercial operations and presents excellent opportunities for the right man. Write, stating age and giving full details of experience, to **SHARPLES CENTRIFUGES, LTD.** (Reference MEO'KT Confidential), **"TOWER HOUSE," WOODCHESTER, STROUD, GLOS.**

SALES MANAGER required to sell glass fibre yarns and glass fibre mat to the plastic and engineering industries. **SALESMEN** also required. Please mark applications accordingly. Highly paid positions with prospects for experienced men. Write, giving full details, to **GLASS YARNS & DEESIDE FABRICS, LTD., 121, KINGSWAY, W.C.2.**

TECHNICAL TRANSLATOR (British born) with fluent Dutch and/or German or French for International Electrical Concern in Holland. Knowledge of Chemical and/or Pharmaceutical Science is essential. Preferably unmarried and willing to live abroad. Salary according to qualifications. Full details to **BOX No. C.A. 3325, THE CHEMICAL AGE 154, FLEET STREET, LONDON, E.C.4.**

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6 BRAND NEW Jacketed STERILIZING VESSELS—7 ft. long by 3 ft. diam., complete with fittings.

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1—Johnson FILTER PRESS—30 plates, 25 in. sq.

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24 in., 30 in. and 36 in. HYDRO EXTRACTORS.

Heavy Cake CRUSHING MILL—2-pair high, by Nicholson.

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5—Excellent Porcelain DISC MILLS.

1—Very Fine GARDNER SIFTER and MIXER, trough 5 ft. 9 in. by 24 in. by 28 in. deep, with wood-built hopper, elevator, A.C. motor and starter.

2—GARDNER 'G' size SIFTERS AND MIXERS.

2—GARDNER 'H' size steam jacketed MIXERS.

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RICHARD SIZER, LIMITED, ENGINEERS, HULL.
Telephone: 31743.

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C.I. FILTER PRESS, 32 in. square plate and frame type by MANLOVE ALLIOTT with hydraulic closing gear. 40 chambers giving cake capacity of 40.3 cu. ft. New and unused.

500-gal. Over-driven M.S. MIXING VESSEL. M.S. pressure filter, 4 ft. 3 in. diam. by 5 ft. 3 in. overall height.

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WELDED VESSELS of all types, in mild steel or stainless Fabricated to customer's specifications.

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We specialise in "MORWARD" "U" shaped TROUGH MIXERS and Drying Units in sizes up to three tons. Horizontal or vertical, jacketed or unjacketed made to requirements.

One 3 ft. 6 in. PEBBLE MILL by LINATEX, in excellent condition. Motorised with inching switch.

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Large selection of MONO and other PUMPS in stock, 2 in. to 5 in. New and second-hand.

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NEW ROTARY LOUVRE DRIER by Dunford & Elliott, 25 ft. long by 7 ft. 6 in. diam. Shell, ¼ in. M.S. M.S. radial louvres, ¼ in. stainless steel double tangential louvres and feed cone. Inside of shell and both sides double louvres sprayed 0.002 in. zinc covered by 0.006 in. aluminium. Drum carried on two roller paths and driven through girth gear and pinion from worm gear reduction box and 15 h.p. motor. Inlet and outlet centrifugal fans, exhaust fan metal sprayed and inside of casing lithcoted.

DRYING INSTALLATION, comprising Rotary Louvre Drier by Dunford & Elliott, approx. 14 ft. 6 in. long by 3 ft. 6 in. diam. Motor driven through girth gear and pinion, timber enclosed bucket feed elevator, conical feed hopper, cyclones with bagging-off outlets, timber constructed vibrating screen, motor-driven suction and exhaust fans, and coke-fired furnace.

POSITIVELY DRIVEN SINGLE ROLL EDGE RUNNER MILL by Torrance, 6 ft. diam., totally enclosed with dust cover, drive by 12½ h.p totally enclosed Crompton Parkinson motor, 400/3/50, through 11 vee-belts. Driving shaft speed approx. 75 r.p.m., roller speed approx. 20 r.p.m.

HIGH OUTPUT DISINTEGRATOR by British Rema. Chamber 34 in. diam. by 10 in. wide with two sectional screens having ½ in. slots providing screening surface of 400 sq. in. Centre rotor fitted eight heavy swing hammers driven direct from vee pulley. Circular hinged inspection door exposing whole of mill; 8 in. sq. flanged inlet in top of casing.

THREE SIFTER/MIXERS by Young, mixing trough 64 in. by 21 in. deep, fitted broken scroll agitator, bottom centre slide discharge. Blending chamber feeds material to positive action brush sifter mounted over mixing chamber. Drive by fast and loose pulleys.

OVERDRIVEN HYDRO EXTRACTOR by Broadbent, 3 ft. diam. by 16½ in. deep. Galvanised basket with cone-type bottom discharge.

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JACKETED AUTOCLAVES OR VACUUM OVENS—8 ft. by 5 ft., 8 ft. by 4 ft., 7 ft. by 4 ft. and 7 ft. by 3 ft. 6 in. diam.

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1,500-gal. **ALUMINIUM CYLINDRICAL ENCLOSED TANK.**

LABORATORY FILTER PRESS—9 in. sq. plates and frames, with pump.

UNUSED ELECTRIC STIRRING ARMS—24 in. long, 400/3/50.

JACKETED "U"-TROUGH MIXER—6 ft. 3 in. by 2 ft. 3 in. by 2 ft. 7 in. deep.

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"ALLEN" CONDENSERS—300 sq. ft. brass tubes. Ditto by **"WEIR"**—105 sq. ft.

100-gal. **STAINLESS STEEL JACKETED MIXING PAN.**

PUMPS, BOILERS, HYDROS, STILLS, DRYERS, CONVEYORS, ETC.

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2—Ditto. Lead lined.

NEW—12 in. **CAST-IRON FLANGED PIPING.** 600 lengths, 12 ft. and 9 ft.; 200 lengths, 4 ft. to 6 ft. Class "B" flanges, Table "C."

2—**HIGH-PRESSURE AIR RECEIVERS,** each 12 ft. by 6 ft. diam. 1 in. plate. 260 lb. per sq. in. working pressure.

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7—**WELDED VERTICAL MILD STEEL VESSELS,** each 9 ft. diam. by 11 ft. 6 in. deep. (Cone based.)

3,000 ft.—**2 IN. BORE ALUMINIUM PIPING.** Flanged, 3/16 in. thick.

1,800 ft.—2¾ in. **BORE STEEL FLANGED PIPING.** 3½ in. o/d in average 18 ft. lengths. Ideal for acid as ⅜ in. thick.

100 Tons **MILD STEEL PLATES.** All sizes.

MADEN & McKEE, LTD.,
317, PRESCOT ROAD,
LIVERPOOL, 13.

HEILBRON.—Offers are invited for 'Dictionary of Organic Compounds,' edited by Heilbron and Bunbury, 1943 edition, in three volumes, published by Eyre & Spottiswoode. Vol. I, new revised edition; Vols. II and III, reprinted with 1943 supplement. The volumes are unmarked, practically unused, and are of considerable value for reference purposes. **BOX No. C.A. 3292, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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WORKING NOTICES

THE Proprietor of British Patent No. 621,897, entitled **"METHOD AND APPARATUS FOR SEPARATING GASES OR VAPOURS FROM MIXTURES THEREOF,"** offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14E. JACKSON BOULEVARD, CHICAGO 4, ILLINOIS, U.S.A.**

THE Proprietor of British Patent No. 644,743, relating to **"IMPROVEMENTS IN THE PURIFICATION OF SELENIUM,"** is desirous of entering into negotiations with one or more firms in Great Britain for the purpose of exploiting the invention either by sale of the Patent Rights or by the grant of licences on reasonable terms. Interested parties who desire further particulars, should apply to **W. H. A. THIEMANN, PRESTIGE HOUSE, 14 TO 18, HOLBORN, LONDON, E.C.1.**

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York House, 12 York Street Manchester.

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EXPORTS

LATIN AMERICA.—A $2,500 million export market must be approached in the buyer's own language. Specimen copies of the Spanish and Portuguese editions of **INDUSTRIA BRITANICA,** the leading British monthly trade journal covering these nineteen Republics, together with details of free translation service available on request to: **INDUSTRIA BRITANICA, BOUVERIE HOUSE, FLEET STREET, LONDON, E.C.4.**

INDEX TO ADVERTISERS IN THIS ISSUE

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