THE Chemical Age

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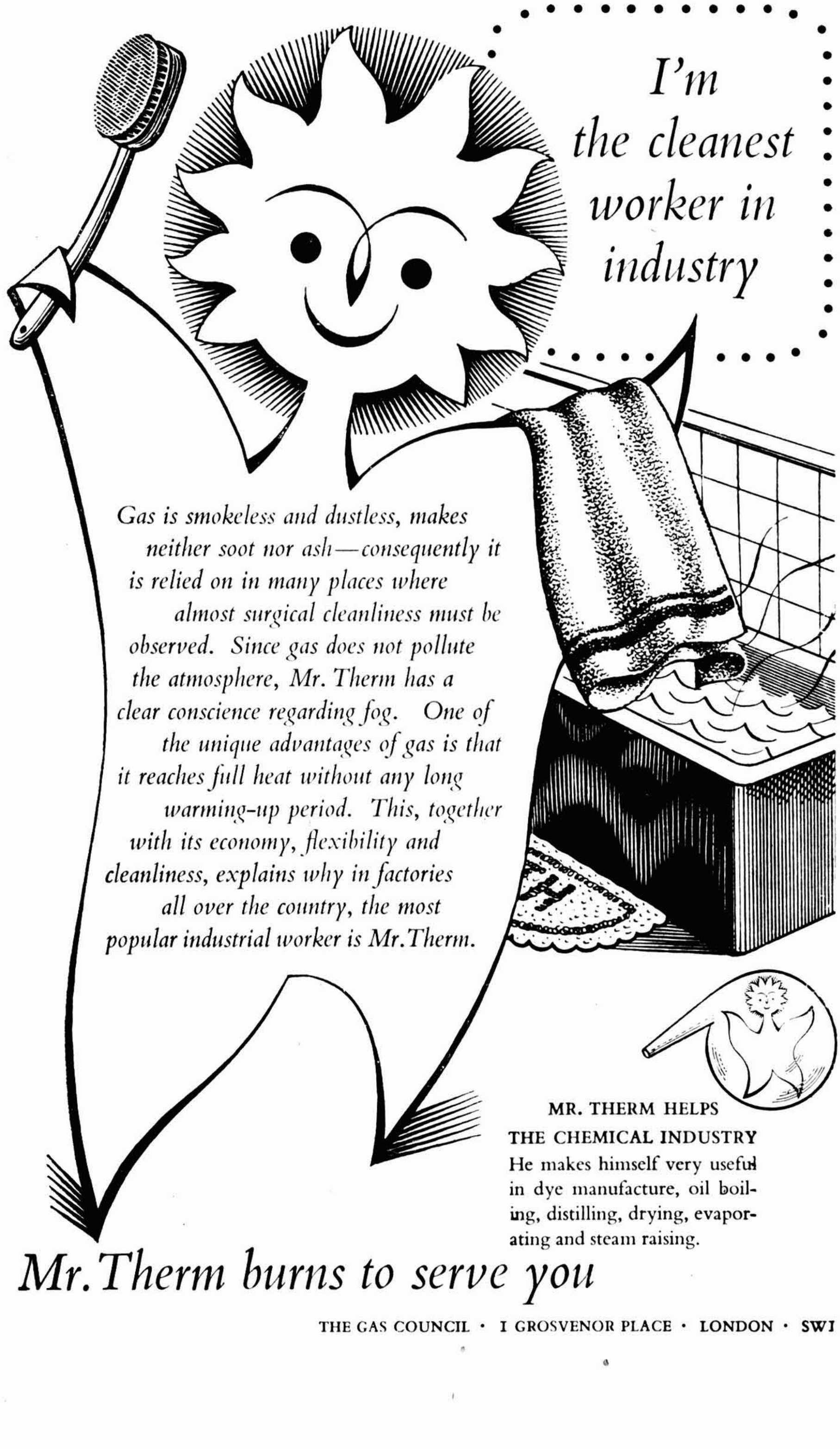
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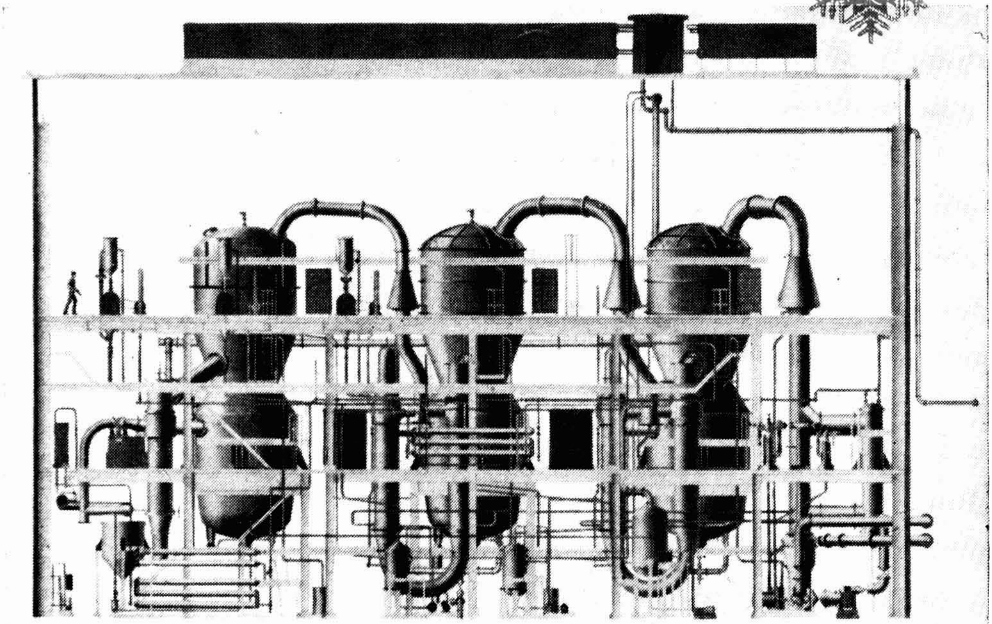

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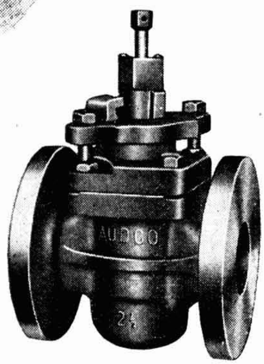
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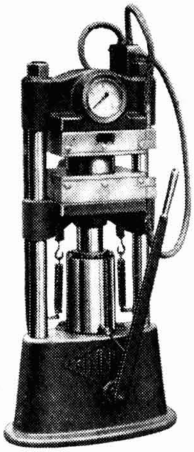

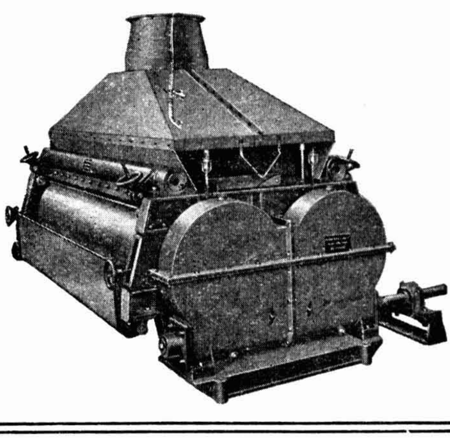

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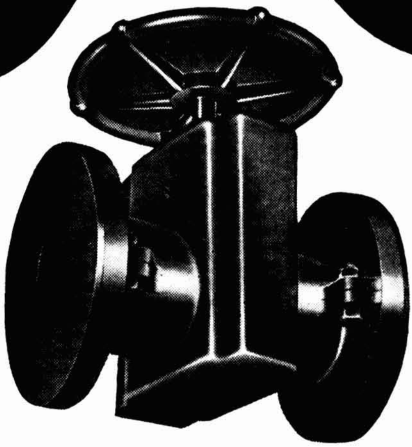

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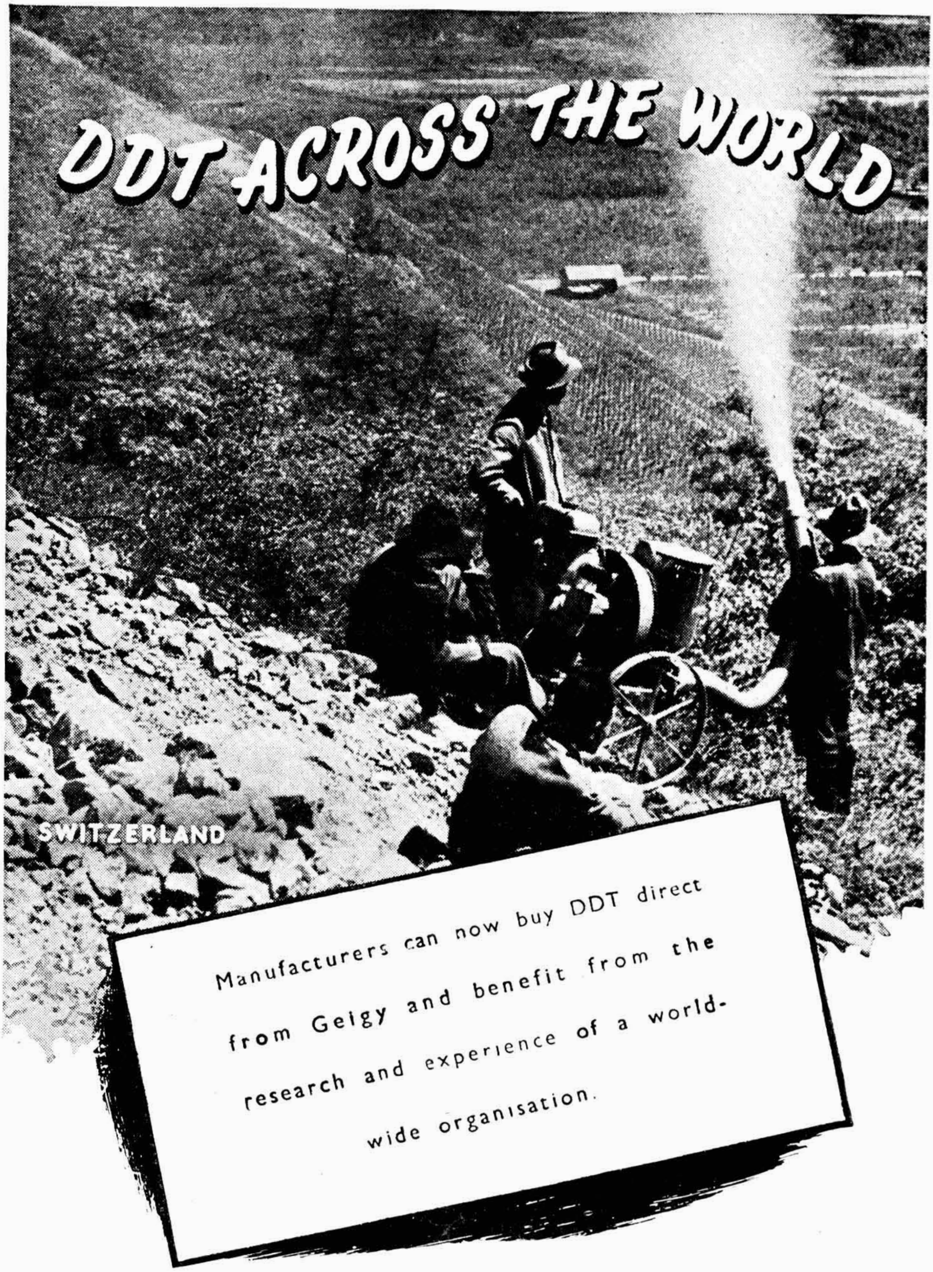
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Scientific India

SCIENTIFIC development has been one of the most prominent features in the policy of independent India. There is a natural aptitude for science in the Indian character, not to be statistically disregarded simply because educational opportunity has been given to so minute a proportion of India's millions. The expectation of life in India is still short but despite this one of the outstanding qualities of Indian thought is patience; another quality commonly displayed is acute flexibility of thought, and theories and ideas are put through their speculative paces with a zest that is sometimes almost dangerously volatile. A strong alliance of these two qualities is by no means rare, and they are first-class qualities for creative science. Nor should another common quality in the Indian character be disregarded—a love of learning for its own sake. In terms of human potentialities the foundation for great scientific progress has long existed in India.

The last war fostered the cause of science in India no less than in other countries. In 1940 the Board of Scientific and Industrial Research was formed with the principal aim of making greater use of India's own material resources; later this became the Council of Scientific and Industrial Research. Youthful though it was in 1947 when India achieved independence, the CSIR was looked upon as one of the most valuable heritages of British stewardship passed on to the new republic. Since 1947 11 national laboratories have been established under its *aegis*. These cover all the technological subjects of importance to India. A realistic appreciation of what this rate of achievement means is to be gained from a recent article by the late Dr. J. W. McBain's widow describing the building and development of the first of these establishments, the National Chemical Laboratory at Poona (*Chemical & Engineering News*, 1954, **32,** 604). Dr. McBain was appointed Director before building began. On his arrival in India in 1949 there was still no laboratory, only a 475-acre site with foundations and a few basement rooms constructed. However, what India lacked in mechanised building equipment she did not lack in labour, and a multitude of men and women enabled the new National Chemical Laboratory to be officially opened early in 1950—'with actual doors which would open, though when Prime Minister Nehru opened them he found a laboratory open to the sky.' But eventually a 200-room laboratory building was completed, and the no less difficult task of turning it into a research centre began.

Dr. McBain had to overcome the tendency for scientists to work in isolation; and even if the caste system had been legally abolished by the Nehru Government, its effects and deep-rooted habits still strongly operated. Yet these barriers to organisation and the team-work necessary for planned research were swiftly eradicated, first by the initiation of a cafeteria (to introduce the 'tea-club' mixing that has long been one of the anti-isolation forces in Western research centres), and second, by the formation of a social centre open to all employees that 'at one stroke cut across caste, religious differences, racial prejudices, and social status.' Many who know India well may reasonably believe that only the stronger force of personal dedication to science could have so readily dispersed the forces of tradition. Even so, Dr. McBain tried every possible source including the Government for funds to build a club-house centre and in final failure paid for one himself! Great devotion to, and aptitude for, science is ironically blended with the age-old problem of pulling oneself up by the boot-straps. This is typified, too, by the inability of young Indian scientists to carry out simple repair work on apparatus. Previous upbringing has rarely brought the opportunity of tinkering with gadgets or toys and the idea that some of the simpler repair jobs could be personally tackled is not instinctively present.

The story of development is brought up to date by an account published this month (*Nature*, 1954, **173,** 422) of the opening of new buildings at the Central Laboratories for Scientific and Industrial Research, Hyderabad. This centre was first projected in 1944 but the plans for a permanent and modern building were not approved until 1949; even now, almost five years later, only the first stage has been completed, providing a floor area of 86,000 sq. ft. including pilot-plant buildings and an electricity sub-station. The Hyderabad centre will particularly serve the needs of South India and generally carry out developmental research of an industrial nature. Dr. Zaheer, the Director, has emphasised that the main activities for some years to come will be the adaptation of the already known and not the pursuit of new discoveries and inventions. There are some ten sections—Fuel, Heavy Chemicals, Ceramics, Physical Chemistry, Oils, Biochemistry, Organic Chemistry and Drugs, Paper and Fibres, Entomology, and Chemical Engineering. In the British view this may be almost too catholic an admixture but it would no doubt be unreservedly approved by the Americans who have had more experience of multi-technological organisations.

It would be wrong to assume that much of the Indian work in technology concerns itself with stages of development long superseded in Western industry. The research programmes are boldly planned. Thus, the Fuel section has a 25-tons per day Lurgi low temperature carbonisation plant, the first in India and set up to test not only Hyderabad coals but coals and lignins from other parts of India. The biochemistry section has been studying citric acid production using *Aspergillus niger*, and the organic section the production of vanillin from paper-pulp wastes. The solvent extraction of oil-cake has been studied by the chemical engineering section. This is a brief and random selection of projects. How far India can in fact short-cut the technological journey remains to be seen, but one can anticipate that introducing these up-to-date processes to industries generally much less advanced than their Western counterparts will be far from simple. There is the risk that only one or two of the largest Indian companies will be able to benefit from this nationally conceived research. There is a wide variation in the capacities of British firms to absorb new technological methods, as the Manchester survey has shown (see THE CHEMICAL AGE, 1954, **70,** 609), but by comparison the gap between CSIR research and Indian industry must be a gulf. Yet there is more to be said for boldness than caution, and India's basic quality of patience will no doubt balance the disappointments and frustrations of haste.

That these developments have already raised new problems of 'scientist-employment' in India is perhaps to be expected. The Indian journal *Science and Culture* (1954, **19,** 319), discussing a presidential plea made at the recent Hyderabad Science Congress for a uniform system of graded remuneration for scientists, has pointed out that the huge expansion of the National Laboratories has created a new level of economic reward in which key-positions are as well paid as any positions in the civil service and far better paid than positions of at least similar status in the universities. This is leading to the absorption of the best trained and qualified men, leaving only idealists and third-rate scientists for the universities. Industry, too, is finding that it must offer higher salaries to attract the competent. This situation of worsening imbalance between technology and pure science may not be without virtue; inasmuch as India's basic needs are the application of the already known, it is a development in the right direction. Its grave weakness lies in the damage it may do to teaching, for whether science is applied or pure it must have its steady flow of recruits.

Beyond any doubt a scientific India is finding her feet, and the Western nations will be imprudent and improvident if they fail to offer the maximum possible encouragement.

Notes & Comments

With a Pinch of Salt

THE recent paper in *Chemistry & Industry* on road problems caused by snow and ice (1954, 230) could hardly have appeared more topically; it had not appeared many hours before the BBC was announcing blocked roads and advising motorists to use chains. To many readers the amount of scientific study given to this wintry subject will have come as a surprise; certainly there seems a very scanty application of all this knowledge by many local and county authorities, especially in the South and South-West of England. Chemical methods of tackling ice-bound or snowbound roads seem to have had less study than mechanical methods. It is said that no known chemical substance is completely satisfactory. Suitable substances are chlorides of sodium, calcium, and magnesium, sodium nitrite, and sodium benzoate. Of these only sodium chloride is significantly used in Britain; in view of our abundant salt deposits and salt's low cost this is an obviously sensible predominance. Snow that has not been greatly compacted by traffic can be softened by salt at a rate of 1/80 lb. per square yard of road surface per °Fahr. of frost; the softening secured will enable low density traffic to remove the snow cover. Salt spreading should not be continued, however, when a falling temperature reaches 20° Fahr. Obviously salt's effectiveness depends considerably upon its prompt application after a snowfall. Few local authorities would be equipped to distribute salt on more than a small proportion of their roads before compacting by traffic had become general. This suggests that the use of salt should be strategic rather than general. Salt could be swiftly applied to selected major roads immediately a snow cover has established itself; and it could also be reserved for selected troublesome roads, especially residential hills, where the normal traffic load is small, and where delay in application will not have allowed undue compacting to have taken place.

And a Peck of Common Sense

WITH hard snow layers, salt is much less effective and the amount needed to improve conditions makes this chemical approach more expensive. Spreading abrasive materials like ashes, sand, etc., to minimise the skidding risk is then the best treatment, but it is recommended in the paper that salt should be added at a rate of 1 part to every 25 of abrasive material. We doubt whether this is at all widely practised in Britain. The risk of damage to road surfaces by using salt seems small. There is some risk with new and low quality concrete surfaces; but on other surfaces there is none. The Road Research Laboratory reports a total absence of damage as a result of using salt at the rates recommended. On the whole, this seems to be a thinly exploited chemical development. What are the actual tonnages of salt used in this country in snowy winters? The salt industry probably has a fairly accurate tonnage picture. Presumably the industry closely follows these RRL research investigations, and takes steps to see that local authorities are also made aware of the results. We make these comments in a state of considerable ignorance, knowing little more than the obvious fact that much too little is done to improve snowbound road surfaces by most authorities.

Popular Version

IT lies in front of us; on the cover, father, mother and small son stand in a field of daisies before a windy sky, across which is scribbled 'Good for us!' Almost certainly, it is a brochure for an insurance company or a building society. We open it: two or three Mervyn Wilson cartoons and the words 'It was raining . . .' persuade us to read the first paragraph, at the end of which we find it to be about—the American heavy chemical industry. It certainly seems to be unusually light reading for its subject and at the end of the page the admonition 'Read on and judge for yourselves . . .' with its echoes of the magazine serial story, is almost tempting. After all, there are only four or five pages, and the little sketches are most cunningly distributed, so that we are compelled to read the paragraphs surrounding them, to find out what they are really about. Workers in the chemical industry in America certainly seem to enjoy the good things of life, but there is no denying that they also seem to be keener about their jobs; this, no doubt, is a result of the intense competition they have to endure, which must make life rather trying at times. But the managements also appear to be keener, and always ready to introduce labour-saving machinery—there's certainly something to be said for American methods. Now here is a list of 20 recommendations for British industry, addressed to the manufacturers, the unions, and the trade associations. They look very reasonable, and quite easy to carry out. A few of these pamphlets, distributed at the next meeting of the board of directors, works committee, or shop stewards, might have far-reaching effects. It is so straightforward, so simple, that the lessons it tries to teach are obvious. Any number of copies of the pamphlet are obtainable, at sixpence each, from the ABCM at Cecil Chambers, 86 Strand, London, W.C.2.

The Popular version of the Report of the Heavy Chemicals Productivity Team (1953) is published under the ægis of the Joint Steering Committee formed by the Association of Chemical & Allied Employers, the trade unions, and the Association of British Chemical Manufacturers.

Experimental Plant

Organisation of Pilot-Stage Research

A MEETING of the North-Western Branch of the Institution of Chemical Engineers was held at Manchester on 13 March, when Dr. H. J. Thurlow presented a paper, 'Description and Uses of a Research Experimental Plant.'

Dr. Thurlow described the research experimental plant as an organisation to test and improve the practicability of a laboratory process. A new process may be passed to the works staff for production, it may be improved on the experimental plant until it becomes a practical production process or it may be sent for further laboratory investigation.

One section of the plant manufactures new products which await a production plant for large-scale manufacture. Differing materials are used for the vessels which vary from five to 1,000 gal. capacity. Batch processes predominate, since they readily give data on yields. Pilot plant of a specialised design is excluded from the research experimental plant. The staff give advice on safe and efficient methods of manufacture and they collect physical and plant data for the design of new plants.

Heavy equipment such as filter presses, centrifuges and dryers is placed on the ground floor of the buildings, reaction vessels are placed on the second and third floors. Gravity flow is used where possible, but nitrogen is used to convey slurries by pressure blowing. The vessels are not re-grouped for different processes, but remain static and are connected as desired for different processes. The vessels have enamelled liners and enamelled agitators; glass piping and glass condensers are used to resist corrosion, so that metallic contamination of the product is avoided. Plant is re-constructed only if the change is necessary to make a process work successfully.

The staff is organised to plan the investigation of difficulties of plant operation, the packaging and despatch of products, the safety and cleanliness of the operations, the testing of the quality of products and tests for the completion of reactions.

The transfer of a laboratory process is discussed with the research chemists and suitable plant is detailed for use. When the process is efficient, it is costed, the technical details are reported, the specification for the plant is made and the process is transferred to a production department.

Most of the problems are physical, e.g., the flow of solids, liquids and slurries to and from a reaction vessel, efficient filtering, purifying and drying the products. Simple indicating and recording instruments are used; complex and automatic control instruments are unsuitable for the work. Careful measures regarding health, fire and safety are enforced.

After a keen discussion of the paper had taken place, a hearty vote of thanks was given to Dr. Thurlow.

The Analyst & the Food Industry

Memorial Lecture at Annual General Meeting

THE 80th annual general meeting of the Society for Analytical Chemistry was held on Wednesday, 3 March, in the Meeting Room of the Royal Society, Burlington House, London, W.1, with the president, Dr. D. W. Kent-Jones, F.R.I.C., in the chair. The financial statement and report of the council for the past year were submitted and approved. The membership of the society was now 1,646, an increase of 54 over last year (it was reported). Eight ordinary meetings were held during the year, six in London, one in Glasgow, and one in Southampton. In addition a joint meeting was held in London with the Royal Institute of Chemistry. Eighteen meetings were held by sections and groups.

The following officers and members of council were elected for the forthcoming year—*President*, D. W. Kent-Jones. *Past-presidents serving on the council*: Lewis Eynon, G. W. Monier-Williams, J. R. Nicholls and G. Taylor. *Vice-presidents*: C. A. Adams, A. J. Amos and T. McLachlan. *Honorary treasurer*, J. Hamence. *Honorary secretary*, K. A. Williams. *Other members of council*: D. C. M. Adamson, A. L. Bacharach, R. C. Chirnside, Miss M. Corner, D. C. Garratt, J. Haslam, C. L. Hinton, H. W. Hodgson, H. M. N. H. Irving, A. G. J. Lipscomb, R. E. Stuckey and C. Whalley. *Ex-officio members*: T. W. Lovett (chairman of the North of England Section), R. S. Watson (chairman of the Scottish Section), A. M. Ward (chairman of the Microchemistry Group), A. A. Smales (chairman of the Physical Methods Group) and L. J. Harris (chairman of the Biological Methods Group). *Honorary assistant secretary*, N. L. Allport.

Bernard Dyer Memorial Lecture

The annual general meeting was followed immediately by the Bernard Dyer Memorial Lecture given by Dr. E. B. Hughes, F.R.I.C., and entitled 'The Contribution of Public Analysts and Other Analytical Chemists to Public Welfare.'

Dr. Hughes said that the analyst had chosen a career that necessitated careful and accurate work, requiring the application of any scientifically controllable means of pursuing an inquiry. Analysis was not merely the handmaiden of industry—although it was sometimes regarded as the Cinderella of industry—it was essential both for control and for research.

Much had been learnt about the effects of trace elements on plants, but less was known of the effect of the beneficial trace elements on humans. The use of chemical pesticides led to anxiety about the possible effects of their residues on crops. These problems were even more urgent than the precise specification of known methods of analysis to meet the requirements of standards and limits of contaminants in foods.

Worthy of Higher Recognition

Without analysis in the manufacturing industries, rule of thumb would be the only guide, and faulty products and irregular quality would be commonplace instead of rare. The key position occupied by analysts in every industry was worthy of wider recognition. It had been said that when trade became bad, the laboratory staff should be doubled, and the same was true in the present paramount need for expansion of trade. Dr. Hughes suggested a symposium on Analysis in Science and Industry to describe what analysts did rather than how they did it. He emphasised that industry, the trade associations, the economists and the Government must be told something of the study and zeal that lay, largely hidden from them, in the analysts' contribution to the prosperity of industry and of the nation.

Dr. Hughes then referred to the work of the public analysts, with whom food chemists had much in common. The first Food and Drugs Act of 1872 was only implemented because there were in practice a few analysts who had the wisdom and foresight to unite to share their knowledge, and they formed, in 1875, the Society of Public Analysts.

It was common, in referring to the Act of 1872, to relate harrowing stories of openly fraudulent and sometimes harmful adulteration of food in the early 19th century, but even then there were in existence food manufacturing firms whose names were still household words and who were as honour-able then as now. Although those days were past, and public analysts' work was now more prosaic, it was still essential for the detection of the infringement of standards and regulations.

The manufacturer needed more stringent testing of his raw materials than was required by the Food and Drugs Act. He must not leave anything to chance, and although analysis showed samples to be generally satisfactory, the occasional faulty sample must be looked for.

Protection & Guidance

A markable, effective and just Food and Drugs Act was necessary to protect the public and to guide the responsible manufacturer. The Minister of Food had widely and generously interpreted the requirement in the 1938 Act that he should consult with representative organisations as he thought fit. The new Food and Drugs Amendment Bill appeared to imply much more control, but much could be gained from clearly stated needful and useful Regulations. If methods of analysis were to be prescribed, it was to be hoped that they would be approved and preferably produced by the Society, and that they would be subject to review as circumstances required.

He was glad to pay a tribute to public analysts for their co-operation with food chemists. The public analysts had relinquished their claim on the name of the society and had generously accepted the changes necessitated by the many and expanding interests of the society. In the new Association of Public Analysts it was to be hoped they would find all the professional status and recognition that was their due, but above all it was hoped that they would continue to support this society and maintain their close scientific contact with the food chemists.

In this age of manufactured food, supplied to countryman and townsman alike, the objective of the food chemist was to ensure that it should be wholesome, nutritive, attractive and pleasing, and capable of withstanding the exigencies of distribution. Their first duty was to maintain, and if possible to enhance, the reputation of their firm's goods. In this respect the food chemist—one of the 'other analytical chemists'—was as much, perhaps more, a contributor to public welfare than was the public analyst; more so, because his object was not merely to find evidence of harm or infringement of law or regulation, but definitely to prevent such mischance.

To a food chemist a raw material must not only be genuine or pure, it must also have other qualities or characteristics of importance in its intended use. Constant application of analysis and microbiological examination, detailed specifications of the care required in manufacturing processes, advice on packing, and tests and inspections to verify the observance of these specifications, were essential.

During such intensive examination, data that would not come to light in casual inspection became available. The care that a food manufacturer took to avoid contamination he naturally required also of the suppliers of the raw materials, and in this alone there was a public benefit.

In recent years the food chemist had been called the food technologist. This should indicate one whose post-graduate training had been concerned with food and food manufacture, and in the speaker's opinion the analyst, suitably experienced, was the ideal food technologist. However, he should not be restricted to the laboratory bench: he should know something of the functioning of the industrial plant and, when he had special knowledge, he should consult and work with the engineer, designer and architect.

Common Misapprehension

The ethics of the chemist in the food industry must be referred to. It had been suggested that the food manufacturer, for convenience and for profit, made use of 'chemicals,' guided by his food technologists, to the consequent detriment of the consumer. Much had been published to show how far this was from the truth. In fact, a joint request had been made by this society and the Food Group of the Society of Chemical Industry to the Ministry of Food to review the Preservative Regulations, and a committee had been formed with terms of reference including not only preservatives but also other chemical additives. It was to be hoped that an unsatisfactory aspect of this subject, the variation between countries as to what was suitable and the amount permitted, would one day be put right by international co-operation.

At the conclusion of the meeting, the president presented the Bernard Dyer Memorial Medal to Dr. E. B. Hughes.

Increasing Phosphorus Production

Albright & Wilson Meet the Country's Needs

AT the end of the war Albright & Wilson Ltd. decided to embark upon the diversification and increase of its business. Decisions were taken which added insecticides, oil additives and certain organic chemicals to established manufactures, and it was decided that a major increase in phosphorus manufacture was necessary, and that a new works must be erected.

Portishead, Bristol, with its docks and adjacent power station was chosen as the site for this important development, and a new phosphorus plant, large in itself and capable of later expansion, was commenced in 1951. The plant was opened at the beginning of February (THE CHEMICAL AGE, 1954, **70**, 428).

It is expected that much of the output will be used to make sodium tripolyphosphate for incorporation in non-soapy detergents. As facilities are not available at Portishead, or at the company's main works at Oldbury, another new works has been erected at Kirkby, near Liverpool, and production is already in progress there.

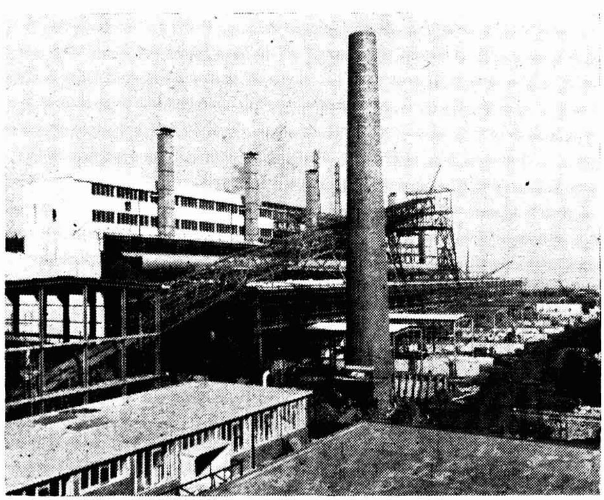
The factory will have a capacity of over 40,000,000 lb. of phosphorus and it is so designed that production can be greatly increased at short notice should additional capacity be required. The capacity of the plant will be greater than the current UK production and should be sufficient to meet the country's needs for many years to come.

Phosphorus produced at Portishead will be transported by rail in special 24-ton tankers to the company's new works at Kirkby, where it will be converted into phosphoric acid and sodium tripolyphosphate. In the last five years there have been very large imports of sodium tripolyphosphate from the Continent. The output from these new plants will entirely replace these imports, which in 1953 amounted to over £2,000,000 in value. Sodium tripolyphosphate is an important component of non-soapy detergents which are today so widely used in the home.

Phosphate rock, which is the main raw material, is shipped principally from North Africa. The rock is fine and because of this characteristic is eminently suitable for handling by pneumatic plant.

Two suction pumps have been installed, each with a 330 HP motor, and these can operate simultaneously from mobile carriers in two holds of the same vessel or in two ships. Although grain has been coming for some time now in bulk, and experiments have been carried out with sugar, this is the first time that phosphate rock has been handled in this manner. Several ship loads have been unloaded.

In the same manner, another of the raw materials, anthracite, is unloaded. Granite



A view of the new factory in the course of construction chippings are brought in by rail and unloaded by wagon tipper on to the same band conveyor as the phosphate rock and anthracite. This leads up to a bank of storage silos which comprise eight 100 ft. high circular storage bins in which the rock is stored. The inter spaces are used to store the granite chippings and the anthracite. The silos have a total capacity of 24,000 tons.

The unloading of the cargo vessels and the transferring of the raw materials is carried out automatically. No mistakes are possible in the unloading and each material must go into its correct storage bin. All the band conveyors are inter-locked electrically, and should any mishap occur, the workmen controlling any section of belt can switch off the power at any point. This automatically stops that particular belt and any that come before it. Those behind it clear any material that may be on them before they stop.

All the materials are dried before being automatically weighed and mixed. Waste gases from the furnaces are used in the calciners. By conveyors the mix is carried into hoppers above the furnaces, and from there is fed by gravity into the furnaces.

Six Reduction Furnaces

The furnace house has a bank of six electric reduction furnaces, each capable of taking a load of 7,500 kW. Each furnace has its own control room, the electrical control gear automatically maintaining a constant furnace load irrespective of variations in internal conditions within the furnace.

Periodically each furnace is tapped and the slag runs out into covered ways. Any fumes that may be emitted during this process are extracted by fans and discharged into high chimneys.

The phosphorus vapour mixed with carbon monoxide is continually drawn off, and passes through dust extractors to condensers. The carbon monoxide is returned either to the calciners or to the steam boilers and used as a fuel, and the condensed phosphorus is stored in heated underground chambers and kept in a molten state. It is pumped from here into railway tank wagons and despatched to the tripolyphosphate factory at Kirkby.

The factory has been designed by the engineering staff of Albright & Wilson, but much of the work of construction has been contracted out as follows:—

Civil engineering and building contracts, detail design and construction of plant and buildings—Simon Carves Ltd.; steel work construction, fabrication and erection—Redpath Brown Ltd.; wharf construction—Charles Brand; pneumatic unloaders—Simon Handling Engineering Ltd.; furnace shells and bunkers—Horsehay Co. Ltd., Wellington; boiler installations—Edwin Danks & Co. (Oldbury) Ltd.; carrying and handling equipment—Simon Carves Ltd.; various vessels—Widnes Foundry Ltd., and Newton Chambers Ltd.; effluent treatment—Dorr Oliver; pipe work installation and plant installation—Matthew Hall; electrical equipment—G.E.C., English Electric, and Reyrolle Ltd.; electrical installation—South Western Electricity Board; storage batteries—Exide; Mulsifyre equipment—Mather & Platt; boiler settings and chimneys—Sykes; electrical precipitation—Simon Carves Ltd.

Metals Mission to USA

THE European Productivity Agency of OEEC is organising a mission to the United States to study the manufacture and use of high purity metals. Special attention will be given to barium, beryllium, germanium, titanium, tungsten, molybdenum, manganese, nickel, cobalt, selenium, tantalum and zirconium. In Europe the development of processes for the economic production of at least some of these metals lags far behind that of the US.

The mission's study (in connection with these metals) will be focused on the following aspects: manufacture of compounds or concentrates for the production of pure metals; manufacture of the pure metals by various methods; analytical processes, testing, impurities, etc.; and processing of pure metals and alloys and their application.

It is proposed that the UK will be represented on the mission, but it is not yet known how many places will be available. The programme of visits of the mission will last approximately four weeks, with a tentative starting date towards the end of June. The cost to delegates will be about £300 each. Firms or individuals interested in the mission should address inquiries to the Board of Trade, IM2 Division, Horse Guards Avenue, Whitehall, London, S.W.1. (Tele.: TRAfalgar 8855, ex. 2740 or 2741.)

Royal Society of Arts

Its Notable Contribution to the Chemical Industry

THIS week marks the bi-centenary of the Royal Society of Arts, a society whose achievements have done much to advance the frontiers of chemical science. Its story has its formal beginning at Rawthmell's Coffee House, Henrietta Street, Covent Garden, on 22 March, 1754. Coffee houses played a highly important part in 18th century London. They were embryo clubs where, for the price of their coffee, customers could read the newspapers and talk by the hour.

Each house acquired its distinctive clientele. The coffee houses of Covent Garden and Temple Bar were favourite resorts of authors and wits; but Rawthmell's was also favoured by learned doctors, like George Mead, physician to George II, and by several men of science who were Fellows of the Royal Society.

The founder of the Society of Arts was William Shipley (1714-1803), an obscure drawing master of Northampton. He had noticed that the Northampton Horse Fair derived its success largely from its Royal patronage and from the generous as well as numerous prizes which it offered to competitors. With this example, he formed the opinion that, if similar encouragement could be given to the arts, sciences and manufactures, it would have an invaluable influence on the life and prosperity of the people. Armed with a letter of introduction to the Rev. Dr. Stephen Hales, F.R.S., physiologist and inventor, he left for London. Dr. Hales welcomed the proposals and promised to mention them to various influential London friends. Shipley later published a leaflet entitled 'Proposals for raising by subscription a fund to be distributed in premiums for the promoting of improvements in the liberal arts and sciences, manufactures, etc.'

Peers Lent Support

Doubtful of the success of his project, if he remained in the provinces, Shipley returned to London to live there permanently. After three months' vigorous canvassing in the capital, he had only 15 promises of support, but among them were those of Lord Folkestone and Lord Romney, both of whom were influential and public-spirited men. They became, respectively, the first and second presidents of the Society of Arts.

From 1755 onwards, membership expanded rapidly and within a few years reached 2,500. Within seven years, the society's income reached £4,600 and, considering that it has never received any official aid, the way in which this philanthropic society has stood on its own feet from the start is surely a great tribute to and vindication of the public spirit of the British people.

Success Earned

The progress of the society from 1755 onwards was not a fluke, but the direct result of careful and economic management. Total receipts for the years 1755 to 1763 were £22,295, while total expenditure was £18,756, of which £8,500 went in money prizes and medals, and £3,500 on a special grant for a system of land carriage for fish.

Personal cleanliness was not a characteristic of the 18th century, but our ancestors had a good excuse for their condition in the scarcity and high cost of soap, due to the shortage of alkali. The alkali then most commonly used in the making of hard soap was 'barilla,' prepared from the ash of various plants growing in or near the sea, the richest in soda ash being the Spanish kali (hence the word 'alkali'), of which large quantities were imported. The society therefore endeavoured to establish this plant in England and also to encourage the making of soda ash of a stronger alkaline content than had so far been achieved from native kelp or seaweed.

A more successful if less important effort of the society was its encouragement of the production of medicinal rhubarb, which it was persuaded to undertake by Robert Dossie in 1760. The difficulty here was that the Chinese, who had a monopoly of rhubarb growing, had long seen to it that the seeds of the 'true' rhubarb were safely kept behind the stone curtain of the Great Wall. Sir Alexandra Dick, President of the Royal College of Physicians of Edinburgh, got into touch through his brother-in-law, the British Resident at the court of the Czar of Russia, with a Dr. Mouncey, the Czar's chief physician, and persuaded him to get a box of the seeds smuggled out of China. Shortly afterwards, a medal was awarded to Dr. Mouncey by the Royal Society of Arts.

Besides the raw materials which are obtained out of the ground by the process of vegetation, there are those which have to be won from it by mining and in these also the Society took a considerable interest.

One of the first two objects for which it offered a prize was the discovery of a cobalt mine in Great Britain, and the other was for the planting of madder. Cobalt ore was required for the production of its silicates, zaffre and smalt, which impart a beautiful blue to glass and were also used at that time for the making of 'powder blue' for washing linen.

Whale Oil Purification

One further source of raw materials which the society did not overlook was the sea. Until the exploitation last century of mineral oils, the most promising source of oil then known was the whale. The society's efforts in this connection were directed to two main ends: in the first place it quickly seized upon the importance of the gun harpoon as a means of increasing the catch of whales; it was the means also of introducing a method of purification of the oil in order to make it fit and pleasant to use.

From its earliest days, the society has consistently stood for humanitarian principles at a time when even the most enlightened people were insensitive to the welfare of the workers. One of the first trades to which the society turned its attention was water-gilding, a process in which gold is deposited by applying it as an amalgam with mercury and then volatising the mercury by heat. The consequent mercury vapours are extremely poisonous, and in 1771 the society began to offer a prize for some form of protection against them. In the same year, an award was made to J. Hills, for inventing an apparatus which drew off the vapours on the same principle as the familiar fume chamber of a chemical laboratory.

Several other respirators and similar devices figured in the list of awards. One made in 1827 was for a simple metal gauze face-guard for the protection of foundry men. A device which embodied all the principles of the modern gas mask was awarded a large silver medal and 50 guineas. The inventor had volunteered to endure an inferno of heat and smoke and emerge unharmed from a special chamber erected inside the shell of a partly built house in Southampton Row.

In 1836, James Marsh produced to the society the famous test now associated with his name for eliminating the danger of arsenical poisoning. The dangers of poisoning from lead paint had also been combated, while in 1805 a gold medal was offered for 'obviating the prejudicial effects of the operation of grinding needles,' the obvious danger being that of silicosis.

Because of the presence of a number of distinguished chemists among the society's members, it is not surprising that in its early years the Chemistry Committee was one of the most important in the society.

The chemicals then in greatest demand for industrial purposes were sulphuric acid and the alkalis, potassium and sodium carbonate. Among the industrial chemicals which figured prominently in the society's first list of offers and awards (in addition to those already mentioned) were borax, saltpetre, verdigris, bismuth and sal-ammoniac.

One of the great factors in the early development of modern industrial chemistry was the pioneer study of the constituents of coal and coal tar. Windsor obtained his well-known patents for coal tar distillation in 1804, and six years later the society awarded a silver medal to B. Cook, of Birmingham, for his distillation process by which he obtained a 'volatile oil' and a 'residuum' equal to the 'best asphaltum.'

Premiums for Dyestuffs

An urgent need of the home textile industry which the society very early tried to meet from the Colonies was dyestuffs, so the first additions after silk to the colonial list of premiums were two dyestuffs, safflower (scarlet) and logwood, for both of which premiums were first offered in 1757. Logwood is a particularly important dark-blue and black dye, so useful indeed that it long survived the introduction of coal tar and synthetic dyes.

In 1758, the society turned to the Colonies to improve the national supply of oil and began to seek in them a much needed source of an important industrial chemical, potash. The obvious remedy was to encourage the manufacture of potash in the limitless forests of North America, and Robert

Dossie well deserved the gold medal he was awarded in 1766 'for effectually acting to establish the manufacture of potash in North America', and the society could feel satisfied that the £900 granted in potash bounties was money well spent.

The Royal Society of Arts has been especially fortunate in those who have served it. Among its former chairman of council are many of the most distinguished scientists of their day. Sir Frederick Bramwell, Bart., F.R.S. (1880-1881), Sir William Siemens, F.R.S. (1882-1883), Sir Frederick Absel, F.R.S. (1883-1885), Sir Douglas White, F.R.S. (1908-1909), Senatore Guglielmo Marconi (1924), Sir Thomas Holland, F.R.S. (1925-1926), and Dr. E. F. Armstrong, F.R.S. (1943-1945) are but a few who have added lustre to the society's reputation. Even more numerous, of course, are the men of science who have delivered lectures to the society, some of them returning several times—and a few almost annually—for a number of years. Among them may be mentioned F. Grace Calvert, Silvanus Thompson, Sir William Preece, Thomas Bolas, Sir Ambrose Fleming, Vivian Lewes, Sir William Abney, W. Worby Beaumont and Sir Leonard Hill.

Fitted for Pioneering

A rôle for which the society has been peculiarly fitted is that of pioneer. Having stimulated a lively interest in a particular need and, by means of its premium system, created a body of interested people to supply that need, it has then stepped modestly out of the picture and left to others the glory of bringing a new idea, a new movement or a society into full fruition.

It is of interest to note that Arthur Aiken, an able chemist and for 23 years secretary of the Society of Arts, was responsible for founding the Chemical Society in 1841 and, at a meeting held in the Society's House, he became the Chemical Society's first treasurer and subsequently its president.

In view of its contribution to the course of scientific progress, small wonder that many regard the society's traditional title as a misnomer and claim that a more fitting name would be the Royal Society of Arts and Sciences.

The first official announcement published by the society describes its proposals as a 'Design for the publick Good,' and similar phrases recur in its records as the primary touchstone by which all the proposals brought before it have ultimately been tested.

Throughout its history, the society has performed its service for the community on an entirely independent basis, and its achievements find a worthy place in the chronicles of our time as one of the finest examples of continuous, disinterested, but inspired public service.

Chemical Analysis of Rubber

DURING the revision of BS. 903, 'Methods of testing latex, raw rubber and unvulcanised compounded rubber,' originally published in 1940, it became evident that it would be desirable to issue the revised standard as a number of separate publications. The British Standards Institution have now issued a further document in this series—BS. 1673, 'Methods of testing raw rubber and unvulcanised compounded rubber, Part 2: Methods of chemical analysis.'

Details of the following methods of determination are given: moisture (including volatile matter); acetone extract; acid value; alcoholic-potash extract; rubber hydrocarbon; calculation of rubber hydrocarbon content by difference; nitrogen; total sulphur (Carius method, fusion method and combustion method); extractable sulphur (nitric acid method and copper spiral method); insoluble matter and dirt; ash; wet oxidation; antimony; manganese; copper (over 10 ppm.); iron.

Copies of this standard (price 7s. 6d.), may be obtained from the British Standards Institution, Sales Branch, British Standards House, 2 Park Street, London, W.1.

Duty on PVC Sheets

THE Board of Trade has given notice that it is considering an application for an increased protective duty on articles made wholly or partly of polyvinyl chloride resins or their copolymers, as follows:—Sheets or sheeting of a weight of not less than 12 oz. or more than 35 oz. per sq. yd., not backed with a textile material. Any representations which interested parties may wish to make should be addressed to the Board of Trade, Industries and Manufactures, Division 1, Horse Guards Avenue, Whitehall, London, S.W.1, not later than 27 March.

Oxidation Processes

Programme for Forthcoming Anglo-Dutch Conference

FURTHER information has been made available regarding the joint conference on Oxidation Processes which is to be held from 6-8 May in Holland by the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry together with the Royal Institution of Engineers (Chemical Engineering Group) of the Netherlands and the Royal Netherlands Chemical Society (Section for Chemical Technology). The conference will not be held at The Hague, as previously announced, but in Amsterdam at Koninklijk Instituut Voor de Tropen (Royal Tropical Institute), Mauritskade 63.

A Varied Programme

Professor Dr. H. I. Waterman (Delft Technical University) will preside at the morning session on the first day and after his introductory remarks two papers will be presented—'Oxidations Carried Out by Means of Vanadium Pentoxide Catalysts,' by Dr. P. Mars and Dr. D. W. van Krevelen (Netherlands State Mines) and 'Manufacture of Synthetic Fatty Acids by Oxidation of Paraffinic Hydrocarbons by Oxygen,' by Dr. G. Wietzel (Imhausen Werke).

At the afternoon session, when Sir Harold Hartley will be chairman, three papers will be presented, as follows:—'The Kinetics of Liquid Phase Oxidation,' by Dr. G. H. Twigg (Distillers Co., England); 'The Development of a Process for the Manufacture of *p-tert.*-Butylbenzoic Acid," by R. M. Cole and A. W. Fairbairn (Shell Development Co., USA); and 'Preparation of Cumene Hydroperoxide," by Dr. J. P. Fortuin and Professor Dr. H. I. Waterman (Technical University, Delft).

For the morning session on 7 May the chairman will be Professor Dr. D. W. van Krevelen. Papers to be presented are:—'The Provision of Oxygen for Industrial Processes,' by A. M. Clark (British Oxygen Co.); 'The BASF Process for Production of Acetylene by Partial Oxidation of Gaseous Hydrocarbons,' by Professor Dr. E. Bartholome (Badische Anilin und Soda-Fabrik AG); and 'Gasification of Coal with Oxygen,' by Dr. F. J. Dent (West Midlands Gas Board, Birmingham).

The afternoon session on 7 May will be under the chairmanship of Professor F. H. Garner and papers will be presented as follows: 'Air Oxidation of Benzene to Phenol,' by Professor M. B. Donald and J. C. Glover (London University); 'Oxidation Processes in the Steel Industry,' by W. J. B. Chater (British Oxygen Co.); and 'Nitric Acid Oxidation Design in the Manufacture of Adipic Acid from Cyclohexanol & Cyclohexanone,' by A. F. Lindsay (Imperial Chemical Industries Ltd.).

It is expected that excursions will be arranged for 8 May, one to the refinery of the Bataafsche Petroleum Maatschappij (Royal Dutch/Shell Group) at Rotterdam-Pernis, with a boat trip through the harbour of Rotterdam, and the other to the bulb fields.

The conference language will be English and preprints of the papers will be made available to members of the conference who return application forms before 1 April. Those who wish to attend the conference should inform the Secretary of the British Committee, The Institution of Chemical Engineers, 56 Victoria Street, London, SW.1, as soon as convenient and not later than 1 April.

Canadian Sulphur Project

SHELL of Canada and Gunnar Gold Mines are to collaborate in a sulphur plant project. The former company's present production of sulphur at the Jumping Pound Gasfield, West Calgary, will be more than doubled by the building of a new $500,000 plant producing 11,000 tons a year, all of which will go to Gunnar's for use in its chemical bleaching process for uranium ores.

Gunnar Gold Mines are to build a $1,000,000 plant at Beaver Lodge Mine workings, to convert elemental sulphur into sulphuric acid.

Shell's expanded sulphur programme will be made possible by a sharply increased gas delivery to Canadian Western Natural Gas Co., which supplies Calgary and district.

Pollution of Air & Water

Its Study and Prevention

THE abatement of air and water pollution is increasingly claiming the attention of engineers and works chemists, as a number of news items this week show.

The first award recognising an individual's efforts to advance air pollution control in America was established recently at a meeting of the board of directors of the Air Pollution Control Association held at its executive offices at Mellon Institute, Pittsburgh.

The award is to be known as the Frank A. Chambers Award in honour of the early advocate of the 'engineering approach' to air pollution control problems. The award will be presented at each annual meeting.

Chambers was one of the first technical engineers employed as head of a smoke control bureau and served in this capacity in Chicago for over 40 years. He was executive secretary of the Air Pollution Control Association from the days when it was known as the Smoke Prevention Association until his death in 1951.

The 47th annual meeting of the Association will be in Chattanooga, Tennessee, on 3, 4, 5 and 6 May. Some 600 management executives and other representatives of the industries, research scientists, and air pollution control officials will attend the four-day meeting.

Thirty-five technical papers will be presented covering the subjects of coal, incineration, petroleum, municipal problems, dusts and fumes, steel, odours, measurements, and meteorology.

Significant Progress

America's chemical industry is making significant progress in leading the way to abatement of air and water pollution, according to *Chemical News*, a publication of the Manufacturing Chemists' Association. Expenditures of vast amounts of scientific skill, as well as upwards of $40,000,000 a year on research and corrective measures, are reported.

A new 150 ft. tower in Philadelphia has been built to burn wastes from a chemical plant, it is reported. The flame burns continuously from the top of the tower, representing 'a visible beacon of the industry's interest in protecting and serving the public.'

In Montague, Michigan, what is described as looking like 'the world's largest swimming pool' has been built to settle residual wastes from a caustics plant. The pool is a block square ten feet deep, and has a capacity of 10,000,000 gallons. At Belle, West Virginia, waste gases are treated so that they escape into the air as harmless and odourless water vapour.

Leadership Assumed

Reviewing how the Manufacturing Chemists' Association began its work in this field, *Chemical News* notes that while the industry was not directly blamed for serious situations of pollution existing in the nation, it was felt by the industry that because of its special skills and resources it might well take the leadership in seeking means of abatement. An Air Pollution Abatement Committee was formed in 1949 and has been steadily at work ever since.

Aroused citizens have brought dramatic clean-ups to such communities as St. Louis and Pittsburgh. While results have been, to many, less satisfying in Los Angeles, *Chemical News* notes that more than 600 tons a day of material is now filtered out of the Los Angeles atmosphere. 'Each day 300 tons of sulphur dioxide and 150 tons of gasoline vapours are collected at the oil refineries.

'In addition, at many plants, bag traps, baffle systems, air scrubbers, magnetic cleaners and other types of devices have been installed. New combustion incinerators destroy 50 tons of organic acids daily, as well as 10 tons of aldehydes and 5 tons of oxides of nitrogen, all smog irritants.

'But,' notes *Chemical News*, '800,000 home incinerators and thousands of automobile and truck exhausts remain uncontrolled. Their output, projected against the atmospheric inversion (a layer of warm air pressing down on the ground level atmosphere), which is so common to the Los Angeles area, contributes more than 60 per cent of the smog problem, according to studies made by Stanford Research Bureau.'

Within the framework and as part of the programme of the 6th Liège International Fair for Mines, Metallurgy, Mechanical and

Electrical Engineering, 26 April has been fixed for the opening of the special exhibition of material for the treatment of pure water supplies, industrial water supplies and waste. Discussions, arranged by the Belgian Centre for Study and Documentation on Water, on the theme: auto-purifying of solid matters in rivers used by industry, and the treatment of waste liquors from factories, will take place at the same time.

Leading pollution experts will address a Southern Industries Wastes Conference to be held at Houston, Texas, 21-23 April. The meeting has been sponsored jointly by the Manufacturing Chemists' Association, Texas Chemical Council and Southern Association of Science and Industry Inc.

Symposium on Fuel

THE Graduates' and Students' Section of the Institution of Chemical Engineers has arranged a symposium on 'Fuel and Power in the Chemical Industry' at Battersea Polytechnic on Friday, 23 April.

The morning session, which will be under the chairmanship of Professor T. R. C. Fox (Shell Professor of Chemical Engineering in the University of Cambridge), will consist of papers by Dr. A. Parker (DSIR), on 'World Energy Resources'; R. H. Paddon Row (Foster Wheeler Ltd.) on 'Steam Generation for Chemical Plant'; J. J. Priestley (W. C. Holmes & Co. Ltd.) on 'Aspects of Gas Manufacture'; and Dr. D. P. Plummer (Shell Refining & Marketing Co. Ltd.) on 'The Production of Heavy Fuel Oils.'

Sir Harold Roxbee Cox (Chief Scientist Ministry of Fuel and Power) will take the chair in the afternoon session, and papers will be read by R. S. Clegg (The British Aluminium Co. Ltd.) on 'Use of Electricity in the Electro-chemical Industry'; B. N. Reavell (Kestner Evaporating & Engineering Co. Ltd.) on 'The Use of Steam in Evaporation'; R. F. Hayman (Gas Council) on 'The Use of Gas in the Chemical Industry'; D. A. Monk (Peabody Ltd.) on 'Burning of Heavy Fuel Oils'; and Professor R. J. Sarjant (Professor of Fuel Technology in the University of Sheffield) on 'Trends in Fuel Economy.' A summing-up will be given by Professor F. H. Garner, Director of the Department of Chemical Engineering, University of Birmingham.

USA Sales Record

Expansion of Plant & Equipment

THE USA chemical industry entered 1954 with new sales records which reflect the results of four years of unprecedented plant and equipment expansion investments. The Manufacturing Chemists' Association publication, *Chemical News*, states that the Association's membership, representing about 90 per cent of the total industry, enjoyed sales of upwards of $20,000,000,000 last year, 10 per cent above 1952, and is still thrusting forward.

Profits last year were estimated at $2,500,000,000, an increase of 6 per cent. However, taxes cut the net to $1,100,000,000. These results, although preliminary, are based on returns from a representative list of companies in the Manufacturing Chemists' Association.

An increase in sales for the industry in 1953 was to be expected in the light of the industry's expenditure of about $1,400,000,000 for new plant and facilities in 1952, since many of these investments began to produce in 1953. Investment in new factories and equipment in 1953 went up to a record-breaking $1,600,000,000, which is an indication of the way in which sales can go in 1954 provided there is no marked decline in the business cycle.

As an indication of the way in which its facilities and management were employed, the chemical industry earned approximately 14 per cent on sales before taxes, compared with about 9 per cent for 23 categories of American industry. This put chemicals in the forefront as the highest earning industry in the country.

Anticipation of the discontinuance of the excess profits tax is believed to have influenced chemical manufacturers, as well as other American industrialists, in their 1953 activities, as reflected in earnings and profits reports. This anticipation doubtless hastened tax write-offs; it also influenced management in liberalising expenditures for expansion and research.

Large sums were spent in preparing new facilities for production such as hiring of labour forces, before new plants could become revenue producers. Some $370,000,000, a 10 per cent increase over 1952, is estimated to have been poured into research work.

Research in Glasgow

Annual Report of the Royal Technical College

REPLACING the former Journal of the Royal Technical College, publication of which has now ceased, the Research Report provides a brief record of the work in progress in the various departments of the College. The report for the session 1952-3, which has just been published, shows that the reputation of the College is being well maintained.

The organic research laboratories have continued work on triterpenoids, steroids, and chemotherapeutic agents. The relationship between β-amyrin and germanicol has been confirmed; *cyclo*-artenol has been isolated and characterised as a *cyclo*-lanost-24-enol; and a new related triterpene is being investigated. Two alcohols have been isolated from the neutral fraction of ox-bile, and a preliminary examination shows them to be sapogenins.

Several modified routes to cortisone have been developed, involving degradation of the steroid side-chain, followed by introduction of the 11-oxygen. Structural investigations involving the stereochemistry of the steroid nucleus are in progress; the preparation of 8-α-ergostane derivatives is of particular interest. A series of compounds related to the anti-rheumatic drug phenylbutazone has been prepared. Investigations of the structure of gladiolic acid have culminated in its synthesis.

Photochemical Decomposition of Ions

The inorganic and physical laboratories continue the general study of the photochemical decomposition of ions in aqueous solution with special reference to the influence of acidity, oxygen and carbon dioxide. The viscosity of solutions of long-chain detergents in the presence of additives has been measured, and to facilitate these studies a co-axial cylinder viscometer is being constructed.

The study of the catalytic properties of metallic oxides continues, and investigations have been made of the growth of thin oxide films on metals during catalysis, and of the anodic behaviour of metals during electrolysis, electro-polishing and oxidation.

The reaction of cupric salts with substituted semicarbazides has been investigated, and work in progress includes a study of certain solid-gas reactions, and of the Hammett acidity function of concentrated acids.

In the department of technical chemistry, considerable progress has been made in interpreting the steric course of the hydrochlorination of rubber latex, and work has begun on the fundamental properties of unsaturated polyesters. The photochemistry of azo dyes on protein substrates, and the development of new analytical methods for azo dyes, have received continued study.

Pyrolysis of Vinyl Benzoate

The pyrolysis of vinyl benzoate has been studied, and has provided a valuable clue to the mode of thermal breakdown of linear polyesters. Side-reactions during the pyrolysis of esters have been elucidated, and a study of pyrolysis of anilino-nitriles is nearly complete. In an allied inorganic field, a kinetic study of the thermal dissociation of ammonium carbamate has been concluded.

Work proceeds actively on a study of the surface properties of finely ground silica. An electron-optical study has confirmed previous conclusions, and a start has been made in the determination of free silica in dusts by aqueous sprays. A study on gas absorption by aqueous sprays has been concluded.

Considerable progress has been made by the department of metallurgy in the determination of thermodynamic data relating to the manufacture of iron and steel: activities for CaO have been determined in lime-alumina, lime-silica and in lime-alumina-silica slags, and for FeO in blast furnace type slags. In the same field, work is proceeding on the study of sulphur and silicon equilibria.

In the schools of pharmacy and bakery, work has been carried out on pyrogens, cardiac glycosides and anticonvulsants; on the constituents of *Aristolochia reticulata*; on a number of microbiological problems; on the fundamental reactions involved in the bleaching of flour doughs by enzyme systems; and on various other matters.

Glasgow Royal Technical College is obviously a very active establishment.

Cleaning Coal Tar

Russell Separator Installed at Beckton Gas Works

THE presence in coal tar of suspended particles of solids causes considerable difficulties in tar handling systems. This is particularly the case on coke ovens. These solids settle out in tanks and separators, blanketing heating coils and preventing the proper heating of the tar necessary to ensure effective separation of the liquor and are very difficult to clean out.

Many attempts have been made to separate these solids from the tar but a filtration problem of this type is not easy. Considerable success, however, is attending the new filter produced by Russell Constructions Ltd., Adam Street, W.C.2, and adapted for the special purpose of filtering coke-oven tar at the Beckton Gasworks of the North Thames Gas Board. (THE CHEMICAL AGE, 1953, **69**, 1273; 1954, **70**, 474.)

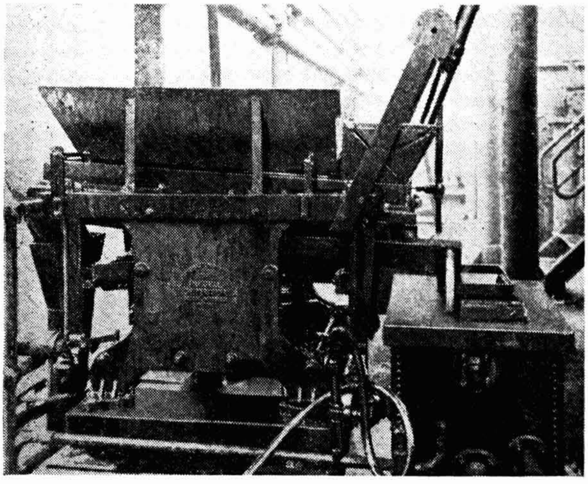
The filter consists of a stainless steel screening cloth which is vibrated at a high frequency but very small amplitude. Tar to be filtered pours on to this screen cloth held in an essentially horizontal position. The solid material is retained on the cloth and continuously brushed off into a receiving vessel at the end of the cloth. The filtered material passes into the tar collecting system.

Various sizes of cloth have been tried including 80, 100, 120 and 200 mesh. The effective throughput of tar was 1,000 gal. per hr. up to the 120 mesh cloth, but above this the throughput was reduced. It was found that the 120 mesh cloth was suitable. With a normal coke oven tar the 120 mesh cloth removes approximately 1 per cent of sludge, which contains approximately 20 per cent of dry solid material.

Up to the present time approximately 500,000 gal. of tar have been filtered through the unit at Beckton at the rate of 1,000 gal. per hr. and operation has been satisfactory.

Further work with the filter will be directed to a study of the possibilities of reducing the water content of tar. It is known that many of the problems of separating water from tar are associated with the presence of solids in suspension and it is expected that their removal will allow of easier separation of tar and water. As already indicated the removal of solids will render effective the heating system in separators and improve separation. Further work is continuing on the possibilities of centrifuging the filtered tar in order to get down to the complete removal of water from tar.

The Anglo-Iranian Oil Co. Ltd. reports that the output of lubricating oils at the Schindler Refinery, near Hamburg, will be increased to about 35,000 tons a year with the completion in June of new furfural treatment plant.



The Russell separator installed at the Beckton works of the North Thames Gas Board

Chemical Engineering Studies*

Their Importance in Relation to Process Development

THE tremendous increase in the production of organic chemicals in the last decade has been brought about with the assistance of research activities both in the discovery of new methods and in the development of those methods. In the USA in 1946 as much as $175,000,000 was spent on research in the chemical industry. When an idea has been brought to fruition in the research laboratory the function of process development can be summarised under four headings:—

1. To test the correctness of the principle of the process.
2. To choose between alternative procedures.
3. To evaluate the economics of the process.
4. To provide data for the design of a commercial plant.

Laboratory research is normally followed by the drawing of a diagram for the new process. It is then essential that the stages in this diagram be analysed and separate investigations made for the most favourable conditions at each stage. Only when this has been done can a pilot plant be usefully built.

A large organisation needs to have part of its development section devoted to the study of unit operations. This knowledge is always being required for the development of any particular process which is being tackled by a further team of workers in the section. By considering three examples in the following paragraphs it will be seen that this study of unit operations is an important part of process development.

The Sulphation of Olefines

This reaction is carried out on a large scale in the production of liquid synthetic detergents. It is not intended to discuss the whole process, but rather to consider the actual reaction system. To make alpha olefines and sulphuric acid react with each other it is necessary to mix intimately the two non-miscible phases. In addition, it is necessary to remove from the system the heat of reaction. These requirements can be met in several ways:—

(a) by passing the two components through an annular space with cooling of both inner and outer wall; using a rotor for stirring;

(b) using an annular, cooled reaction chamber (as before), the feed being premixed and made to flow through at high velocity;

(c) passing the two components through a mixer, the heat being removed by a cooling coil or jacket.

(d) using a centrifugal pump to circulate the mixture through a cooler. At suitable points in the circuit the two components are added and the product is discharged.

The reaction time which it is possible to attain in any of these systems will be limited by the extent of the cooling surface. For example, system (a) will necessarily give a much slower reaction rate than the other three systems. Another point requiring attention is the pressure drop which will take place in the reactor with a consequent increase in the power requirements.

Thus it can be seen that it is process development by which the essential factors for sulphation are obtained, but it is chemical engineering that specifies the reactor which best suits the task. The final decision will be made taking everything into consideration from an economic viewpoint.

The Fluid-Bed Technique

This process has been evolved in the petroleum industry for catalytic cracking of oil distillates. Oil vapours are brought into contact with a dense cloud of catalyst particles. This cloud behaves more or less like a liquid. The process requires two reactors: one for cracking the oil and the other in which the catalyst is regenerated.

The fluid process was originally claimed to be an easy method of transporting the catalyst. While this is true it is also clear that other important advantages can be claimed. Heat transfer between the particles is extremely rapid and this results in the bed temperature being homogeneous. Heat transfer between the gas and the wall

* Abstract of a paper presented by H. Hoog at a meeting of the Institution of Chemical Engineers on 2 March.

of the vessel is greatly increased and there is consequently less risk of local overheating.

One disadvantage of the fluid bed is that the gas phase is also nearly homogeneous which means that the reactor is only a single stage mixer. This results in a lower conversion rate than would be obtained under similar conditions with a fixed bed catalyst. It is important to note that this mixing does not occur in very narrow vessels and care must therefore be taken in the correct design of pilot plant for this operation.

Hydro-Desulphurisation of Oils

This process aims at the removal of sulphur from oil by mild and selective hydrogenation. The catalyst which has been evolved by development work is an improved cobalt-molybdenum supported type.

The need to reduce the quantity of hydrogen which is recycled has led to adoption of the 'trickle' technique. Vaporisation of the oil is avoided by allowing it to flow down as a thin liquid film over a fixed catalyst bed. It was found that this led to an additional advantage in that the catalyst activity is not impaired.

It was important, when constructing the pilot plant for this process, to obtain results representative of a commercial scale reactor. This necessitated a study of the flow over the catalyst bed for varying ratios of catalyst diameter to tube diameter. It was found that when this ratio becomes greater than 1 to 5 more than 30 per cent of the oil flows along the wall of the tube. The pilot plant therefore required the use of small pellets of catalyst.

Even with a catalyst of the right size the flow of liquid is not uniform and it is beneficial to sub-divide the catalyst bed and put liquid-redistributors in between. This also enables cooling of the oil to be carried out between the parts of the catalyst bed in order to compensate for the exothermic reaction which occurs.

Canadian Iron Ore Discovery

A big find of iron ore at Bruce Lake, Ontario, in which the tonnage of magnetite ore may be equal to any known iron ore body in Canada, is being financed by the Chimo Gold Mines Co. The deposit is said to be remarkably uniform, with an average grade of about 36 per cent iron.

OCCA *Dinner & Dance*

An Altogether Delightful Company

A DISTINGUISHED and happy company assembled at the Savoy Hotel, London, on 12 March, the occasion of the Oil & Colour Chemists' Association biennial dinner and dance.

The members and their guests were received by the president (Mr. H. Gosling) and Mrs. Gosling. They included Dr. Calvin Overmyer (president of the Federation of Paint and Varnish Production Clubs of America) and Mrs. Overmyer; Sir Willion G. Ogg (president of the Society of Chemical Industry) and Lady Ogg; Mr. R. Ashley Hall (president of the National Paint Federation) and Mrs. Hall; Col. F. W. Jones (president of the Society of British Paint Manufacturers) and Mrs. Jones; Mr. J. B. M. Coates (president of the British Printing Ink Association) and Mrs. Coates; Mr. G. D. Dane (president of the Federation of British Printing Ink Manufacturers) and Mrs. Dane; Professor M. V. A. Briscoe (president of the Paint Research Association) and Mrs. Briscoe; and Mrs. A. R. Penfold.

Australian Visitor Ill

It had been hoped that Mr. Penfold, a founder and first chairman of the Australian Section of OCCA and a vice-president of the Association, Director of the Museum of Applied Arts & Sciences, Sydney, who had been selected to receive the 1954 Fritzsche Award and Medal of the American Chemical Society, would have been present at the dinner, but unfortunately he was prevented by illness.

Proposing the toast of the Association, Mr. J. B. M. Coates said that the progress it had achieved was known throughout the world, and it was indeed fortunate in having a tradition behind it which was so unselfish, and which conferred such benefits upon the industries it served and upon the community at large. The president, in his response, said that on such occasions they were encouraged and sustained in the work they undertook; they were particularly conscious of the friendships and friendliness which the Association brought to them, and he hoped all their guests would think of them, not only as oil and colour chemists, but as a friendly, generous, hospitable and altogether delightful company.

CHROMATOGRAPHIC METHODS OF INORGANIC ANALYSIS. By F. H. Pollard and J. F. W. McOmie. Butterworths Scientific Publications, London. 1953. Pp. viii + 192. Figs. 26, Plates iv. 30s.

Although various attempts had been made from the middle of the nineteenth century onwards to utilise cellulose (usually in the form of paper) as a medium for the separation of inorganic substances, it was not until partition chromatography, and, in particular, so-called 'two-dimensional' or 'paper-partition' chromatography came into being that any extensive amount of successful work was carried out in this field. The relatively few years that have elapsed since this latter technique was developed have, however, sufficed to unload a bewildering mass of literature on to the analytical chemist, most of it with a purely empirical background, and most of it so uncoordinated as to be more than usually confusing.

The authors of this book, foremost among British pioneers in the inorganic applications of the new technique, have consistently attempted to plan their published research according to a systematic scheme. It is with some gratitude, therefore, that we welcome this extension of their systematising to include the salient features of the work of others, and to attempt to present some ordered account of the separation of inorganic ions by these techniques.

At an early stage in the book the authors rightly point out that in the type of separations discussed adsorption, partition and ion-exchange all may be involved. Their very much simplified theoretical treatment, which is probably all that is advisable in a work of this type, confines itself to an ideal discussion of each factor separately, without attempting to consider the real situation where all three may be at work. The bulk of the book is concerned with separations in which the second factor, partition, is presumed to be the ruling one. Adsorption separations, either of mixtures of ions or of mixtures of compounds formed with the ions, on or off the column, receive brief treatment; and ion-exchange separations are practically untouched.

In the treatment of partition separations a good account is given of the detailed techniques, the reagents and the solvents used. The 17-page appendix to Chapter 5, which gives tabular details of only the more important solvent mixtures which may be used, serves admirably to bring home the difficulty in selection that there must have been to ensure that the book should be really useful at the bench. The authors have, however, succeeded admirably in presenting information which will permit and encourage immediate work in the laboratory.

The book may present neither a theoretical nor a comprehensive treatment, but it is undoubtedly a working manual. It is therefore likely to be of considerable value to a wide variety of laboratories, by helping them to solve their problems of cation and anion separation, identification and estimation by partition chromatography, particularly on the small scale. The experimental descriptions are ample and clear, and all important practical phases of both qualitative and quantitative work appear to have received adequate attention. Quite sufficient literature references are included to enable the worker to carry on from here in any selected aspect of the work.—CECIL L. WILSON.

ANNUAL REVIEW OF NUCLEAR SCIENCE. Vol. 3. Annual Reviews Inc., Stanford, California. Distributed by H. K. Lewis & Co. Ltd., London. 1953. Pp. ix + 412. $7.00.

Like volumes 1 and 2, this collection of review articles covers a wide range of topics about equally divided between physics, chemistry, and the biological sciences. The authoritative standard of the earlier volumes is maintained. Every article is copiously documented, in some cases with hundreds of

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references. The reviews of special interest to chemists deal with 'Radiation Chemistry,' the 'Chemical Effects of Nuclear Transformations,' 'Separation Techniques Used in Radiochemistry,' and the 'Isotope Effect in Chemical Reactions.' The one on the 'Isotope Effect' covers only progress made during 1952 in research on the subject; it would be very useful to a specialist in the field, but no attempt has been made to organise the subject matter so as to attract the general reader. Each of the other reviews is intended to present an overall picture of the standing of its subject at the present time, with emphasis on current problems. The article on 'Radiation Chemistry,' by a leading theoretician in the field, is the best of its kind which has appeared for several years. The article on 'Chemical Effects of Nuclear Transformations' also deserves high praise. 'Separation Techniques Used in Radiochemistry' is less successful, perhaps because too many essentially unconnected subjects are included under the title.

All who work with radioactive substances or X-rays will be interested in the review on 'Practical Aspects of Radiation Injury.' This surveys evidence of acute and delayed radiation injuries caused both by irradiation from external sources, and by the ingestion of radioactive substances. The literature of the subject, covering everything from cases of cancer in early radiologists to radium poisoning in watch-dial workers, and injuries due to the atomic bombing of Japan and to reactor accidents in the USA, is now so diverse that this critical review is most welcome. The article on 'Radiation Dosimetry and Protection' is also of general interest. Most people whose wŏrk or interests are connected with nuclear science will find this volume, like its predecessors, a constantly useful source of information and references.—H.G.H.

INDUSTRIAL INORGANIC ANALYSES. By R. S. Young. Chapman and Hall, London. 1953. Pp. viii + 368. Figs. 12. 36s.

The plan of this book is quite straightforward. For something over 40 elements, arranged in alphabetical order, the author has presented a compact account of the analytical chemistry likely to be of most use in the general analytical laboratory.

In most cases there is a discussion of the forms in which the element may be encountered, the merits and demerits of the usual ways of determining it, and the problems raised by the more usual types of interference likely to be encountered. This is followed by detailed accounts of the normal methods of determining the element, referred to as 'general procedures.' Frequently, the general procedures include ways of opening up the sample or carrying out preliminary separations. If popularity or convenience warrants, there may also be included 'special procedures,' which may, for example, deal with an important type of analysis met only in more limited circumstances. Cases in point are the determination of copper by cyanide titration as a rapid routine method, and the determination of copper oxide in a sulphide-oxide mixture, which are included as special procedures in the section on copper, following on the general methods which comprise decomposition of ores or alloys, electrolytic determination, two procedures for iodometric determination, and two procedures for colorimetric determination. Each section closes with an ample literature survey.

The final section of the book is devoted to unclassified procedures, brief accounts being given of such branches as water and gas analysis.

In spite of its comparatively small size, this book manages to provide a surprising amount of information. Where feasible, reasons are given for unusual points of procedure. Additional comments and explanations help to put the selection of methods on a rational basis, so that workers, and in particular junior workers, ought to understand and appreciate quite fully why the operations which are described are necessary. This is, of course, highly desirable, and it seems to the reviewer that the author has succeeded particularly well in this aspect of presenting his material—more so than some comprehensive works.

In the analyses described there is somewhat of a mining and metallurgical bias, which is probably inevitable from the background of the author. But a sound attempt has been made to deal with problems of interest to the general inorganic laboratory.

The book makes a very favourable impression indeed. Although the advanced worker or the specialist may tend to regard it as too small and circumscribed in its scope, the reviewer feels that it fills a very definite need. There is a dearth of compact but utilitarian books on industrial inorganic analysis. For the small laboratory this book could well form the first reference to a wide variety of problems, and often might prove to be the only reference necessary. To the student of analytical chemistry it would be a valuable introduction to many of the problems, both of assessment and of technique, arising in the general laboratory. Even the more advanced worker with first-rate library facilities might find himself turning to this book as a handy working manual for the more usual day-to-day problems.

The author points out that he has drawn heavily on other more comprehensive works, and gives a useful bibliography of these. He has in fact done a very considerable service to analytical chemists in using his experience to provide this very practical digest of modern analytical procedure.—CECIL L. WILSON.

ELEMENTARY QUANTITATIVE ANALYSIS. By R. L. Van Beurslem and H. C. Imes. McGraw-Hill Book Co., New York and London. 1953. Pp. 383. 36s.

This book, which is intended principally for Course I university students, is designed to meet several objectives such as the development of satisfactory analytical skill, the understanding of the chemical and physico-chemical principles of analysis, the appreciation of the importance of precision and accuracy, and the development of 'analytical sense.'

The content of the book is based on a national survey of courses in quantitative analysis throughout the United States made by one of the authors some 10 years ago. All topics, both of theoretical or laboratory application, which were treated in 25 per cent or more of these courses, are included in this select course. Several other topics of lower frequency are also included.

It may be surprising to some to find that theoretical detail looms so large in the book, but there is no doubt in the reviewer's mind that this aspect must be stressed at the outset of a first course in quantitative analysis. The theoretical material is by no means indigestible and contains lucid discussions on the preparation of the sample, measurement

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of quantity, chemical equilibrium, precipitation phenomena, quantitative separations, determination of the desired constituent, neutralisation, electrodeposition and oxidation and reduction. The reliability of analytical results and the calculations of gravimetric and titrimetric analysis are then dealt with in detail.

The experimental section does not follow the familiar pattern and is divided into 13 units:—the analytical balance, specific gravity, gravimetric analysis (preparation of sample, determination of ash in coal, sulphur in gypsum, iron and chlorine), calibration of apparatus, precipitation titrimetry, acidimetry and alkalimetry, redox titrimetry, analysis of limestone, analysis of brass, chemical equilibrium, acid-base indicators, redox potentials and colorimetry and photometry.

This order of experiments may appear to have resulted from a random selection of the available material, but the reviewer feels that it was made only after very careful consideration of the stated objectives.

This is a well-written and well-produced book and can be recommended unreservedly.—A. J. NUTTEN.

TONERDE UND ALUMINIUM (Ergebnisse und Erfahrungen aus der Betriebspraxis). By Wilhelm Fulda and Hans Ginsberg. Walter de Gruyter & Co., Berlin. 1953. Pp. 358, 264 illustrations. DM. 44 (full cloth).

In this second volume the authors have followed the character of presentation of Volume I by writing, not a text-book on the chemical and physical properties of aluminium, but a monograph of practical aluminium metallurgy with relation, in particular, to the German industry. The technical development of the electrolytic production of aluminium, both in Europe and the USA is covered chronologically.

In the electrolytic production of aluminium the separation of 1 kg. of the metal requires about 25 kilowatt hours of current; consequently a supply of cheap current is necessary. It is therefore interesting to find among considerations of the technical conditions of electrolysis that the production of cheap electrical energy finds a place. The

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price of a kWh is calculated for water power and brown coal (page 27). In Germany the cost of current from water power is scarcely less than that from thermal power. 'Open' ovens and 'closed' ovens are standard practice in the technical language of German metallurgists. The latter are electrolytic ovens surrounded by a metal mantle and, before the introduction of Söderberg anodes in German metallurgy or VAW 1938 only 'open' ovens were used. A comparison between both types of ovens, which includes production costs, use of current and raw material, is discussed.

Among other important topics of aluminium working considered in detail in this excellent work are the production of aluminium alloys (silicon, manganese and titanium alloys) and of the purest aluminium by electrolysis, the manufacture of Söderberg anodes and burnt electrodes and the production and properties of the oxidised surface layer. The authors claim that the most reliable presentation is one limited to some special field. In this work they have achieved this aim. The specialist will find this book a valuable reference.—R. J. MAGEE.

POCKET BOOK OF CHEMICAL TECHNOLOGY. By V. Stannett and L. Mitlin. George Newnes Ltd., London. 1953. Pp. 282. 30s.

The size of the chemist's *vade mecum* increases yearly, the editions of the forties were twice as large as those published before the war and the present-day productions are at least three times as large. Indeed, the present editions, even when printed on the most flimsy paper, are formidable volumes of some 2,000 pages. There exists a need, therefore, as the editors rightly observe, for a conveniently-sized pocket book containing only that information which would be required by the chemist or chemical engineer while working in the laboratory or on the plant. The present volume is an attempt to satisfy this need and has been sensibly printed on good quality paper which will not disintegrate in its first encounter with chemical solutions.

In a handbook of this size, the amount of information is of course strictly limited and the quality of the production may be judged on the grounds of the selection of information and the utilisation of space. The first of these criteria is an indefinite one, since no two workers will agree on what is absolutely necessary and what may be safely omitted. There can be no ambiguity however about the second criterion and here the book is sadly at fault; pages are left blank and others are covered by over-large diagrams and charts. There is a temperature conversion scale which occupies two pages and is unduly extended in range, but it could have been replaced by a formula or a small table covering the most commonly used temperature range. Inexplicably, there are two tables of atomic weights, one arranged alphabetically and the other in order of atomic number. The values given are confusing, one table giving weights to three decimal places for certain elements, the other to only two places for the same elements although in the same table some weights are given to three decimal places.

In the selection of information there is much to be applauded; a list of radioactive isotopes and labelled compounds, a conversion table for the three systems of measuring specific gravity, and a table of gravimetric factors. Information which seems irrelevant to the purpose comprises trigonometrical ratios and common integrals. Among serious omissions are trivial and alternative names in the table of properties of organic and inorganic compounds and the trade names of plastic materials. Suggested additional information includes the properties of commercial ion exchange resins, summarised qualitative tables and a list of named chemical reactions.—J.R.M.

Experimental Chemistry Award

The Corday-Morgan silver medal and a monetary prize of 150 guineas are awarded annually to the British chemist of either sex who, in the judgment of the council of the Chemical Society, has published during the year the most meritorious contribution to experimental chemistry, and who has not, at the date of publication, attained the age of 36. Copies of the rules governing the award may be obtained from the general secretary of the society. Applications or recommendations in respect of the award for 1953 must be received not later than 31 December next.

· HOME ·

Steel & Pig Iron Production

Steel production in February averaged 357,200 tons a week. This is the highest figure ever recorded for February, and compares with a weekly average of 352,400 tons for February, 1953. Pig iron production averaged 222,300 tons a week.

A Narrow Escape

The Billingham Reach pumping station, which distributes river water from the Tees over the whole of the north site of the I.C.I. factory for cooling purposes, was in grave danger of a breakdown last week. Owing to what was described as 'a technical fault,' the basement became flooded to a depth of 14 in. and was within a foot of stopping the pumping motors when firemen arrived with three machines and dealt with the emergency.

More Bottled Gas

Plans have been announced by Anglo-Iranian for the expansion of their Grangemouth refinery facilities for the production of bottled gas. New equipment and handling plant will enable the refinery to produce 16,000 tons a year, compared with a present output of 7,000 tons. Over the past few years there has been a great increase in the use of liquid gas in rural areas.

Unprecedented Sales

Petroleum-derived ketones and alcohols are reported to be attracting increasing turnover in the United Kingdom. Sales in January and February reached unprecedented levels. Demand for epoxide resins made from petroleum-derived epichlorhydrin is also steadily gaining ground, and sales in February were the greatest since the introduction of these resins on a commercial scale last year.

Industrial Barrier Creams

The industrial barrier creams marketed by Innoxa (England) Ltd. will be known as Kerodex barrier creams from 1 April and will be marketed by Innoxa's associate company, Scientific Pharmacals Ltd., Innoxa House, London, N.1. The reason for the change is that Kerodex has for some time been well known overseas and this name will be used to ensure that the creams are known universally by the same name.

Big I.C.I. Extension at Wilton

The main board of Imperial Chemical Industries have approved extensions costing £6,000,000 to the company's petrochemicals works at Wilton, it was announced at Billingham last week by Mr. E. A. Blench, production director of the company's Billingham division. The new extensions will be operated by Billingham.

More British Oil Wells

The Anglo-Iranian Oil Co. announced last week that sites for the fourth and fifth oil wells at Plungar have been chosen, and that drilling on one of them will begin next month.

Towers Apparatus at B.A.C. Meeting

At a meeting organised in Liverpool by the British Association of Chemists, J. W. Towers & Co. Ltd. demonstrated a wide range of their equipment, including an automatic distillation apparatus which has been developed in conjunction with the Shell Refining & Marketing Co. Ltd., and which was described and demonstrated by Mr. G. C. Eltenton, of the Shell Company. Also shown was the Towers' direct reading automatic balance (model 205), electric ovens and incubators, magnetic stirrer with hotplate, etc.

New Coke Oven Plant

The National Coal Board's new £2,000,000 coke oven and by-products plant at Fishburn (Co. Durham), which has taken three years to build, will be brought into full operation in May. Erected by Woodall-Duckham & Co. Ltd., it comprises 50 ovens in two batteries, each oven holding 16 tons of coal. The plant will produce 250,000 tons of coke annually, in addition to tar, benzole, sulphate of ammonia, etc.

Licence of Right Endorsed

Under Section 35 of the Patents Act, 1949, Patent No. 667,893 'Production of phosphorus oxysulphides' (Albright & Wilson Ltd.), was endorsed 'Licence of Right' on 1 March, 1954. Any person who claims that the patentees at the time of endorsement were precluded by a contract in which the claimant is interested from granting licences under the Patents, may apply for cancellation of the endorsement within two months.

OVERSEAS

Castor Oil Exports

The Indian Government has decided to permit established shippers to export castor oil during the period ending 30 April, 1954, up to a ceiling of 6,000 tons.

Canadian Iron & Steel Output

Canadian production of pig iron during 1953 reached 3,012,269 tons, which is 12 per cent more than in 1952 and is a record. Output of steel ingots also constituted a record—4,010,000 tons, as against 3,578,100 tons in 1952.

Lactose in Poland

A new lactose factory is being built at Lyszkowice, which, it is claimed, will be the largest and most up to date of its kind in Poland. Another lactose factory recently put into operation at Radzimow is said to be completely mechanised.

Atomic Reactor for Holland?

The Dutch Government is proposing the construction of an atomic reactor in Holland. The estimated cost is 28,000,000 guilders, most of which will be needed for the purchase of heavy water. Dutch industry will be invited to participate in the project, which, it is thought, will take three years to complete.

Special Equipment Arrives from UK

A 77-ton shipment of British automatic control equipment arrived recently at Australia's largest sulphuric acid plant which is being erected at Adelaide by Simon Carves (Australia) Pty. Ltd. It included temperature-recording and airflow instruments which have been specially proofed as a protection against acid. The plant will have an annual output of 100,000 tons of acid and will help make Australia's superphosphate supply more secure.

Indian Dye Imports

The Indian licensing policy for the import of dyes derived from coal-tar and coal for the period January-June, 1954, has been partly amended. It has been decided that not more than five per cent of face value of licences can be utilised for the import of (a) rapidogens; (b) acid dyes, and (c) direct dyes.

Manganese Dioxide from India

The Indian Government has decided to allow export of manganese dioxide during the current year by established shippers, subject to the quantities not exceeding 100 per cent of their best year's exports during the calendar years 1952 or 1953.

Scheelite Mines Closing

Because of the fall in the world price of tungsten, scheelite mines in Rhodesia are closing one by one. Of the 57 scheelite mines, big and small, which were producing in the Bulawayo district last year, fewer than six remain in production.

Sulphuric Acid from Israel

The first export of sulphuric acid from the Israeli plant of Fertilisers & Chemicals Ltd.—a consignment of 650 tons to Turkey—was recently pumped aboard a ship in Kishon Harbour. Pyrites from Turkey and other Middle East countries are used as raw materials in this new factory, which took 16 months to construct. Most of the equipment was obtained from the USA, under an Export-Import Bank Loan.

Titanium Price Fall

Titanium, which achieved commercial importance only about three years ago, has had its first significant price reduction in the United States. The cuts, effective immediately, average more than 12 per cent for commercially pure sheet and plate, reports the Titanium Metals Corporation, a leading producer in the United States. The company said the reduced costs reflected rapidly expanding production and improvements in manufacturing techniques, such as the use of continuous mill rolling of titanium sheet.

Outlook Good for Plastics

The American Plastics Industry estimates that it will consume some 35,000,000 lb. of polyester resins, its major raw material, during 1954. The industry used 26,000,000 lb. in 1953, the industry's previous peak year. The 1954 consumption estimate is based on present output schedules of the moulders of reinforced plastics. It includes a long list of products ranging from tiny electrical components to single-piece tanks of more than 4,000 gal. capacity.

· PERSONAL ·

DR. ALEXANDER FLECK, chairman of I.C.I. Ltd., was made a burgess of the borough of Saltcoats, Ayrshire, last week. Dr. Fleck's ticket referred to his outstanding services to science and industry, of the leading position to which he had attained in the great corporation of which he is head, and the honour which had thereby accrued to the borough as the home of his boyhood.

The governors of Dulwich College have appointed MR. R. GROVES, headmaster of Campbell College, Belfast, to the vacancy of Master created by the sudden death of Mr. C. H. Gilkes last September. Mr. Groves has been headmaster of Campbell College since 1943. He was educated at Bradford Grammar School and at Christ Church, Oxford, where he obtained first class honours in Natural Science (Chemistry). He is a Fellow of the Royal Institute of Chemistry.

LORD BAILLIEU, Dunlop chairman, has returned to England after an extended business tour during which he visited Australia, New Zealand, Ceylon and Malaya.

DR. JOHN T. STOCK, M.Sc., Ph.D., F.R.I.C., vice-principal and Head of the Department of Chemistry and Biology at Norwood Technical College, London, is sailing aboard the *Queen Mary* on 24 March for New York. Dr. Stock was awarded the Robert Blair Fellowship in Applied Science and Technology for 1953 by the London County Council and this enables the holder to pursue a course of advanced study or research in the Dominions, the United States or other foreign countries. Dr. Stock has elected to spend a year in the Division of Analytical Chemistry at the Institute of Technology, University of Minnesota, to work with Professor I. M. Kolthoff. Dr. Stock's researches in connection with polarography and allied electrochemical topics, together with his many achievements in the field of micro-chemistry, have already brought him world-wide recognition. Only recently (THE CHEMICAL AGE, **70**, 511) details were announced of the new portable semi-micro organic laboratory which he and his colleague, Mr. M. A. Fill, developed and which is now being marketed by Quickfit & Quartz Ltd.

MR. JOHN W. NICHOLLS, who has been appointed secretary of the Society of Dyers & Colourists, was formerly administrative director under Sir Robert Fraser, Director-General of British Government Information Services, in London, as well as general secretary of the Institution of Works Managers. His new appointment is due to the increasing work of the Society of Dyers & Colourists. DR. C. J. HOOPER, who has been secretary as well as editor of the society's many publications, now becomes editor and technical officer.

MR. C. J. STOPFORD, managing director of British Titan Products Ltd., has been released from service with the company to enable him to accept an invitation to join the National Lead Co. of America. He will take up his new appointment on 1 July.

Among those recently elected Fellows of the Royal Society of Edinburgh were: DR. J DUCKWORTH, Rowett Research Institute; DR. C. LONG, senior lecturer, Department of Biological Chemistry, University of Aberdeen; DR. B. RAISTRICK, research manager, Scottish Agricultural Industries Ltd.; and DR. R. B. STRATHDEE, reader in chemistry, University of Aberdeen.

DR. G. F. HARGREAVES, M.B., B.Ch. (Cantab.), M.A., has joined the staff of Evans Medical Supplies Ltd., as an assistant medical director at the Evans Biological Institute.

SIR GEOFFREY HEYWORTH, chairman of Unilever Ltd., has been elected chairman of its subsidiary, the United Africa Co., in succession to the late Mr. Frank Samuel. Sir Geoffrey joined Lever Brothers (now Unilever Ltd.) in 1912 and has been a director of the parent company since 1931. He has been a member of the board of the United Africa Co. since 1941.

MR. M. R. MILLS, B.Sc., who during the past 11 years has been in charge of the technical department of Messrs. Norman, Smee & Dodwell Ltd., Mitcham, has now left to take charge of the British Oil & Cake Mills Ltd. development laboratories at Erith.

MR. J. C. SAYWOOD has been appointed to the board of Catalin Ltd.

MR. ARTHUR H. CARTER, of the Sherwin Williams Co. of Canada Ltd., Montreal, has been elected president of the recently formed Canadian Agricultural Chemicals Association at the first annual conference in Toronto. Nearly two hundred representatives of the Canadian manufacturers of agricultural chemical products attended.

MR. A. G. NORMAN, managing director of Thomas De La Rue & Co. Ltd., flew to America last week on a 25,000-miles business trip. While in the States he will visit the Formica Co., Cincinnati, to see their latest laminated plastics and compare manufacturing techniques with those of his own company. Going on to Australia, he will visit Sydney for discussions with the company's agents. His return home will be via Pakistan.

MR. A. G. PEACOCK, B.Sc., A.R.I.C., A.Inst.P., has resigned his position as secretary of the Scientific Instrument Manufacturers' Association, and has joined the board of Mervyn Instruments, St. John's, Woking, Surrey. A graduate of Bristol University, Mr. Peacock has had a wide experience in instrument problems of a diverse nature. With an academic training in chemistry and physics, he has spent his lifetime in the field of engineering, and the wide experience he has built up has always been generously placed at the disposal of British instrument makers and users. He is perhaps best known as the honorary exhibition secretary of the Physical Society, and as a protagonist for increased publicity for British instruments is a well-known figure at exhibitions both in this country and abroad. He has also been associated with the many publications of the Scientific Instrument Manufacturers' Association, particularly those concerned with radio-isotope applications. Mervyn Instruments, which Mr. Peacock joins, has been established for over 21 years and has since 1939 become increasingly active in the commercial instrument field.

MR. I. M. O. HUTCHISON, a director of Henry Balfour & Co. Ltd., George Scott & Co., and Enamel Metal Products Ltd., left this week for a business tour which will include visits to the USA, Canada, New Zealand, Australia and South Africa. He is not expected back for about four months.

At the Spring Convocation of the Textile Institute in Manchester on 26 March, the Institute Medal will be presented to MR. W. HOWARTH (general manager, Musgrave Spinning Co. Ltd.) and DR. C. S. WHEWELL (Reader in Textile Finishing, Leeds University), in recognition of distinguished service to the textile industry in general and to the institute in particular.

Obituary

The death has occurred of MR. GEORGE C. HOLLIDAY, who was well known in the gas industry as manager of the Watson House research establishment at Fulham. After gaining an honours degree in chemistry at Oxford, Mr. Holliday began his career with the former Gas Light & Coke Co. as an assistant to the works chemist at Beckton in 1923. Subsequently he held a variety of posts with the company and as senior assistant to the chief gas chemist assisted in initiating the research laboratory at Fulham, where he spent five years on research on gas manufacturing problems.

In 1929 he was transferred to the general manager's department and occupied various administrative and technical positions, including the joint secretaryship of the South Eastern Gas Corporation during its formative period, secretary of the Patents Committee and secretary of the Works & Products Committee. He became assistant chief technical officer at Watson House in 1937 and after five years as manager of the Gas Light Centre was appointed manager of Watson House in 1950. The Gas Light Centre was reorganised after the nationalisation of the gas industry and became the Watson House Centre, of which all the area gas boards are members.

Publications & Announcements

MARCONI Instruments Ltd., St. Albans, have greatly increased the productive capacity of their Longacres works by the opening of a new factory wing. Several sections of the business have been reorganised, permitting a smooth flow of production and distribution at the new level, and a new design centre provides improved facilities for the company's engineers. These measures will, it is hoped, enable the company to cater adequately for expanding business both at home and abroad. Believed to be one of the largest organisations of its kind in the world, the company designs and produces the widest range of communications test equipment. In the industrial field, also, the company has had considerable success with a range of moisture meters and *p*H equipment, while Marconi Instruments X-ray and electro-medical equipment is widely used in hospitals both in this country and abroad.

* * *

AN agreement has been signed between Sheepbridge Engineering Ltd., of Chesterfield, and the Horix Manufacturing Co., Pittsburgh, USA, granting the British firm sole manufacturing and selling rights for the complete range of Horix automatic bottle filling machines for practically the whole of the sterling areas of the world. The Horix Bottle Filler is described as a rapid automatic, vacuum filling, high efficiency machine and is employed in bottling all the Coco Cola syrup and 90 per cent of the ketchup and whiskey produced in the USA. It is also used for the rapid bottle filling of oils and anti-freeze, etc.

* * *

SPECIALLY designed for the chemical and allied industries is the Linatex motor driven diaphragm pump produced by Wilkinson Rubber Linatex Ltd., Camberley, Surrey. It is a neat, compact unit with a rigid cast iron base, aluminium pump body and electric geared motor drive. The pump body is lined throughout with Linatex, and there are solid Linatex valves and diaphragm having resistance to a wide range of chemicals up to 65°. Also produced by the same company is the Linatex hand operated diaphragm pump, which has been designed as a convenient portable unit for emptying vessels, sumps and pits. Rubber bearings are fitted and because there are no metal bearing surfaces no lubrication is required. Lined throughout with Linatex rubber and having a diaphragm and valves in this material, resistance to corrosion against a wide range of chemicals up to 65° is assured. Leaflets describing and illustrating both types of pump are obtainable from the company.

* * *

FOR the first time a 60 l. (13.2 gal.) blown polythene bottle is available in this country. This product is designed as a carboy for the shipment and transport of dangerous and corrosive chemicals, and, for this purpose, a plywood jacket is supplied to give extra protection. The bottle is also capable of being fitted with a polythene tap, making it a storage jar for liquid chemicals of all sorts. The dimensions of the bottle are: height 33 in., diameter 14½ in., neck diameter 2¼ in, weight 14 lb.

In the United States 13 US gal. polythene carboys have been in use since early 1952. They were first used for the storage and transport of hydrofluoric acids and other fluorine chemicals. This bottle is of Swedish manufacture and is being sold in Britain by X-Lon Products, 1 Cumberland House, Kensington Court, London, W.8.

* * *

A NEW booklet on the subject of composite tubing—illustrating the possibilities of supplying tubes made from two different metals—has been published by Accles & Pollock

Ltd., Oldbury, Birmingham. Conditions that mainly determine the use of composite tubing can be summed up as follows: where the corrosive conditions in the bore are different from those outside and one material cannot be found to resist both; where a tube is required combining maximum corrosive resisting properties in the bore with high mechanical properties (such as in high pressure chemical plant); and when an expensive material is used for the main purpose of the tube, a saving can be effected by using a sheathing (or lining) of a cheaper material. It is felt that the possibilities of composite tubing are not as well known as its importance merits and the purpose of the booklet is to introduce its advantages to a wider field. The company will be issuing a new series of technical literature over the next six months and readers' applications to be put on the mailing list will be welcomed.

* * *

LUSTREX X.820 was the name given to a copolymer material developed as a water insoluble stabiliser or protective colloid, and at first available only from Monsanto Chemical Company of America. Recently, however, manufacture in the United Kingdom has been started by Monsanto Chemicals Ltd. and from semi-production scale operations the company can offer immediately 1 cwt. lots, with larger quantities at a few weeks' notice.

In general Lustrex X.820 can be said to retain the desirable properties of casein as a stabiliser, or protective colloid, while at the same time eliminating the admitted disadvantages of susceptibility to bacterial attack and changes in viscosity on standing. Chemically, Lustrex X.820 is a carboxyl containing polyelectrolyte resin, details of which will be given in the data sheet which is being prepared. It is normally dissolved by adding 3 parts of 0.880 ammonia with continuous stirring to 10 parts of Lustrex X.820 which has been allowed to swell with continuous stirring for about 15-20 minutes in 87 parts of water. Although Lustrex X.820 is dissolved in a similar manner to casein, a notable difference is seen on drying because, unlike casein, it deposits a water insoluble film immediately on drying. The inclusion of Lustrex X.820 has the effect of increasing the total insoluble content of a film and adding materially to the water resistance.

The most important application of Lustrex X.820 at the moment is probably its use as a protective colloid in emulsion paints based on polystyrene latices, but it has also other interesting uses in its own right, including the preparation of pigment dispersions, wax emulsions, adhesives, heat sealing compounds, leather finishes, printing inks and high gloss and grease resistant coatings. Development work on these applications is proceeding, and further details will be published in due course.

Further information and assistance may be obtained from Monsanto Chemicals Ltd., Sales Development Group, Victoria Station House, Victoria Street, London, S.W.1.

* * *

E. BOYDELL & Co. Ltd., Manchester 16, manufacturers of the well-known Muir-Hill dumpers and loaders, announce the introduction of a new high-lift loader, the Muir-Hill 'Supalift,' having the remarkable clearance of 14 ft. 6 in. under the lip of the tipped bucket when fully raised. The dangers to stability resulting from an increased loading height have been minimised by virtue of the special Muir-Hill system of suspension. The new machine retains a safe working stability even with full load at maximum height and forward reach. Intended primarily for feeding and loading elevated hoppers, it is available with either a standard $\frac{5}{8}$ cu. yd. bucket or with a coke-type 1 cu. yd. full-width scoop.

During a recent test under actual working conditions the loader easily negotiated a 1 in 7 ramp to load 15 tons of sand in 15 minutes into a bin over 11 ft. in height from the top of the ramp. Total weight without ballast is 4 tons 7 cwt., and maximum bucket lip reach forward is 4 ft. 5 in. Diesel powered and with driver's weather protection to order, these machines are available for early delivery.

'Fabulous' Oil Find

What is described as a 'fabulous' oil pool has been discovered by engineers of the Arabian-American Oil Co. at Uthamiyah, Saudi-Arabia. Named the 'Ghawar' field, it stretches from 24 to 26° north and is believed to hold as much oil as all the proven oil reserves of the US—28,000,000,000 barrels.

Law & Company News

Commercial Intelligence

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

Satisfaction

OXY-FERROLENE LTD., London, W., manufacturers of chemicals, etc. Satisfaction, 12 February, of two debentures registered 18 April, 1935.

Increases of Capital

The following increases of capital have been announced:—JOHN MARTIN OF LONDON LTD., from £40,000 to £70,000; A. & W. SELLERS LTD., from £5,000 to £7,000; MIDLAND AEROSOLS LTD., from £100 to £20,000.

Change of Name

The following change of name has been announced:—FERTILISERS & CHEMICALS LTD., to CHEMICALS & FEEDS LTD., on 5 February.

New Registrations

A. Revai & Co. (Chemicals) Ltd.

Private company. (529,172.) Capital £25,000. Manufacturers of and dealers in chemicals, solvents, plastics, essential oils, waxes, hormones and glandular products, etc. Directors: P. C. Gondos, R. E. Spall. Reg. office: 7/8 Idol Lane, London, E.C.3.

Domestic Chemicals (Manchester) Ltd.

Private company. (529,540.) Capital £2,000. Manufacturers, packers, distributors and salesmen of domestic chemicals, etc. Directors: Geo. E. Corner and Jacqueline C. M. Corner. Reg. office: 77 King Street, Manchester.

Hanpro Ltd.

Private company. (529,568.) Capital £1,000. Manufacturers of and dealers in chemical preparations and processes, etc. Directors: Kenneth W. Mercer and John Logsdail. Reg. office: 42a Shenley Road, Boreham Wood, Herts.

J. H. Hoyle (Chemist) Ltd.

Private company. (529,597.) Capital £2,000. Wholesale or retail, consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: Frank Hitchen, Lucy Hitchen, James H. Hoyle and Alice Hoyle. Reg. office: 316c Newchurch Road, Stacksteads, Bacup.

Anglo-South American Proteins Ltd.

Private company. (529,918.) Capital £15,000. Manufacturers of and dealers in animal and vegetable proteins, chemicals, metallurgical and other goods, etc. Directors: Claron E. Beardsley, Geo. E. Gould, Walter N. Reif, Pablo B. Wachsmann and Mrs. Rosa Wachsmann. Reg. office: 6/8 Crutched Friars, London, E.C.3.

Judd's Chemists (Pitfield) Ltd.

Private company. (530,042.) Capital £1,000. Manufacturing chemists, druggists, importers and manufacturers of and dealers in chemists' sundries of all kinds, etc. Directors: Harry Judd, Barbara Judd and Norman G. Cole. Reg. office: 43 Upper Berkeley Street, London, W.1.

Orobis Ltd.

Private company. (530,121.) Capital £100. Manufacturers of additives for lubricating oils and manufacturers of chemicals, chemical products, etc. First directors not named. Solicitors: Coward Chance & Co., St. Swithin's House, Walbrook, London, E.C.4.

Geotechnical & Concrete Services Ltd.

Private company. (530,109.) Capital £100. Objects: To carry on the business of testing of cement, concrete, soil and similar substances, conducting soil and geological and geographical surveys, making borings and acting as consultants and advisers in connection with the stabilisation and consolidation of soil by chemical and other processes. First directors not named. Solicitors: Porrett, Fawcett & Renwick, Sheffield.

Dupont-Windsor Ltd.

Private company. Capital £10,000. To carry on the business of manufacturing and assembling for sale or hire mobile and other units, machines and equipment for extruding, moulding, casting and otherwise fabricating pipes, tubes, ducts, drains, channels and other articles out of plastics, resins, synthetic compounds and other chemicals, etc. First directors not named. Reg. office: Winchester House, Old Broad Street, London, E.C.2.

Next Week's Events

MONDAY 22 MARCH

Royal Institute of Chemistry

Dartford. Technical College, Lowfield Street, 7 p.m. Dr. J. M. Fletcher. 'Chemical Problems Associated with Nuclear Reactors.'

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. B. J. Habgood: 'Polymer Auxiliaries & Butyl Rubber.'

TUESDAY 23 MARCH

Chemical Society

Cork: 7.45 p.m. Joint meeting with the Institute of Chemistry of Ireland, RIC and SCI. Dr. E. J. Bourne: 'Some Aspects of Oligo- & Poly-saccharide Synthesis.'

Society of Chemical Industry

Birmingham: Birmingham & Midland Institute, Paradise Street, 6.30 p.m. Joint meeting of Birmingham & Midland Section with Fine Chemicals and Microbiology Groups. Dr. W. B. Emery: 'Bacteriological Problems in Translating from Small Equipment to the Industrial Scale'; J. L. Yuill: 'Microbiology of the Citric Acid Fermentation.'

WEDNESDAY 24 MARCH

Royal Institute of Chemistry

London: Institute of Metals, Grosvenor Gardens, S.W.1, 6 p.m. Joint meeting of London Section with SCI (London Section). Professor A. R. J. P. Ubbelohde: 'Some Recent Advances in Physical Chemistry.'

Institution of Chemical Engineers

Coventry: Courtaulds Ltd., Little Heath Works, 11 a.m. Visit by Graduates and Students Section (Midland Centre). Meeting at Coventry Technical College, 6.45 p.m. L. Clunn and L. E. Hodges: 'Chemical Engineering Aspects of Fibrolene Manufacture.'

Chemical Society

Dublin: University College (Department of Chemistry), 7.45 p.m. Joint meeting with the Institute of Chemistry of Ireland, RIC and SCI. Dr. E. J. Bourne: 'Some Aspects of Oligo- & Poly-saccharide Synthesis.'

Society of Chemical Industry

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 10 a.m. and 2 p.m. Plastics & Polymer Group symposium: 'The Chemistry & Physics of Synthetic Fibres.'

London: Burlington House, Piccadilly. 6.15 p.m. Food Group (Nutrition Panel) annual general meeting, followed by ordinary meeting. Chairman's address by Dr. J. I. M. Jones: 'The Man of Substance.'

Newport: Technical College, 7 p.m. Joint meeting with RIC. L. R. Thomas: 'Developments in Chlorine Production with Reference to the Mercury Cell.'

THURSDAY 25 MARCH

Institution of Chemical Engineers

Chester: Blossom Hotel, Forgate Street. 7.15 p.m. Graduates & Students Section (North West Centre) annual meeting followed by films.

Chemical Society

London: Burlington House, Piccadilly, 7.30 p.m. Liversedge Lecture by Professor H. J. Emeléus: 'Organometallic Compounds Containing Fluorocarbon Radicals.'

Galway: University College (Department of Chemistry), 7.45 p.m. Joint meeting with the Institute of Chemistry of Ireland, RIC and SCI. Dr. E. J. Bourne: 'Some Aspects of Oligo- and Poly-saccharide Synthesis.'

Liverpool: The University (Chemistry Lecture Theatre), 5 p.m. Joint meeting with RIC, SCI, British Association of Chemists and the University Chemical Society. Professor G. F. Marrian: 'The Biochemistry of the Adrenocortical Hormones.'

Society of Chemical Industry

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 10 a.m. and 2 p.m. Continuation of Plastics & Polymer Group symposium: 'The Chemistry & Physics of Synthetic Fibres.'

The Fertiliser Society

London: Royal Society of Tropical Medicine & Hygiene, 26 Portland Place, W.1, 2.30 p.m. Papers on the Fertilisers & Feeding Stuffs Act by J. D. Westlake and Dr. J. Manning.

FRIDAY 26 MARCH

Society of Chemical Industry

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 10 a.m. and 2 p.m. Continuation of Plastics & Polymer Group symposium: 'The Chemistry & Physics of Synthetic Fibres.'

Royal Institution

London: 21 Albemarle Street, W.1, 9 p.m. Dr. F. A. Paneth: 'The Chemical Exploration of the Stratosphere.'

Market Reports

LONDON.—There has been little alteration in market conditions during the past week, the movement on home account continuing to cover good volumes, while export trade is well up to the average for recent months. Prices generally are well held and there have been a number of adjustments; carbon tetrachloride is £2 per ton higher, di- and mono-ammonium phosphate are higher at £94 10s. and £97 per ton respectively, and higher rates are now ruling for di-sodium and tri-sodium phosphate. The makers announce an increase of $\frac{1}{4}$d. per lb. in quotation for sodium and potassium dichromate, and sodium chromate. Also an advance of $\frac{1}{4}$d. per lb. in quotations for chromic oxide, chrometan 25 per cent, potassium chromate and ammonium dichromate. These increases are due to dearer raw materials and wage costs, and operate for deliveries as from 17 March, 1954. There has been a movement in the prices of the chemical compounds of non-ferrous metals and the latest quotation for red lead is £118 5s. per ton, litharge £120 5s. per ton, and dry white lead £125 per ton. Business in the coal tar products is fairly brisk with a persistent demand for the solvents.

MANCHESTER.—A continued steady undertone has been in evidence during the past week on the Manchester market for heavy chemical products and the tendency in one or two lines is towards somewhat higher levels. Leading industrial consumers in Lancashire and the West Riding areas, especially in the textile and allied trades, are taking steady deliveries still under contracts and replacement buying has represented a fair aggregate quantity. The demand in the fertiliser section is now on reasonably steady lines.

GLASGOW.—The past week has been one of active trading in all branches of the industry. Prices on the whole have remained steady and the falling off in the United States demand for lead has resulted in an easing of price. Zinc prices also have eased but certain derivatives still remain in very short supply. The demand for agricultural chemicals is intensifying.

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.

STATION CHEMIST

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BANKSIDE GENERATING STATION.

Applicants should have had considerable experience in the

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The appointment will involve close attention to operating conditions of oil-fired boilers operating at 900 p.s.i. and flue-gas washing plant. They should have had experience in a modern Generating Station and have initiative, resouce-fulness and personality.

SALARY:

Class H, Grade 7=£810 12s. per annum.

Applications to:

DIVISIONAL SECRETARY,
B.E.A., LONDON DIVISION,
GENERATION HOUSE,
GREAT PORTLAND STREET,
LONDON, W.1.

CHEMICAL ASSISTANT

required at

DEPTFORD GENERATING STATION.

Applicants must possess the School Leaving Certificate at Ordinary level in English, Mathematics, Chemistry and a modern Foreign Language. Encouragement will be offered to continue studies for a higher qualification. The work will consist of **TESTING** and **EXAMINATION** of **FUEL OILS** and **WATERS.**

SALARY dependent on age and qualifications in the range of £200 to £550 p.a.

Applications to:

DIVISIONAL SECRETARY,
B.E.A., LONDON DIVISION,
GENERATION HOUSE,
GREAT PORTLAND STREET,
LONDON, W.1.

ANALYTICAL CHEMIST required as Assistant in modern laboratory of works manufacturing a high quality inorganic product in Pembrokeshire. Age 25-35. Salary according to qualifications and experience. Housing assistance can be given if required. **BOX No. C.A. 3300, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SITUATION WANTED

MAN, working, Nat. Cert., experienced Cosmetics, Electro-plating, Plastics, requires laboratory work (preferably analytical): also knowledge German, French, Typing. **BOX No. C.A. 3301, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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Whessoe Open Top Riveted Steel **MIXING TANK** 13 ft. diam., by 15 ft. deep, 9/16 in. plate.
TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**
ONE Stainless **CONICAL HOPPER,** 7 ft. 3 in. diam., overall depth, 7 ft. 6 in.
TWO Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m., 150 lb. pressure.
SIX Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ¾ in. o.d.
FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lb. w.p.
CAST-IRON PIPES. 400 yds. 8 in. **NEW.** Also most other sizes.
VALVES in Stainless, Gunmetal, Enamel Lined.
Free Catalogue. "Watkins Machinery Record," available

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STAINLESS STEEL STEAM JACKETED ENCLOSED VACUUM PANS, Hemispherical. 3 ft. 8 in. at top by 1 ft. 10 in. deep at centre with 1½ in. bore bottom centre outlet. Bolted-on domed cover, fitted with two 6 in. sight glasses, 1 in. and 1½ in. bore flanged branches and thermometer pockets. Polished internally and suitable for 28 in. vacuum. Mild steel jacket. Working pressure 30 lb. p.s.i. Mounted in mild steel angle stand. Unused.
STAINLESS STEEL PLATE HEAT EXCHANGER by **A.P.V. CO., LTD.** Type HH. 76 plates 43 in. by 16 in., total projected area 346 sq. ft. Hydraulically operated opening and closing gear.
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M.S. SPIRIT EXTRACTION PLANT, comprising 3 ft. diam. by 5 ft. deep extractor with dished bottom jacketed for 5 lb. per square inch working pressure, condenser, separator, storage tank.
KESTNER HORIZONTAL TUBULAR EVAPORATOR, having six turns copper tube 1½ in. bore by 6 ft. long, complete with copper reception pot.
STEAM JACKETED COPPER STILLS, 150 gallons capacity. Fitted swan-neck, sight and light glasses, etc., and complete with copper coil condenser. Jacket working pressure 40 lb. per square inch.
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DOUGH MIXER, having "U" trough 1 ft. 5 in. by 1 ft. 7 in. wide at top by 2 ft. deep. Sheet brass trough, cast-iron ends, G.M. agitator. Belt driven and arranged for hand tilting.
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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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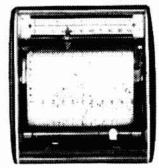
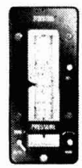
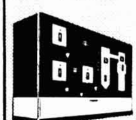


MODEL 52 CONSOTROL

Another high-grade instrument in the same series but designed for indicating and controlling. The case dimensions are 7$\frac{5}{16}$" high by 3$\frac{3}{8}$" wide.





GRAPHIC

CONSOLE

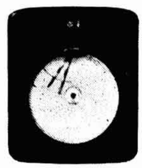
STABILFLO VALVES

A high quality air-operated control valve with exponential characteristic, designed especially for use with the controllers shown on this page.

CONVENTIONAL

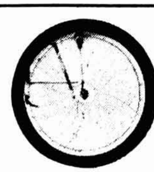
MODEL 40 RECTANGULAR

A well-known and well-proven instrument, measuring 17" high by 14$\frac{3}{4}$" wide and available for indicating, recording and/or controlling with either mechanical or Dynalog electronic measuring systems



ROUND FORM SERIES

This series includes the simple concentric indicator, the recorder, as illustrated, together with the indicating or recording controller with On/Off or Proportional action.



CONVENTIONAL

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