THE Chemical Age

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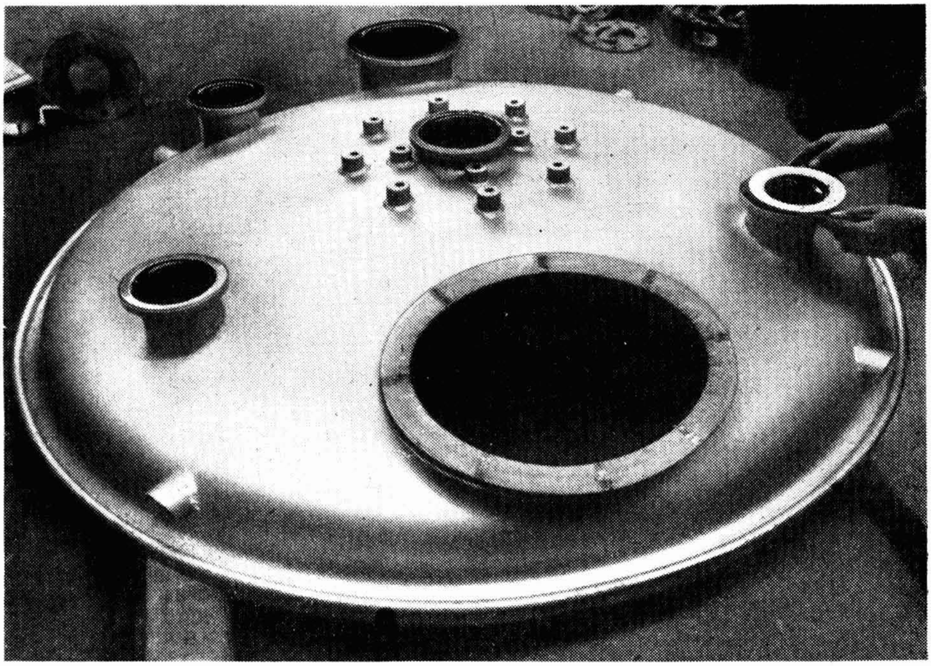

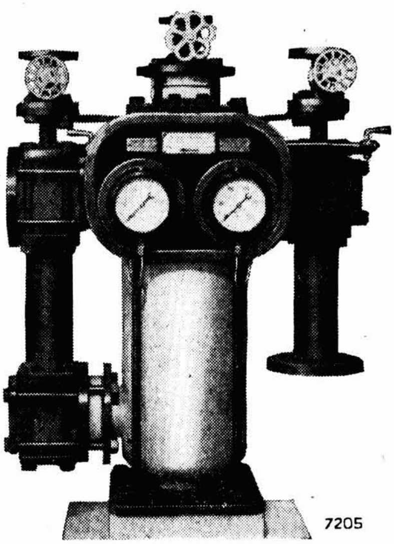

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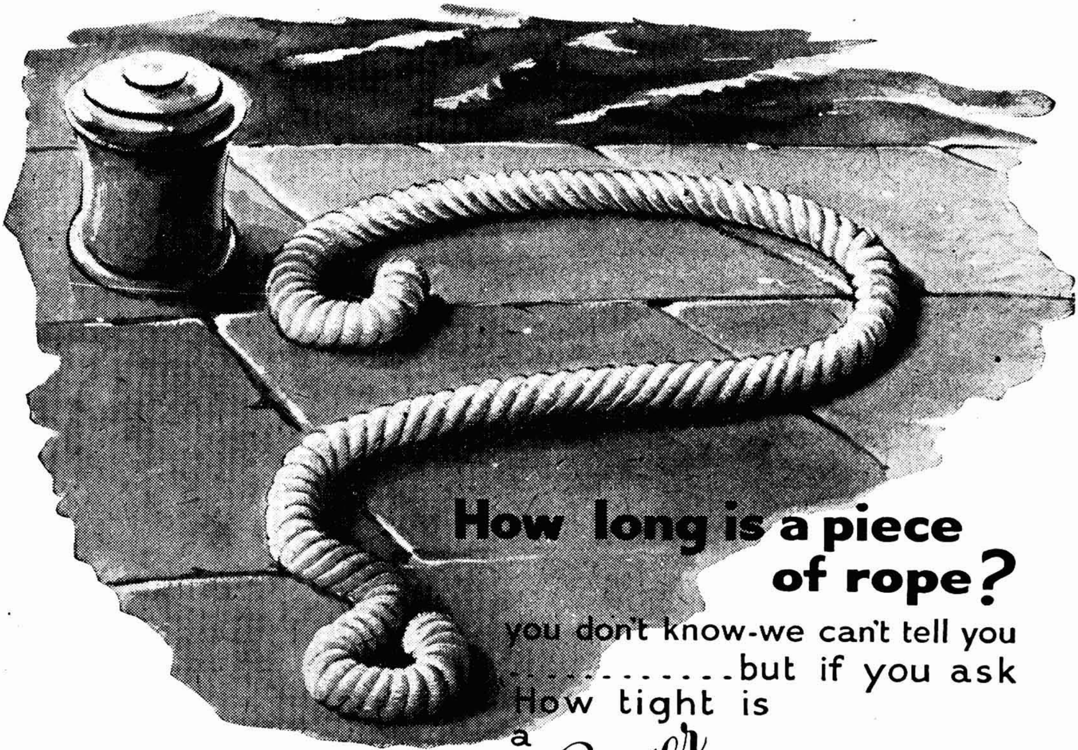

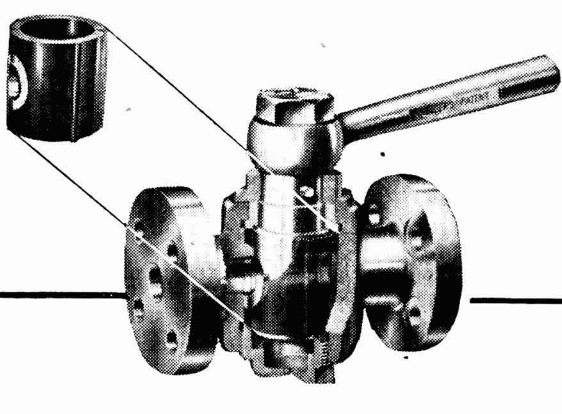

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Industrial Management

LAST year senior staff members of the United Steel Companies gave a series of lectures on industrial management to undergraduates at Cambridge, and these have now been published by the company in book form. The result is one of the best contributions to this subject we have yet encountered. The 'science-cum-art' of industrial management has acquired a sizeable 'literature' during recent years. No one could call the subject new, for it was being pioneered, although somewhat solitarily, by a few far-seeing people like Mary Follett long before it achieved much real attention.

Nevertheless, it is important to distinguish between the genuinely practical and the theoretical mumbo-jumbo in the avalanche of literature on management. Few subjects are more open to the quackery of the verbose. People with little experience of managing anything but words can quickly acquire a bubble reputation. Advising companies on their administrative problems is a new profession, and new professions are notoriously easier to enter than old ones. The number of experts which has seemingly become available in a few years calls for a good deal of credence, and the elderly industrialist who wonders why more of these people are not 'doing' rather than 'showing' may not be indulging in an entirely irreverent thought. For that reason this new book, from an active industrial organisation with seven works, a staff of 33,000, and its own research organisation, is a particularly meritorious study of the subject, essentially practical in atmosphere yet in no way neglectful of the theory and principles of modern management. The fact that the technological background is engineering is no disability to applying any of the methods to the chemical industry. Indeed, it is one of the best features of the seven lectures reprinted in this book that in none of them is the attitude taken that the administrative problems of steel manufacture are unique.

The first lecture was given by Mr. G. Steel, the appropriately-named managing director of USC. It is substantially the same lecture that he has also given on several occasions at the Administrative Staff College at Henley. His text is a quotation from a *Times* leader—'the function of management is more an art of direction, supervision, and co-ordination at the highest level, more a task of managing the managers.' As described by Mr. Steel, 'The Role of the Directing Authority in a Large Company' is a continuous operation in decision by consent and discussion and an equally continuous avoidance of dictatorship. However, one wonders whether this one lecture might not have been placed at the end rather than at the beginning of the book; for, when modern management is effective, authority at the top rests upon the variously delegated branches of management.

The second lecture deals with production management. It is particularly concerned with the movement problems of a works which covers a large acreage and in which one process produces the 'raw materials' for feeding other processes; chemical industry readers will certainly not ignore the passing reference to relationships between raw material quality control and production maintenance. The main meat in this section is the responsibility chart. We have seen a good many of these presentations for showing the administrative flowlines in a works or business, but we have not seen a better one than this, which covers both the factory and its office, and which so clearly distinguishes between the responsibilities of a general manager and a general works manager. Thus, all production duties are directly under the latter, but research, inspection, and commercial controls are directed by the former.

The administrative controls required for the successful operation of a large company managed by indirect or delegated means are described by Mr. R. Peddie. Here there are two distinct problems: the handling of individuals, again a matter of chart-planned interlinkage; and the control of expenditure. The important point about controls for individuals and their functions is that the chart will always remain a scrap of paper unless it is continuously invested with personal contact, with committee or committee-like discussions between the various groups of managers and workers and with constant accessibility of management.

With the purely economic controls, another major point is made. 'The techniques used are, of course, those of the accountant . . . to make the system effective, the accountant must have a knowledge of the productive processes concerned and the standards of performance must be built up *with the co-operation and approval of the production department'* (our italics). Far too many businesses have worshipped the phrase of 'budgetary control' only to find that head-office costs have risen and personal enthusiasm in works management staff has faded.

Mr. Slocombe's lecture on the functions of a chief engineer in a large steel works can perhaps be passed by here as a picture of specialised functions within the system of modern management. Dr. J. H. Chesters' lecture on the organisation of research in industry offers a theme of somewhat greater relevance to these pages. Here, again, we must admit that we have not come across a better presentation and discussion of the problems that are involved. 'The usefulness of a research department depends primarily on the originality, initiative, and effort of the staff, but the framework within which research workers function greatly influences the results . . . .' Some passing data about general industrial expenditure upon research are given, and it would seem that in the United States a cost equivalent to ½ per cent of a company's sales and services is an average figure, while here it is possibly an above-average figure reflecting the research effort of the more progressive organisation.

Dr. Chesters stresses the danger in having too many projects in hand at any one time, commendably quoting his own company's position at the time of lecturing—260 different investigations in hand with about 180 people working on them. The removal of at least 80 of these projects would almost certainly raise the efficiency of the department. The case of an associated company's research organisation is cited—ineffectiveness was traced to the fact that it was trying to cope with four times as many problems as the number of its staff. The pursuit of secrecy is commendably scorned—'when you lock the laboratory door, you keep out more than you keep in.' The importance of initial investigation sheets which correctly state the presented problem is firmly emphasised. So, too, is the importance of clear final reports, and of interim reports for the slower, troublesome projects.

The final two lectures deal with planned development—mainly old plant extension or new plant construction—and with staffing, principally with the problem of new recruitment. These subjects are treated no less effectively than the others, but space prevents further comment in detail. What little we have been able to say here may well have created a desire to read this book in full. The satisfaction of that desire will not be achieved by a visit to a bookshop. We can only say that the book, entitled 'Industrial Management' is published by the United Steel Companies Ltd., Sheffield 10, and carries no pricemark. We believe, however, that requests on headed notepaper are likely to be met.

To all readers
the staff of The Chemical Age
wish a very happy Christmas
& prosperity in the New Year

SOMETIMES we feel that the lot of a journalist is a hard one. The hours are long and the work made more tiring by the spectre of a steadily ticking clock which always seems to hang above the editorial chair. Nervous breakdowns, duodenal ulcers and thrombosis are the occupational diseases of our profession. The most unsatisfactory side of the life, however, is that usually our labours appear in vain. For months on end the daily grind goes on without any sign as to whether or not we are putting our message across or whether the material we publish interests the majority of our readers. When Christmas comes, however, all is changed. With the arrival of seasonal greetings from all corners of the world we suddenly realise that relations with our readers are not so impersonal as we had thought. The friendly messages we have received from Australia, Canada, Communist China, Czechoslovakia, Hong Kong, India, South Africa and the United States—as well as from England, Scotland, Wales, Northern Ireland and Eire—have pleased us immensely. Most of these have come from firms or individuals with whom we have not had any personal contact and it has encouraged us to learn that we have made friends without realising it. We are warmed by the feeling that our readers are members of one big family scattered throughout more than 45 countries, yet held together, in spite of language and political differences, by a common interest in industrial chemistry. Typical of the messages we have received is one from Bryce, Robarts and Co. Ltd., a firm of chemical traders who next year celebrate their 50th anniversary. This message reads: 'On the occasion of our Jubilee Christmas, we feel it only right that we should avail ourselves of the opportunity to wish you continuous success with your admirable journal, whose service we have enjoyed during our past years of trading. As a small indication of our good wishes, we hope you will accept the enclosed calendar, and we look forward to the pleasure of reading the valued technical and commercial information contained in your publication during the ensuing years.' We cannot, unfortunately, reply individually to all the kind messages we have received. We would, however, like all those who have remembered us to know that we appreciate their kindness and that we do sincerely wish them all very long life and great prosperity.

Notes & Comments

Solids in Flow

CRITICAL link in many systems of automatic materials handling is the flow of solids through bins or hoppers, spouts or feed apertures. All too little is known about the 'dynamics' of this subject; very often the word 'statics' could be more aptly used, for the formation of an arch of blockage is a common cause of processing hold-up. Two very useful papers on this subject have recently appeared in *Chemical Engineering* (1954, **61**, [12], 175 and 181). One is by a consultant on materials handling, Dr. A. W. Jenike, who has developed a useful working theory to cover most features of the problem, the other, though in some disagreement with Dr. Jenike's ideas, deals rather more mathematically with hopper design. It is certainly not practicable to give abbreviated accounts of either paper here, but chemical engineers who have to face these problems of solids flow should certainly peruse the papers in their full form.

Caught in the Hopper

DR. JENIKE'S own summary of his working theory runs roughly as follows. A solid material in bulk is compacted by pressure in a bin, and there are three sources of pressure—weight of material above, impact, and vibration. Cohesive strength is built up under pressure. Opening the bin gate or feeder removes the material just above the gate or feeder, and this brings about a redistribution of stresses within the mass. The tendency to form an arch is produced. The stresses in the arch must be higher than the compacted strength of the material if there is to be steady flow from the bin. Bin or hopper design, including the design of the outlet, can be pre-planned to ensure that this condition operates for specific solid materials. However, the capacity of the solid material to develop strength under pressure is also an important influence. Dr. Jenike suggests that this capacity can be measured in terms of a 'flow-factor' and describes a method for this somewhat empirical determination. An interesting point in Dr. Jenike's paper is concerned with the shape of the outlet. He has found that a rectangular opening has an advantage—the width of opening that will obviate doming above the outlet is rather smaller than for elliptical openings. However, in practice, this advantage is frequently lost by the use of a feeder system which in effect cuts down the width of opening. The feeder system must draw material from the whole opening, not merely from one part of it. It might well be that many cases of stoppage through arching in simple bulk handling are due to this defect in operation.

I.C.I. Dispute

Men and women employed in the blasting department of the I.C.I. explosives factory at Ardeer agreed to go back to work on 20 December after being idle for nearly a week. About 350 men had been suspended for 'going slow' and 500 women had to stop work because of lack of materials. After work had started again, negotiations began between the firm and the TGWU on rates of payment in the blasting department.

New Electronics Factory

At a ceremony in Shepperton on 20 December, Mr. John D. Profumo, MP (Stratford-on-Avon), Parliamentary Secretary (Aviation) to the Ministry of Transport and Civil Aviation, laid the foundation stone of the new factory of Winston Electronics Ltd. The factory, to which the company will be moving from their present address at Park Road, Hampton Hill, is the first demonstration of the 'Cranleigh' system of building developed by F. & D. Hewitt Ltd., of Cranleigh. Winston Electronics make a wide range of revolutionary instruments; one of particular interest to the chemical industry is the spectrographic monitor, or 'electronic lung,' which was developed in association with Harwell, although American experts maintained that it was impossible.

Heat Exchange Equipment

Birmingham Firm Introduces Fintubing

HEAT exchangers incorporating longitudinally finned tubes have been widely used for many years in the petroleum and chemical industries in the United States. They are now being manufactured in this country by Brown Fintube (Great Britain) Ltd., a company formed recently in association with Birwelco Ltd. (formerly Birmingham Welding Co. Ltd.) of Chester Street, Aston, Birmingham.

The manufacture of the tubes is a US patent and is performed under licence. The process involves continuous welding (or brazing for non-ferrous materials) using patented special machines and techniques built up by the Brown Fintube Company of America. The process, claimed to be the only one of its kind in Western Europe, was shown to members of the technical press who visited the firm's plant at Birmingham last week.

The fins are formed in pairs from flat strips of metal which are rolled into a truncated 'V' which is then welded or brazed to the tube. The resulting fintube is thus of completely integral construction, and the fins cannot be detached.

Their Advantages

The advantage of using fin surfaces lies in the fact that they cut down the amount of tube which must be used in a given heat exchanger. Certain fluids pick up heat less readily than others and it is therefore sometimes an advantage to arrange that one fluid in the heat exchanger has a bigger surface area to pick up or give heat than the other fluid. Also, with so great a surface available with relatively short lengths of tube of small diameter it is possible to design heat exchangers of useful size incorporating only two tubes, whereas between 15 and 25 plain tubes would be necessary.

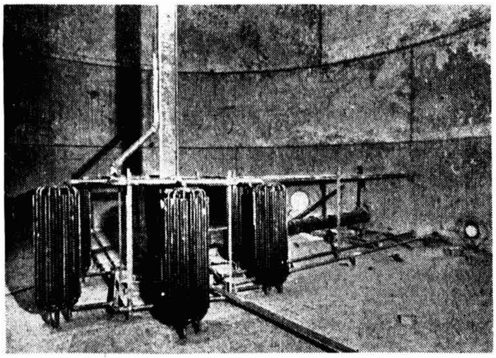
The two tubes can each be shrouded in a closely fitting outer tube, providing a passage between the inner and outer tubes through the fins for one liquid and through the centre of the inner tube for the second liquid. The resulting heat exchanger is comparatively light and small and is easier to clean, repair and service.

Another use for fintubing is for the heating of the contents of storage tanks. This can replace the practice of using flat coils made of plain tubing situated on the floor of the tank where they become embedded in sludge and dirt. Special fintube tank heaters (TF.20) made by grouping approximately 20 fintubes into suitable headers mounted vertically on the floor of the tank are now in use in a number of British oil refineries.

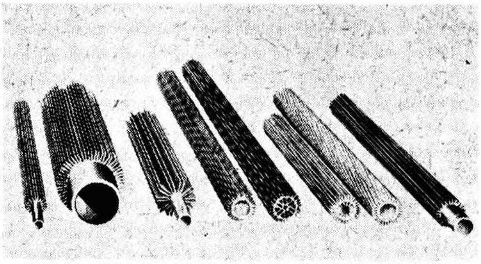
These tank heating coils are manufactured as standard units and the number of units installed in the tank can be determined to suit the exact heating requirements of the fluid stored. The units can be arranged in a ring formation, thus imparting a thermal flow movement to the tank contents.

The manufacture of fintubes in this country came as a result of a meeting with an American, Mr. John Brown, who was anxious to spread the use of his discoveries in extended surface heat equipment. Representatives of Birwelco paid several visits to the USA and the chief engineer, Mr. A. C. Brown, spent six months there. The manufacturing plant for the fintubing and the heat exchange equipment that goes with it were finally installed and, working under Mr. Brown, a team of engineers has been set up to design heat exchange equipment—given the bare essentials of the chemists' and chemical engineers' problem.

Although the process is an American one,



TF-20 tank heaters installed in an oil storage tank



A selection of fintube sizes and types

it is hoped that the British team will develop their own ideas and in the words of the general manager, Mr. R. G. Lewis, 'that Britain will catch up and perhaps take the lead in heat transfer equipment.'

The petroleum and chemical industries are at present the chief users of fintube exchangers, but the firm point out that many other industries, such as, for example, food manufacturing, would find them advantageous. Brown fintube heat exchange equipment is now in use both in this country and abroad. It has been used in Vacuum Oil Co.'s refinery at Coryton and Esso's refinery at Fawley. Equipment is being manufactured for the National Benzole Co. and the Shell Refining & Marketing Co., and other users include I.C.I. (at Wilton), CIBA, The Distillers Co. and Monsanto.

Heat exchangers made by the firm have been delivered to Spain, France, Trieste, Italy and Australia for major oil companies and more is at present being manufactured for customers in Holland, Belgium, France, Italy, Switzerland, Spain, Trinidad and Australia.

A paper prepared by the chief engineer, Mr. Brown, points out that the suitability of extended surface heat exchangers is largely governed by the comparative rates of heat transfer for the fluids involved. Should there be an appreciable difference in the heat transfer coefficients between the exchanging fluids, the use of finned surface exchangers should receive serious consideration. A ratio between the two coefficients of 3:1 or better is indicative that extended surface should be used.

The paper goes on:—'Double pipe heat exchangers have come more into general use in recent years as the advantages of this type of exchangers have become better known. The most frequently used form of the double pipe exchanger is the "Hairpin" section permitting easy connection of the number of sections required into a compact bank capable of performing almost any heat transfer duty.

'Generally speaking, the best application of the longitudinally finned double pipe "Hairpin" exchanger is in transferring heat between two fluids having unequal heat transfer characteristics; the purpose of employing what is, in effect, unequal surfaces on the two sides of the tube is to help balance out the heat transfer characteristics of the two dissimilar fluids, so that each fluid will have, as far as possible, the optimum surface for picking up or giving up heat. This can perhaps be best illustrated by considering a fuel oil heater, with steam as the heating medium. Such a heater incorporating a bare tube element would require sufficient surface area to enable the oil—a poor heat transfer fluid in comparison with condensing steam—to pick up the required quantity of heat. This would result in the area provided for the steam to give up its heat being grossly excessive. With a fintube element, sufficient outside surface can be provided to suit the poor thermal characteristics of the oil, with an inside surface more suited to the steam characteristics.

Other Considerations

'Allied to such considerations is the relativity of the film coefficient to the thermal conductivity of the fins: with high film coefficients the advantage of the extended surface, which may be expressed as fin efficiency, is less than it is with low film coefficients on the finned side. This effect, which is a function of temperature gradient from fin root to fin tip, results in a lower heat density per unit surface and is frequently turned to advantage when dealing with heat sensitive fluids or fluids liable to coking.'

Brown Fintubes' sectional exchangers for 'Hairpin' sections are manufactured in a standard range of sizes; there are four diameters of inner tubing and four diameters of shell, these giving a total of ten standard combinations. These standard exchangers are available in lengths of 5 ft., 10 ft., 15 ft., 20 ft. and 30 ft., so that it is possible to cater for almost any heat exchanger requirements by choosing a suitable number of one of these standard sections and suitably manifolding them and connecting them together.

Catalytic Oil Gas Plant

Britain's First ONIA-GEGI Installation at Stafford

IN September 1951, the West Midlands Gas Board decided to build an experimental catalytic oil gas plant at Solihull. While the plant was being constructed, a visit was paid to a small installation in France, a 300,000 cu. ft. per day plant developed by Office National Industriel de l'Azote (ONIA) in collaboration with Gaz à l'Eau et Gaz Industriel (GEGI). The results obtained with this plant so impressed the board that it was decided to order a 1,000,000 cu. ft. plant for erection at Stafford (originally Cannock was chosen). A contract was placed with Humphreys & Glasgow Ltd. in May 1952, and it was this installation which was opened on 19 November by Major Hugh Fraser, MP (THE CHEMICAL AGE, 1954 **71**, 1138).

The plant is the first using the ONIA-GEGI process to be built in Great Britain. The principal parts are a combustion chamber, regenerator, catalyst chamber and waste heat boiler. Gas treatment plant comprises a washer-scrubber, electrostatic detarrer and naphthalene washer.

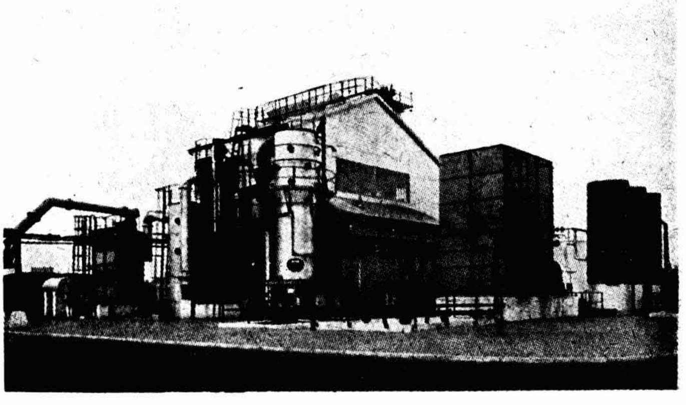
The catalyst chamber is refractory lined and contains the nickel catalyst supported on a firebrick bed; the heavy oil sprayer is located centrally in the top of this vessel. Owing to the difficulty of patenting catalysts, there is a natural reticence in disclosing information, but it appears that the upper layer is a shock catalyst which brings about a rapid initial decomposition of the oil to permanent gas; while the under-layer appears to be of a different type and probably acts more slowly.

The waste gases pass through a horizontal fire-tube waste heat boiler before being discharged. The make gas passes through a washer-scrubber, in which it is cooled to 110-120° F, at which temperature the tar may be removed. After the detarrer there is a secondary scrubber, in which the gas is cooled to 70-80° F before passing to the naphthalene washer.

The plant is brought up to working temperature by burning fuel oil, and can be started and shut down as simply as a carburetted water gas plant. The operating cycle of 8¼ min. comprises two phases, the blow and the make, which occupy about 47 and 50 per cent of the cycle respectively, with a 3 per cent steam purge between.

During the blow phase, oil is burned with primary air introduced at the top of the combustion chamber, and additional air required for burning carbon from the catalyst is introduced at an inlet to the preheater. The mixture of air and combustion products flows downwards through the catalyst bed and then through the waste heat boiler.

During the make period, steam is introduced into the preheater and oil is sprayed on to the top surface of the catalyst, the resulting gas being led off through the scrubber-washer. So far the efficiency of the plant at Stafford has not reached that of the experimental plant at Solihull, 1 gal. of oil producing 1,000 cu. ft. of gas, with a calorific value of 450 BThU. per cu. ft. The whole of the steam required is provided by the waste heat boiler.



General view of the installation at Stafford

New Antioxidant

Latest I.C.I. Rubber Chemical

THE Dyestuffs Division of I.C.I. has introduced a new, powerful, and completely non-staining antioxidant for rubber—Nonox WSL. This new product should be of particular value to rubber manufacturers at the present time when there is greatly increased interest in the production of white and light-coloured goods, notably white tyre-sidewalls. Nonox WSL should also help manufacturers to improve the appearance and quality of white and coloured rubber footwear, flooring compositions, proofings and cable insulation compounds, as well as of many latex goods.

Potency & Staining

Hitherto, the general tendency for potency to be associated with staining has severely restricted the number of antioxidants available to the rubber technologist concerned with producing light-coloured goods. Non-discolouring—or substantially non-discolouring—results have, in the past, usually been achieved at the expense of an important degree of protection against ageing. There are, of course, some good antioxidants that produce relatively little yellowing or discoloration.

Nonox WSL is reported to have emerged successfully from an exhaustive and prolonged series of exposure tests to sunlight, in Britain as well as under sub-tropical conditions in northern India. For these tests it was incorporated in a series of vulcanised rubbers, being compared with similar rubbers containing Nonox EX, a non-staining antioxidant already well known in the rubber industry. The Nonox WSL rubbers showed complete absence of staining and, in retention of tensile strength after accelerated ageing, proved in every case superior (in many cases markedly so) to the Nonox EX rubbers.

Definite Step Forward

The production of Nonox WSL thus marks a definite forward step in the field of rubber technology, making possible the more efficient and effective use of rubber.

A brochure detailing the tests made on Nonox WSL and their results, and containing physical and full technical data, is available from Imperial Chemical Industries Ltd., Dyestuffs Division, Manchester.

US Industry is Building

THE US chemical industry has completed privately financed construction projects representing an investment of $1,216,516,000 during the past 12 months, and has under construction or definitely planned another $1,514,392,000, according to a survey of chemical industry expansion announced by the Manufacturing Chemists' Association.

The total of projects completed this year, and those now under construction or planned, most of which will be completed within three years, is $2,730,908,000. The MCA pointed out that many more projects have been announced as 'under consideration' or in the planning stage, and that while many of these will be started within the next year, none of them was included in this survey.

William C. Foster, MCA president, comments: 'These new facilities will mean substantial increases in jobs and operating payrolls of the chemical industry, earnings for share owners, tax returns for federal and local governments, and new or improved products for consumers. Despite some reported cutbacks in construction plans earlier this year, this survey appears to bear out the prediction that the chemical industry will quadruple its production capacity by 1975.'

In addition to this construction financed by the corporations themselves, the MCA reported that there is an estimated total of some $3,360,000,000 government-financed chemical construction now under way or planned, most of it under contract with chemical companies.

Lecture Demonstrations

TWO special courses of lecture demonstrations on certain aspects of analytical chemistry are to be held in the Chemistry and Biology Department of Acton Technical College, High Street, London W.3, during the 1955 Spring Term.

At 7.30 p.m. on Fridays, starting on 14 January, a course on 'Paper Chromotography and Ion Exchange in Analytical Chemistry' by I. Smith, B.Sc., A.R.I.C., will be held. This will be followed at the same time and day, starting on 25 February, by a course given by specialist staff of the Radiochemical Centre at Amersham on 'Radio-Isotopes and their Applications in Analytical, Inorganic and Organic Chemistry.'

Butadiene from Petroleum

By PETER W. SHERWOOD

LARGE-SCALE production of butadiene from petroleum stocks is one of the proud engineering achievements of the 1940s. To cover the urgent war-borne need for this di-olefine, seven petroleum-based butadiene plants were built under the US government's synthetic rubber programme. There plants have a combined rated capacity of slightly above 1,000,000,000 lb. In addition, a privately built petroleum-to-butadiene plant accounts for 200,000,000 lb. per year; and two alcohol-based plants are in condition to provide emergency production of butadiene, but the economics by which these installations operate are not favourable.

After a temporary post-war slump, butadiene demand has recovered well. The 1953 output of 1,150,000,000 lb. is barely short of (petroleum-based) capacity and construction plans to supplement existing facilities are well under way. Recent announcement has been made of plans for a 100,000 tons per year butadiene plant by a Texas combine of which Warren Petroleum Company is a member; Texas Butadiene and Chemical Corporation intends to construct a butane-to-butadiene plant; and Union Carbide and Carbon Corp. has been awarded a certificate of necessity for building butadiene facilities at Seadrift, Texas.

Growth of the butadiene industry continues to be governed by the demand for GR-S rubber, which vastly overshadows all other outlets. New markets for butadiene are, at present, still making only gradual headway. Tracy[1] foresees a 1955 consumption of 691,000 short tons, of which 611,000 is for GR-S.

Butane to Butadiene

Existing butadiene facilities look to butane as the raw material. The process takes place in two stages: (a) Dehydrogenation of *n*-butane to 1- and 2-butenes, followed by (b) dehydrogenation of butenes to butadiene. To a certain extent, butenes may be recovered directly from refinery gas, in which event the first dehydrogenation step is, of course, eliminated. However, the practical supply of butenes from this source is insufficient and butane-to-butene conversion is therefore an integral part of butadiene manufacture.

Interest attaches also to the one-step production of butadiene from butane, as developed by Houdry Process Corp. It is said that this method will serve as basis for the Texas Butadiene and Chemical Corporation's intended plant.

Conversion of butane to butene proceeds as follows:

$$C_4H_{10} \rightleftharpoons C_4H_8 + H_2$$

Position of the equilibrium is improved by rise in temperature. The following table[2] shows the effect of this variable in the olefine content of butane-butene equilibrium mixtures:—

Temp. °C.	Mole % Olefines in Paraffin-Olefine Equilibrium Mixture (1 atmosphere) *n*-butane	isobutane
427	11.4	12.5
500	24.5	26.3
600	41.9	42.7
727	48.7	48.7

In practice, occurrence of cracking reactions limits the upper temperature to 600° C. In order to obtain best conversion per pass within this limitation, commercial butane dehydrogenation is carried out between 525 and 600° C. This necessitates the use of highly active and specific catalysts. Chromia-alumina is in general use for this purpose.

Effect of temperature and contact time on dehydrogenation over such a catalyst has been reported by Grosse and Ipatieff[3]. Contact time is of critical influence on conversion. At 600° C per-pass yield of *n*-butylene rises from 25 per cent after 0.6 seconds to a maximum of 30 per cent at 2 seconds. After that, side reactions rapidly take their toll, and per-pass yield is again depressed to 25 per cent at 4 seconds' residence time. (These figures are illustrative only of trends; their numerical value is determined by catalyst formulation and age).

Catalysts in butane dehydrogenation service are fouled by carbon deposition. This problem is particularly pronounced with sulphur-free feedstocks, and doping with 30-40 ppm. carbon disulphide has been resorted to where pronounced soot formation actually caused obstruction to the process stream. In any event, regeneration by burning is required after one to three on-stream hours, and chromia-alumina catalysts are sufficiently rugged to permit such treatment with only tolerably slow decline in activity, provided that proper precautions are taken to restrict regeneration temperature below sintering level (700-750° C).

Billingham Process

Beesley and Whipp[4] have described commercial butane dehydrogenation operations at I.C.I.'s Billingham plant. Here, the fresh feed consists of 70 per cent isobutane and 30 per cent *n*-butane. Since per-pass conversion averages only 22.5 per cent, unconverted butanes are separated from the make and are returned to the conversion stage (containing about 3 per cent *n*-butylene). In a typical recycle the charge ratio is 3:5.

The catalyst is chromia on alumina, promoted by alkali compounds for greater activity and stability. (While exact catalyst composition has not been disclosed for the Billingham plant, the writer knows of another butane dehydrogenation plant where the catalyst consists of activated alumina impregnated with 8 per cent CrO_3 and 1-2 per cent K_2O). In standard operation, 1 lb. of butane will yield 0.85 lb. butylenes, 0.03 lb. hydrogen, and 0.01 lb. C_1- to C_3-hydrocarbons. The remainder goes to carbon or is unaccounted loss.

Quite generally, the first step in the separation of butanes-butenes mixtures is the removal of isobutene by selective absorption in sulphuric acid. The remaining mixture is fractionated into a light cut consisting of isobutane and 1-butane, and a bottoms mixture of *n*-butane and 2-butenes. Extractive distillation serves to separate components of these two fractions.

Extraction of isobutylene is practiced in two stages[5]. In the first stage, prefractionated C_4-mixture is contacted at app. 100° F with lean extract obtained from the second stage. After phase separation the rich extract is taken to regeneration. The raffinate (hydrocarbon) phase is cooled and then enters a second extractor where it is contacted with 65 per cent sulphuric acid at 55-75° F. The acid layer leaving this step is forwarded to the first extraction stage. The hydrocarbons, substantially devoid of isobutylene, are worked up in a distillation scheme to be described below.

Isobutylene is recovered from the sulphuric acid phase. This regeneration is effected in a tray column. Rich extract is fed at the top and live steam is introduced at the bottom. The depleted acid leaves the tower's base at 45 per cent strength, substantially free of hydrocarbon. Isobutylene is taken overhead, cooled and washed. Some by-product *tert*-butyl alcohol and iso-butyl polymer is liquefied in the course of isobutylene cooling. By recycling these materials to the extractor feed, isobutylene efficiency of 95 per cent may be achieved in the regeneration stage.

After isobutene separation, distillative methods serve for the purification of the remaining C_4 hydrocarbons. Straight fractionation is used to separate isobutane (rel. volatility 1.47) and 1-butene (1.29) from *n*-butane and the two stereoisomers of 2-butene (1.00 to 1.09). The components of each fraction may be separated by extractive distillation with furfural which will take the purified paraffins overhead, leaving the olefines in the bottoms.

An alternate separation scheme eliminates the primary fractionation in favour of extractive distillation with acetone. This segregates the combined butenes from isobutane and butene. The recovered olefinic fraction may be used as feed to butadiene production without further separation. Separation of C_4-hydrocarbons is made more complicated by the initial presence of butadiene.

For the conversion of *n*-butenes to butadiene, two catalysts are today commercially prominent. Standard Oil Development Company's 'Catalyst 1707', which assays 72.4 per cent MgO, 18.4 per cent Fe_2O_3, 4.6 per cent CuO, 4.2 per cent K_2O, has been the workhorse of the industry. More recently, Dow Chemical Company's calcium nickel phosphate catalyst has entered commercial dehydrogenation service (at Polymer Corporation's butene dehydrogenation plant at Sarnia).

High Temperatures Needed

In the dehydrogenation of *n*-butenes, thermodynamic equilibrium necessitates use of very high temperatures, and favours low pressures. The reaction is (at equilibrium) limited to 40 per cent conversion at 0.1 atmospheres and 1100° F. Thermal cracking reactions take too serious a toll above 1300° F to permit operation above this limit. Russell *et al.* indicate[6] that practical operating temperature is held within 1150-1250° F at a superficial reactant residence time of app. 0.2 seconds to achieve

25-30 per cent conversion per pass (with '1707' catalyst).

The dehydrogenation reaction itself is favoured by low converter pressure. Even more important, a low partial pressure of product butadiene counteracts this material's strong tendency to undergo polymerisation and other degradation reactions. The objective of low partial pressure (app. 100 mm. Hg) of hydrocarbon is achieved by dilution with steam. This technique has the further advantages of providing a ready vehicle for the introduction of the large required endothermic heat and of minimising the need for catalyst regeneration by gasifying much of the coke as soon as it is formed. Obviously, this operating scheme calls for high steam: hydrocarbon ratios (10:1 to 20:1) and resistance to deactivation and degradation by high-temperature steam is one of the important merits of the commercial butene dehydrogenation catalysts (alumina-chromia cannot stand up to such operating conditions).

Some carbon deposition is unavoidable at the drastic dehydrogenation conditions, even in the presence of steam, and regeneration is necessary. Thus, butadiene production is a cyclical operation which calls for several (at least two) reactors in parallel. The regeneration step itself is accomplished by steaming in the absence of hydrocarbon at regular reaction inlet temperature or, preferably, some 25° F below it.

Carbon Formation

Kearby[7] has shown that the extent of carbon formation is determined by the steam:hydrocarbon ratio and by the potassium content of the '1707' catalyst. Departing from the original cycle of one hour on stream and one hour on regeneration, Kearby found that a 7:1 steam-to-butene ratio at 1200°F reduced the time for adequate regeneration to 10 minutes out of every hour. By doubling this steam ratio, continuous operation without regeneration was made possible for 100 hours, although the temperature had to be gradually boosted for constant conversion.

A further important effect is the gradual depletion of potassium carbonate from '1707' catalyst, with resultant acceleration of carbon deposition. This can be overcome by replenishing the catalyst's potassium content.

The industrially useful steam: hydrocarbon ratio is fixed by economic compromise. Rising ratio raises useful yield as well as permissible on-stream time of the catalyst. On the other hand, throughput is lowered, and fuel consumption (as well as cooling water requirements) is significantly increased. Typically, a ratio in the range of 10:1 is chosen.

A Recent Catalyst

The same general process scheme is applicable to the production of butadiene over calcium nickel phosphate catalysts, which are of more recent origin. This catalyst is also operated cyclically. The reaction stream is *n*-butene and steam, while air-and-steam mixture serves for regeneration. Each part of the cycle lasts 0.5-1 hour.

This catalyst pays for its high steam requirements and considerably lower space velocity by providing outstanding yields. At 21.4 steam ratio and 30.5 per cent conversion, Britton *et al.*[8] obtained selectivity of 92.0 and yield actually reached 94.0 per cent per-pass reaction. Conversion drops markedly as the cycle's reaction phase is lengthened and regeneration after 30-60 minutes on steam is quite essential. Nickel-containing steels cannot be tolerated in contact with this catalyst. Harm is also caused by contamination with oxides of alkali and alkaline earth metals.

The direct conversion of *n*-butane to butadiene by a process developed by Houdry has been brought into the limelight by the recent announcement of Texas Butadiene & Chemical Corporation's intention to employ this route commercially. Combination of the two dehydrogenation steps into a single operation is made feasible by a very large price differential between available butane and butene.

Houdry Process Corporation's[9,10] single-stage process of conversion of butane to buatdiene involves the use of chromia-alumina catalyst[10]. The process is operated on a heat-regenerative principle; i.e., the endothermic dehydrogenation period alternates with combustion of coke deposited on the catalyst bed. Enough heat is stored in the catalyst bed during the burning to cover the reaction period's requirements. To provide the large heat capacity needed, the catalyst pellets are mixed with suitable inert material.

Fresh butane charge is joined by a recycle butane-butene stream from butadiene recovery. The mixture is preheated to app. 1150° F before it enters the reactors. The converter make gas is oil-quenched, compressed and cooled and the gas, after separation from condensate, is passed to a standard absorber-stripper system. Recovered C_4-hydrocarbons are separated by fractional and extractive distillation.

If maximum butadiene production is the objective, the recovered butenes are recycled to the reactors together with butane. Typical reaction conditions are 1125°F and 5 in. Hg. On-stream time is between 7 and 10 minutes. A vacuum purge follows this period. Preheated air is then introduced to effect regeneration. Total cycle time is 20-25 minutes.

Low Yields

Since this process relies on coke formation as a major source of fuel needed in the reactors, only relatively low yields of butadiene may be looked for. In maximum butadiene production, ultimate yield of butadiene is app. 55 per cent w/w (based on butane). The process may be adapted to yield a mixture of butenes and butadiene, or to the production of butenes only. In the latter case, higher pressure may be used and butene recycle is eliminated.

Butadiene is usually required in 95-98 per cent purity. The reactor make, however, contains barely 30 per cent of the diene in the 2-stage process, and 11 per cent in the single-stage process. For the removal of lighter hydrocarbons and hydrogen, which are formed to a limited extent, the liquefied reactor make is stabilised in conventional equipment. The heavy (C_4-plus) fraction is rectified for isolation of the C_4-cut.

Standard fractionation is adequate for the removal of relatively high-boiling 2-butenes and *n*-butane. The vapour pressures of butadiene and 1-butene are, however, sufficiently close for purification by fractional distillation to be inadequate. Two methods have served for the commercial purification of butadiene; extractive distillation in the presence of furfural[12] and absorption in aqueous cuprous ammonium acetate[12].

Basis of the distillative method is the fact that the volatility of 1-butene relative to butadiene is heightened by the presence of large amounts of furfural. A typical column in this extractive distillation service has 100 plates, with the feed introduced at midpoint and the solvent, at 60°C, entered near the column top. 1-butene (together with any contained isobutane) is taken overhead, and butadiene dissolved in furfural is withdrawn as bottoms at 160°C. Separation between solvent and butadiene is accomplished in a separate 20-plate column.

Happel[11] reports the following conditions as typical in a 14-foot diameter extractive distillation column:—

Overhead (1-butene) ..	16.4 tons per hour
Hydrocarbon reflux ..	58.9 tons per hour
Hydrocarbon reflux ratio	3.58: 1
Furfural feed rate ..	556 tons per hour

The use of cuprous ammonium acetate solution as diene solvent is practised principally for the recovery of butadiene in polymerisation plants, and is therefore of more limited interest in the present discussion. Briefly, the process is based on the formation of a water-soluble butadiene complex with the copper salt, which makes absorption of butadiene possible while the other components remain in gaseous form (any dissolved 1-butene is displaced by a small stream of pure butadiene). The butadiene-rich solution is heated for decomposition of the complex and recovery of the diene.

The copper liquor process calls for higher capital investment than extractive distillation, but it is economical, nevertheless, for recovery of butadiene from dilute streams. For such a feed, the thermal efficiency of the furfural process is prohibitively low. Work by Borrows *et al.*[13] suggests that extractive distillation is economically more advantageous with feeds containing 50 per cent or more butadiene. At significantly lower concentrations, operating savings in copper liquor absorption are sufficient to pay out the higher needed investment.

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Nitrogen Output Still Rising

Annual Report of British Sulphate of Ammonia Federation

THE annual report of the British Sulphate of Ammonia Federation Ltd. for the year ended 30 June shows that the upward trend in world production and consumption of fixed nitrogen continued during 1953/54. Compared with the previous year, total production rose by about 11 per cent and total consumption by 13.2 per cent. The increase for agricultural use was 11.5 per cent and for industrial use nearly 22.2 per cent.

Production in the United Kingdom rose from 431,700 metric tons to 451,300 metric tons. For the whole of Europe, including the Eastern Zone of Germany and the USSR, the increase was from 3,279,500 to 3,629,000 metric tons. Increases in both production and consumption were recorded in all other continents. Since 1945 there has been a continuous upward trend in world fertiliser nitrogen consumption.

Total UK production of nitrogen products in 1953 was 5.9 per cent higher than in 1952. Output of fertiliser products increased by 3.6 per cent and production for industrial uses by 11.9 per cent.

Total deliveries in 1953/54 for agricultural consumption in the UK of all nitrogen fertilisers show an increase of more than 11,000 long tons of nitrogen content over 1952/53. This is a record tonnage and consumption is believed to have approximated closely to deliveries. The tonnage of nitrogen sold in compound fertilisers was much greater than in any previous season.

Agricultural Use Increased

The amount of sulphate of ammonia delivered for agricultural use in the same period increased in the UK from 650,157 long tons to 717,433 long tons.

Exports of sulphate of ammonia showed a decrease of 34 per cent from the figures for the year 1952/53, when exceptionally large shipments were made. The fall was largely accounted for by a decline in exports to Asia, particularly China and Hong Kong. Total exports amounted to 299,000 long tons, compared with 455,577.

The report states that weather conditions in the spring of 1954 were not favourable for the application of fertilisers to grassland, but the preparations made by fertiliser manufacturers in the winter of 1953/54 to meet a heavy demand were justified by sales which were well maintained to the end of the season. The slow start and extended season of demand eased distribution problems in the normal peak period and all home trade requirements were met without serious delay.

All fertiliser prices were freed from statutory control on 1 July, 1953. A new scale of early delivery and compounding rebates for sulphate of ammonia was introduced on that date, and the results for the season appear to have justified the changes made. It was necessary to increase the price of sulphate of ammonia by 4s. per ton on 1 March, 1954, to cover increased transport costs. Subsidy arrangements were the same in 1953/54 as they were in 1952/53.

Importance Recognised

In a reference to the gradual removal of controls and restrictions on agriculture, the report says that the role of fertilisers in increasing yields per acre, reducing unit costs and improving efficiency in a free market is becoming more widely recognised.

The important saving in milk production costs which can be made by proper use of well fertilised grassland has been repeatedly emphasised by all authorities concerned with milk production, the report adds.

The annual Price Review, 1954, determined the guarantees which would apply to livestock products from April, 1954, to March, 1955. The awards were in general well received, and farmers recognised that provided adequate marketing arrangements were made they were well justified in planning for full production at maximum efficiency. The full effects of the 1954 guarantees will probably not be seen in fertiliser sales until next season.

Agricultural development work by the federation's agent, Imperial Chemical Industries Ltd., in 1953/54 covered a variety of subjects. The main emphasis was on grassland, where the substantial volume of information already accumulated was further increased and made available to farmers. Extensive trials have been carried out on the manuring of cereals and further work is planned on the effect of nitrogen on the yield and quality of different cereal varieties. The new stiff-strawed wheats for milling and barleys for feeding have given very good results with heavy top-dressings of nitrogen.

Press advertising has concentrated on the use of nitrogen for grassland and cereals at the appropriate times of the year. Literature ranging from very large editions of leaflets on specific subjects to monographs on the use of nitrogen on a whole-farm scale have been circulated to the agricultural trade and official bodies. Lectures were held throughout the winter of 1953/54 all over the country.

Four works with a total annual output of 12,000 tons have been registered as Grade 1 producers during the year, bringing the number up to 37. Experiments at a number of other plants are promising, and it is expected that a considerably increased tonnage of Grade 1 salt will be produced during the coming year.

Although general agreement has been reached with collaborating members on the development of suitable methods for the determination of impurities in coke oven liquors a few details are still under discussion, and it has not yet been possible to publish the methods in the Summary of Reports.

Resin Cements Studied

Experiments in the use of resin cements for protective coatings have been extended to furane resin cement reinforced with glass fibre. So far copper pipes have been covered by this technique, but adhesion tests and other tests are being carried out on a number of metals and alloys commonly in use in the sulphate of ammonia industry.

The report gives details of the final average realisations receivable by members of the federation per ton produced, based on sales realisations for all deliveries for home and export free on rail at makers' works in secondhand bags, after making allowances for adjustments in the value of unsold stocks and provisions against losses in certain markets. For the year 1953/54 the average realisation for ordinary quality (20.4 per cent nitrogen) was £13 1s. 5d., compared with £13 14s. 2d. for the previous year. For neutral quality (21.1 per cent nitrogen) it was £13 14s. 1d. (£14 6s. 10d.).

The decrease is due partly to larger deliveries in the home market, leaving a smaller tonnage available for export, and partly to the lower prices prevailing in overseas markets during the earlier months of the year.

At 30 June, 1954, another quadrennial period was completed. One new member joined the federation during the year and one member resigned, having ceased production. The number of members therefore remained at 75.

Sir John Cass College

Next Term's Courses for Chemists

A COURSE on 'Microchemical Analysis' consisting of about ten lecture-demonstrations and suitable for analysts and advanced students of chemistry will start on 13 January at Sir John Cass College, Jewry Street, London E.C.3. The course, given by A. G. Lidstone, M.A., B.Sc., and David W. Wilson, M.Sc., F.R.I.C., is designed to introduce the principles and technique of inorganic and organic analysis on the micro and semi-micro scales. It will be held on Thursday evenings.

A. R. Philpotts, M.A., will be the lecturer in a course of ten lectures on 'Absorption Spectroscopy' that will start on 14 January. The subject will be treated mainly with reference to the practical problems of the chemist, and the lectures will be illustrated by lantern slides, photographs, charts, demonstrations, etc.

Two courses in practical spectroscopy by L. O. Freeman, M.Sc., Ph.D., and D. B. Powell, B.Sc., A.R.I.C., are to be held, one in the second and one in the third term. The first one, on emission spectroscopy, will be held on Friday evenings from 14 January to 18 March and the second on emission and absorption spectroscopy from 29 April to 1 July.

On 18 January a course of nine lectures on 'Recent Developments in Molecular Theory' by H. H. Greenwood, B.Sc., Ph.D., will begin. The lectures, which will deal with more advanced molecular theory, will be in continuation of those given in the first term and will be suitable for advanced students of chemistry of physics.

A course of eight lectures by G. A. Dummett, M.A., A.M.I.Chem.E., on the principles and practice of distillation, intended for industrial chemists and chemical engineers, will be held on Friday evenings, beginning on 21 January.

All courses will begin at 6 p.m. and will be held in the Department of Chemistry.

Problems of US Industry

Challenge to the Future

FOUR major problems challenge the future of the chemical industry and the country, Mr. William C. Foster, president of the US Manufacturing Chemists' Association, told industry executives in New York recently. The four were future resources of energy, the effect of new technology and changing economic conditions on human health, the training of men and women to manage increased technology, and the advancement of fundamental research.

Speaking before the Drug, Chemical and Allied Trade Section of the New York Board of Trade at the Waldorf-Astoria Hotel, Mr. Foster said that at present rates of consumption conventional sources of energy would be insufficient within 50 years to maintain living standards at current levels. At the same time power demands were being rapidly increased by heavier demands of technology, growing populations throughout the world, and the increasing desire of people in other lands to match American living standards.

'The future supply of power is the essential material problem bearing on the future of world civilisation,' he said. 'It may be more important than the clash of ideologies, serious as that is.'

Chemical Techniques Involved

Pointing out potentialities of nuclear and solar energy, the fuel cell, and development of low-grade fuel sources, Mr. Foster said all these had one outstanding common factor—'they involve heavily the use of chemicals and chemical techniques.'

A number of questions had been raised, he said, as to whether new or increased amounts of chemical products, in mass use over long periods, would adversely affect human life. A committee of the MCA Board was now studying this problem and was charged with the responsibility of suggesting what further could be done, in addition to the tremendous amount of research and control now being carried out by the industry, to assure maximum safe use of chemical products.

After outlining the growing scarcity of technical graduates in face of growing demands, Mr. Foster said: 'The amazing thing is that probably never before have there been more college assistance programmes or more job and career opportunities for the young person who might choose to prepare himself in this field. This problem seems to be one of reaching the minds of these young Americans, firing their imaginations with the excitement and opportunity of service in this field and with the possibilities of reward.'

In fundamental research, Mr. Foster observed that America was lagging, both in terms of needs, and in comparison with other countries. 'We have profited enormously from such research imported from other countries,' he said. 'If these sources were cut off it could put us at a tremendous competitive disadvantage. At worst, in the event of war, it could mean disaster.'

Spring Term Courses

TWO lecture courses starting at the beginning of January are announced by the Department of Chemistry, Northampton Polytechnic, London E.C.1. The first, starting on 3 January and to be held on Mondays at 7 p.m. will be on 'Recent Developments in Metal Finishing.' There are to be seven lectures given by various lecturers and the subjects to be covered include developments in the electrodeposition of nickel, chromium, tin and tin alloys, the electroplating of precious metals, metal spraying, zinc coatings on steel, lacquer and synthetic enamel coatings and stoving finishes.

A course of eight lectures on 'Liquid Fuels, their Properties and Utilisation' by G. F. J. Murray, B.Sc., A.M.Inst.C.E., A.M.I.Mech.E., M.Inst.F., A.M.I.H.V.E., will start on 4 January and will be held on Tuesday evenings at 7 p.m. The course will provide a survey of present-day knowledge, and the standpoint of the user of liquid fuels will be stressed throughout. It will be of particular interest to fuel technologists, metallurgists, executives, engineers and those in charge of fuel-burning furnaces and boiler plants and will be valuable to people studying for the examinations of the Institute of Fuel and the Institution of Metallurgists.

Courses starting later in the month include a laboratory course in refractory technique (6 January), 'Heat Transfer, with Special Reference to Fuels' (24 January) and 'Materials of Construction' (27 January).

Head of the department is J. E. Garside, Ph.D., M.Sc.Tech., F.R.I.C., F.I.M., M.Inst.F.

Membrane Filters

Now Available in Cellulose Acetate

COURTAULDS Ltd. announce that they have developed a process for the production of membrane filters, and these are now available in limited quantities. The filters are chiefly of use for the rapid bacteriological examination of water and sewage, and for the filtration of pharmaceutical fluids, or in fact for any work which requires the separation of bacteria or other fine particle suspensions from liquid or gaseous media. Membrane filters have considerable advantages over the conventional type filters normally used for these applications, in that much greater rates of flow through them can be obtained.

In the cases where bacterial counts are required, the bacteria filtered off on the membranes can be subsequently grown by placing the filter in contact with liquid nutrients to give visible colonies on the surface of the filter. The used filters can afterwards be dried and kept as a permanent record. Other uses are in the preparation of bacteria- and dust-free water, the separation and subsequent assay of antibiotic drugs, the filtration of wines and soft drinks, and the filtration of air for atmospheric pollution and pollen counts.

Soluble in Ketones

The filters are made of cellulose acetate and are thus soluble in certain organic esters and ketones, but they are unaffected by water, alcohol, ether and most hydrocarbons. The filters can be sterilised either by autoclaving at 10-15 psi. pressure or by treatment with ethylene oxide.

The filters, which are about 0.005 in. thick, have a fine porous structure, one surface consisting of a thin layer of very fine pores, the size of which are of the order of 0.5-1.0μ, while the remainder of the filter consists of pore sizes of 3-5μ. This type of structure enables suspensions to be filtered off on the surface of the filters and also permits a high porosity to be obtained. The membrane, although somewhat brittle when dry, becomes quite tough when wetted with water. The membranes can be stored indefinitely in a dry condition, without change of properties. An idea of the permeability of the films may be obtained from the fact that the flow rate at 70 cm. differential pressure is 80 cu. cm. per minute per sq. cm. at a temperature of 20° C. It is possible in the production of these membranes to vary the size of the pores within certain limits if so desired. The films can be rendered transparent by immersion in white oil.

The filters are supplied in the form of discs marked with a $\frac{1}{4}$ in. grid for ease of making bacterial counts. At present these discs can be supplied up to 8 cm. diameter, but larger sizes will be available in the future. The price of membrane filters is 6d. per 6 cm. disc, for quantities of one gross or more.

Tax on Machinery

DURING the first ten months of Canadian Chemical Co. Ltd.'s operations in Alberta, only 1 per cent of the plant's output was sold in the province, while 26 per cent was shipped to eastern Canada and 70 per cent to foreign markets. Giving these figures in a brief submitted to the Royal Commission on Metropolitan Development of Calgary and Edmonton, Mr. N. W. Mackenzie, president of Canadian Chemical, said the construction of the plant, the largest single industrial development in Alberta, involved a capital expenditure of more than $75,000,000, of which about 60 per cent was represented by machinery and equipment.

He urged a revision of Alberta's assessment laws governing industrial plants and the adoption of an assessment basis similar to that which applies to competing industries in other provinces and countries, where fixed machinery used for manufacturing is exempt from local taxation.

Petrochemicals Course

A COURSE of lectures on 'Chemicals from Petroleum' will be held at Sir John Cass College, Jewry Street, London E.C.3, on Thursday evenings at 6 p.m. beginning on 3 March, 1955. The course will consist of four lectures, each lasting about an hour. It is for advanced and postgraduate students and others who wish to obtain a knowledge of the present scope and possible future trends of some aspects of the petrochemical industry. A visit to the Shell Chemical Plant, Stanlow, will be arranged at the end of the course.

Subjects of the lectures will be 'Synthetic Fibres and Synthetic Elastomers,' 'Synthetic Polymers,' 'Solvents and Surface Coatings' and 'Detergents.'

MECHANISM OF POLYMER REACTIONS. By G. M. Burnett. High Polymers, Volume III (new version). Interscience Publishers, London. 1954. Pp. xv + 493. 80s.

This is a completely new version of Volume III in the well-known High Polymer Series, replacing Mark & Raff's 'High Polymer Reactions.' The relatively short time which has passed since the publication of the original version has seen an almost explosive development of the subject, much of which has resulted from the work of Dr. Burnett, who was the first to find an answer to the problem of determining rate constants and radical concentrations in liquid-phase free radical polymerisation. The rapid growth of the subject has made it impossible for him to follow the pattern of the original version in which much of the then published work was reviewed in some detail. In this version, the aim is to present general principles with a background of specific examples.

The approach is a kinetic one and the fundamental concepts of chemical kinetics are outlined in a brief introductory chapter. This is followed by a chapter on experimental methods in which the emphasis is on methods of following the course of polymerisation, other experimental methods, such as the determination of molecular weights, which are already well covered in other volumes in the series, being only briefly considered. It is, however, rather surprising that the Huggins expression for the dependence of viscosity of a polymer solution on the polymer concentration is not mentioned.

Additional radical polymerisation is then discussed generally, the topics dealt with including initiation and termination, molecular weight distribution, radical-molecule reactions and diene polymerisation. A chapter on the kinetics of radical polymerisation gives first a simplified kinetic analysis followed by a detailed mathematical treatment, the aim being the indication of obscurer manipulations, application to particular cases and facilitation of modifications.

The subjects of gas phase polymerisation, homogeneous liquid phase polymerisation, rate constants of radical polymerisation, copolymerisation and heterogeneous liquid phase polymerisation are then successively considered. Under these headings are discussed the general properties and kinetics of polymerisation of unsaturated hydrocarbons and vinyl compounds, suspension and emulsion polymerisation, the measurement of radical life times, non-stationary state measurements, structure and reactivity in copolymerisation and copolymer composition.

A feature of the book is a long chapter on the degradation of high polymers in which kinetics and theories of radical depolymerisation are considered and applied to the degradation of a number of polymers and copolymers. Ultrasonic degradation is also considered, but hydrolytic breakdown, such as that of cellulose and related compounds, only briefly. Ionic polymerisation is the subject of a brief chapter which includes sections on cationic and anionic polymerisation and on ionic copolymerisation. The final chapter deals in some detail with condensation polymerisation under the headings of molecular weight and size distribution in linear polymers, three-dimensional polymers, the post-gel reaction, ring formation, condensations involving formaldehyde and the synthesis of polypeptides.

In such a rapidly advancing field omission of the most recent work is inevitable. Thus, as the author points out, while the Stockmayer theory of cross-linking in polycondensation is considered in detail, the corresponding theory of Flory has appeared since the book was written. Such omissions are few and treatment is generally detailed with a wealth of specific examples, experimental details and results. In cases where treatment appears to be brief, as in the hydrolytic breakdown of cellulose, the topics are generally considered in detail in other volumes of the series. The book provides an authoritative, balanced, and as far as possible, an up-to-date treatment of polymerisation reactions. It is extremely well documented with references and there are many clear diagrams. It will be a very valuable addition to the libraries of polymer chemists of all kinds. —W. R. MOORE.

THE OPTICAL PROPERTIES OF ORGANIC COMPOUNDS. By A. N. Winchell. Academic Press Inc., New York. Second edition, 1954. Pp. xviii + 487. $12.00.

The optical properties of about 2,500 organic compounds are described in this book, this representing an increase of almost 1,000 over the previous edition.

Principal stress is laid on the use of the refractive indices of crystalline materials for identification purposes, and the process depends on these and related optical properties such as the birefringence. The amount of characterisation available for organic substances varies widely from compound to compound, and the analyst is guided either to tables or to comprehensive charts, depending on the extent to which data for his unknown happen to have been published.

Although the charts are large folders contained in a pocket at the end of the book they are still not large enough for the purpose, and certain parts of them are confused and difficult to read.

The practising organic chemist will find this a valuable reference book, but primarily he will use it for the confirmation of already suspected identities rather than for the identification of material *ab initio*. If he is to make use of the book he must be familiar with the methods of chemical microscopy, for the brief outline of refractive index determination which is given is not sufficient to enable anyone unversed in the methods to put them into practice.

He will also perhaps lament the absence of much information which might be of value to him. This, it should be emphasised, is no fault of the compiler of these data, but is simply due to the lack of published information. A great service would be performed if, in addition to the data usually given, solvents suitable for recrystallisation, and the usual habit from these solvents (which may vary markedly) were always noted. The few crystal drawings and photomicrographs included are not of any great service. In view of the recent work on crystallisation from the melt, it might be of interest also to have information regarding characteristic crystal angles obtained in this manner. The refractive index at the melting point, which has been utilised so successfully for analytical purposes, would also be a welcome addition.

However, this additional information, even if it were possible to obtain and collate it, would probably take the work well beyond the scope originally envisaged by Professor Winchell, whose approach, that of the mineralogist, is bound to be more rigorous than that of the organic chemist.

Acquaintance with this book should induce at least some organic chemists to get beyond the conventional 'lustrous plates' or 'beautiful needles' in describing their products, thus rendering more easy the task of other workers who have to deal with these materials subsequently. Chemists who already use optical methods for identification will probably need no urging to buy this book. Those who do not would be well advised to consider whether, in view of the considerable body of data here assembled, they might not find it profitable to extend their range of techniques.—CECIL L. WILSON.

CHEMICAL BUSINESS HANDBOOK. Edited by J. H. Perry. McGraw-Hill, London. 1954. Pp. 1367. £6.

This volume, prepared by a staff of specialists under the direction of the late John H. Perry, is a reference book of modern business management, prepared to meet the needs of the chemical and chemical engineering industries. In 20 sections all major aspects of business operation, from such subjects as finance to patent law and research, are covered by experts in the field. Presentation of business methods, data tables, forms for records and control, etc., represent the actual practice of leading American companies. The book will prove invaluable to executives in chemical and allied industries, to members of companies related to the industry as suppliers, customers, investors, etc., and as a reference for industrial chemistry courses in universities. —M.E.

HOME

October Imports

There was a big increase in imports of phosphate rock during October, the quantity rising from 71,600 tons in the previous month to 111,800 tons. Sulphur imports fell from 24,000 to 21,900 tons.

Sulphuric Acid Output

Sulphuric acid production during September reached a weekly average of 165,500 tons, the highest figure for several months. Consumption was 179,000 tons a week. Consumption of sulphur used in sulphuric acid manufacture was 21,900 tons a week and 9,700 tons of sulphur were used weekly for other purposes.

Distillation Plant Refused

The National Coal Board have refused to meet Midlothian Trades Council to discuss a plan to build a distillation plant at Dalkeith to make use of the coal by-products of coke and coal tar. According to delegates of the National Union of Mineworkers the proposed plant would be a step towards 'balancing' industry in the area. Mr. Ralph Gibson, Trades Council secretary, says the Coal Board state there is no likelihood of their erecting a distillation plant in the immediate future and because of this they have refused to meet them.

Application Needed

Britain's reputation in the field of science stood very high but application of discoveries was much slower, Sir Harold Yarrow, chairman of Yarrow & Co. Ltd., said when presenting diplomas and associateships at the Royal Technical College, Glasgow, recently. There was thus ample scope for the technician who could convert inventive ideas into marketable products.

Smoke Pollution Station

An observing station for measuring the smoke and sulphur dioxide pollution in the London atmosphere has been established in the Science Museum, South Kensington, by co-operation with the Fuel Research Station of the Department of Scientific and Industrial Research. The station is one of a number that are being established to permit a more detailed examination of atmospheric pollution. The sampling equipment is displayed in the Meteorology gallery.

More Carbon Black Used

Consumption of carbon black by UK rubber manufacturers rose from a weekly average of 920 tons in August to 1,340 tons in September. Production also went up, from 1,130 tons to 1,250 tons a week.

UK Lead Statistics

Figures issued by the British Bureau of Non-Ferrous Metal Statistics show that during October 8,495 long tons of virgin lead were imported into the UK from British countries and 1,350 long tons from other countries. The figure includes pig lead refined from imported bullion; 14,966 tons were used. Production of lead in concentrates during the month amounted to 597 long tons and of English refined lead to 7,988 long tons. This figure was slightly less than the 8,077 long tons of English refined lead used.

Zinc Supplies

Imports of zinc concentrates into the UK during October amounted to 3,379 long tons, all from British countries. Slab zinc imports of all grades totalled 7,986 long tons from British countries and 1,341 from other countries. Consumption figures were: zinc in concentrates (virgin), 7,971 long tons; slab zinc, all grades (virgin), 21,307 (including a small quantity of zinc in concentrates consumed directly for chemicals, etc., also included as consumption of concentrates).

£3,000,000 Orders from China

A party of British businessmen who have returned from trade talks in China brought back contracts worth £3,000,000, mostly for chemicals and textiles. Among the products for which orders have been placed are fertilisers, pharmaceuticals, laboratory chemicals and plastics moulding powders.

Expanding Plastics Group

The Commercial Plastics group of companies has acquired additional factory space by taking over a new factory on the West Chirton Industrial Estate, North Shields. Productive capacity for PVC sheeting was recently doubled at the group's main works at Wallsend-on-Tyne where new plant was installed. All available space there has now been used, and the factory is wanted for further developments.

OVERSEAS

Somaliland Exploration

The Standard-Vacuum Oil Company of America has acquired exploration rights in British Somaliland, covering 11,380 square miles.

Canadian Mineral Output

Mineral output in Canada is expected to reach the record figure of $1,356,000,000 this year, compared with the official figure of $1,331,000,000 for last year. The total includes metal production of $733,000,000, petroleum ($219,000,000), coal ($96,000,000), asbestos ($78,000,000), and other non-metals ($230,000,000).

Another Subsidiary in Holland

The large American combine Merck, of New Jersey, have established a subsidiary company in the Netherlands, it is reported. Production is expected to begin before the end of the year, with the processing of crude products. Later, complete manufacture will be undertaken.

US Sulphur Production

The US domestic sulphur industry produced 439,244 long tons of native sulphur and 27,200 tons of recovered sulphur (of a purity of 97 per cent or greater) during the month of September, according to reports of producers to the Bureau of Mines, United States Department of the Interior. Producers' stocks of native sulphur decreased from the previous month and at the end of September stood at 3,229,407 tons.

Laboratory Apparatus for Baroda Exhibition

Laboratory equipment will be exhibited by the Union Scientific Co. on behalf of Quickfit & Quartz Ltd., of Stone (Staffs), at the 42nd Indian Science Congress to be held in Baroda in January, 1955. The exhibits will include Kjeldahl apparatus, moisture-determination equipment, a water-still, general utility sets and the company's semi-micro set—the 'vest-pocket' laboratory—which is a standard set of interchangeable semi-micro glassware apparatus mounted on a stand and includes assemblies to cover all the common techniques of organic chemistry.

Drop in Chilean Copper Output

Total Anaconda and Kennecott production of Chilean copper from 1 January to 30 November this year was 289,144 tons, compared with 296,626 tons in the same period last year.

TV for Saran-Wrap

Dow Chemical of Canada is backing coast-to-coast distribution of its new transparent household wrap with sponsorship of a new TV show imported from the US. Saran-Wrap (polyvinylidene chloride) comes in a dispenser-box about a foot wide and containing a roll 25 ft. long. It is used for wrapping any kind of food which should be protected from the air while being stored at home.

Refinery to Reopen

The Burma Oil Co.—joint venture of the Burmese Government and the Burmah Oil Co.—is to reopen a refinery at Syriam, across the river from Rangoon, which was destroyed during the retreat from Burma in 1942.

Pilot Plant for Sulphur

Shell Oil Co. of Canada reports it is building a small experimental pilot plant in Alberta's Okotoks sulphurous gasfield which could be the forerunner of a large sulphur extraction plant. Shell states the plant will determine the 'applicability of a new method of scrubbing sour gas.' The plant is for this purpose only and is not designed for production. Okotoks gas contains about 30 per cent sulphur, by far the highest sulphur content of any gasfield in Western Canada.

Indian Newsprint Factory Opens

The first Indian national newsprint factory built as part of the Indian five-year plan at Nepa Nagar in Madhya Pradesh is expected to go into production by the end of this month. To begin with the factory will use imported chemical pulp. Its own chemical section will be ready by October next year. By March next year the factory will reach full capacity of 100 tons a day, meeting one-third of the company's newsprint requirement.

· PERSONAL ·

Three new directors have been appointed to the board of the Distillers Co. Ltd. They are MR. E. G. GROSS, MR. A. F. MCDONALD and MR. G. W. SCOTT.

MR. A. R. MILNE has been appointed, with effect from 1 January, a member of the Terylene Council of Imperial Chemical Industries Ltd. Mr. Milne is at present deputy regional manager of the southern regional office of Imperial Chemical Industries Ltd. and was formerly regional sales manager of the plastics department of the southern regional office.

PROFESSOR R. P. LINSTEAD, C.B.E., M.A., Ph.D., D.Sc., A.R.C.S., F.R.I.C., F.R.S., has been appointed Rector of the Imperial College of Science and Technology, South Kensington; in succession to the late Sir Roderic Hill. Professor Linstead became Professor of Organic Chemistry and Director of the Organic Chemistry Laboratories at the Imperial College in 1949 and Dean of the Royal College of Science in 1953.

SIR FRANK EWART SMITH, M.A., M.I.Mech.E., M.I.Chem.E., technical director of Imperial Chemical Industries Ltd., has become chairman of the British Productivity Council, in succession to Mr. Tom Williamson, general secretary of the National Union of General and Municipal Workers. He was formerly deputy chairman of the council.

DR. ERNEST S. HEDGES, D.Sc., Ph.D., A.R.I.C., F.I.M., F.R.S.A., will become director of the International Tin Research Council and the Tin Research Institute, Fraser Road, Greenford, Middlesex, following the retirement at the end of the year of MR. JOHN IRELAND, M.C., B.Sc. DR. W. E. HOARE, D.Sc., F.I.M., and MR. W. R. LEWIS, B.Sc., have been appointed assistant directors.

MR. GEOFFREY THOMAS KING, A.M.I.C.E., A.M.I.Mun.E., of the East Suffolk & Norfolk River Board has been appointed to the executive staff of the Association of British Chemical Manufacturers as trade effluent officer to deal with the growing demand from members for information and advice in connection with their trade effluent disposal problems. He takes up duty on 3 January, 1955. Two years ago the association set up a standing committee to deal with this complicated and difficult subject in close collaboration with the Federation of British Industries and the Society for Analytical Chemistry. Mr. King has for some years been a member of the council of the Institution of Municipal Engineers and served articles at Barnstaple Rural District and the City of Exeter before holding appointments at Chichester, Torquay, Eastbourne and Poole.

The Minister of Food, the Rt. Hon. D. Heathcoat Amory, MP, has approved the appointment of MR. N. R. C. DOCKERAY, an Assistant Secretary, Ministry of Food, as a member of the Food Standards Committee in place of MISS E. WALKER, O.B.E.

MR. F. B. MARMOY, A.R.I.C., has joined the research staff of British Filters Ltd., where he will be in charge of the microbiological laboratory. Mr. Marmoy was recently concerned with the development of the Industrial Products Department of Ward, Blenkinsop & Company.

Obituary

We announce with regret the sudden death of MR. JOHN THOMAS KIDD, M.Sc., F.S.D.C., A.T.I., chief chemist and technical manager on the staff of the Bleachers 'Association. Mr. Kidd, who was 55, was taken ill at work and died shortly afterwards. During his career, Mr. Kidd had been engaged on research and worked for a time under Dr. Henry Dreyfus with British Celanese Ltd., at Derby. Later he became manager of the Norwich Silk Mills, then general manager of British Silk Dyeing Co. Ltd. At one period he was a chemist at S. Heap & Son Ltd., Rochdale. He was made an Honorary Fellow of the Society of Dyers and Colourists at their centenary celebrations this year.

The death has occurred of MR. WILLIAM HENRY GAUNT, of Highfield Villas, Heckmondwike, at the age of 78. Mr. Gaunt was until his retirement a partner in the firm of Ramsden, Sons & Greenwood, oil refiners, Crown Oil Works, Dewsbury.

Publications & Announcements

AVAILABLE from United Oil & Natural Gas Products Corporation Ltd., Anchor Chemical Works, Manchester 11, are copies of 'The Role of Intermediate Level Carbon Blacks in Rubber,' a reprint of a paper delivered to the 3rd Rubber Technology Conference in London, 22-25 June, by Dr. I. Drogin, director of research in the United Carbon Company Inc., Charleston, West Virginia.

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REVIEWED in THE CHEMICAL AGE, 1953, **69**, 189, was Volume I of 'Catalogus van Chemische Apparatuur,' a guide to the manufacturers of chemical plant in Holland. Volume II has now appeared, a list of the Dutch representatives of foreign manufacturers. In this volume the indexes are only in Dutch. Volume II is sold together with Volume I at a total price of Hfl.25, and is obtainable from Bureau voor Bedrijfsdocumentatie, Hilversum.

* * *

THE Association of Scientific Workers has published a memorandum *The Constructive Use of Science* in which the redirection of science and technology from military to civil research and the attraction of a larger number of students to these subjects is urged. The use of fertilisers in this country, says the memorandum, is only one-seventh of that in Holland, which has an increased yield per acre. Lack of co-ordination in the nationalised industries, lack of effort in developing new forms of power and the loss of the valuable by-products of coal are also criticised in the pamphlet published by the association, whose address is 15 Half Moon Street, London W.1.

* * *

GAS condensers form the topic of the latest booklet from Simon-Carves Ltd., Cheadle Heath, Stockport. The cooling of coal gas and the maintenance of relatively uniform conditions are both essential, and the booklet discusses various types of condensers: atmospheric, tube and direct contact coolers. Then follows a discussion of practical considerations of condenser design, and a review of recent progress, illustrated with a set of curves for heat transfer/temperature at various gas and water velocities. The survey concludes with details of Simon-Carves plant for the gas industry.

HILGER production projectors and inspection enlargers are the subjects of two pamphlets obtainable from Hilger & Watts Ltd., 98 St. Pancras Way, Camden Road, London N.W.1. When there are very large numbers of a single article or component to be gauged rapidly, a projector on which their enlarged images can be compared with accurately drawn templates provides the best means of carrying out the process efficiently. Both types of instrument have been specially designed for rapid industrial routine gauging, and various refinements are available for different models.

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CONTENTS of the *Proceedings of the Chemical Engineering Group* of the Society of Chemical Industry, 1953, **35**, are papers on 'The New Treatment Plant of the Colne Valley Sewerage Board' by J. Griffiths; 'Protective Coatings for Buried Pipelines' by K. A. Spencer and Dr. H. B. Footner; 'Synthetic Resin Cements in Chemical Engineering Practice' by F. K. Earp, S. Shapiro and A. E. Wiggs; 'Some Properties and Applications of Synthetic Resin Cements' by V. Evans; 'Integration of an Oil Refinery' by A. J. Carter; 'The Application of Impulse Rendering to the Animal-Fat Industry' by I. H. Chayen and Dr. D. R. Ashworth; 'Metallurgical Trends of Interest to Chemical Engineers' by L. Rotherham; and 'Instruments for Quality Control' by G. C. Eltenton. The *Proceedings* are published by the Chemical Engineering Group of the SCI, 56 Victoria Street, London S.W.1, price 42s.

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A BROCHURE 'Sell it in a Tube,' is the latest publication of the Collapsible Tube Manufacturers' Association, 47 Welbeck Street, London W.1, and explains a specialised application of these flexible metal containers. Its object is to bring to the notice of the food manufacturers of the country the advantages of collapsible tubes (already widely used for this purpose on the Continent) as packs for all classes of foods produced in paste, cream, jelly, or semi-liquid form. The secretary of the Association will be pleased to send a copy to any interested reader who cares to apply to the above address.

British Chemical Prices

(These prices are checked with the manufacturers, but it must be pointed out that in many cases there are variations according to quantity, quality, place of delivery, etc.)

LONDON.—Most sections of the market have been quiet during the past week due to seasonal influences, and apart from some contract renewal business there is unlikely to be any substantial inquiry until the turn of the year. Prices generally are unchanged at recent levels, but a few price revisions are expected to come into operation on 1 January. Firm and unchanged conditions have been reported on the market for coal tar products with pitch enjoying a good demand on export account. Naphthalene is in strong request and the light distillates continue in good demand.

MANCHESTER.—As is usual at this time of the year the past week has witnessed rather quieter conditions on the Manchester market for chemical products so far as fresh business is concerned, although, on the whole, contract deliveries have kept up fairly well. Shipments have also been on steady lines. Traders are anticipating a continued satisfactory movement of supplies in the early months of next year. Fertilisers are a quiet trade, with a fair call for most of the by-products.

GLASGOW.—There has been a slight falling off in demand during the last week but this is not surprising and is usual about this time of the year. Trade has, however, by no means been quiet and a thoroughly satisfactory week's trading is reported from most sections of the industry. The slight falling off does not apply to the export trade which has been extremely brisk.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 10 tons, £83 ; 80% pure, 10 tons, £89 ; commercial glacial, 10 tons, £91 ; delivered buyers' premises in returnable barrels (technical acid barrels free) ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £130 per ton.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £17 15s.

Ammonia, Anhydrous.—1s. 1d. to 1s. 3½d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums : 1-ton lots, £49 per ton.

Ammonium Chloride.—Per ton lot, in non-returnable packaging, £27 17s. 6d.

Ammonium Nitrate.—D/d, £33 per ton (in 4-ton lots).

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s. per ton.

Antimony Sulphide.—Crimson, 4s. 4d. to 4s. 9½d. ; golden, 2s. 7½d. to 4s. 0¾d. ; all per lb., delivered UK in minimum 1-ton lots.

Arsenic.—Per ton, £45 to £50 ex store.

Barium Carbonate.—Precip., d/d : 4-ton lots, £39 per ton ; 2-ton lots, £39 10s. per ton, bag packing.

Barium Chloride.—£42 15s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s. per ton d/d ; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£27 17s. 6d. per ton in returnable casks, carriage paid station, in 4-ton lots.

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid : Anhydrous, £58 10s.; in 1-cwt. bags ; commercial, granular, £38 10s. ; crystal, £41 ; powder, £42 ; extra fine powder, £43 ; BP, granular, £47 10s. ; crystal, £50 ; powder, £51 ; extra fine powder, £52.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £67 ; crystal, £75 ; powder, £72 10s. ; extra fine powder, £74 10s. ; BP, granular, £80 ; crystal, £84 10s. ; powder, £87 ; extra fine powder, £86 10s.

Calcium Chloride.—Per ton lot, in non-returnable packaging: solid, £15; flake, £16.

Chlorine, Liquid.—£36 7s. 6d. per ton, in returnable 16-17-cwt. drums, delivered address in 3-drum lots.

Chromic Acid.—2s. 0⅝d. per lb., less 2½%, d/d UK, in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, 7½d. per lb. delivered (£70 per ton).

Citric Acid.—1-cwt. lots, £10 5s. cwt.; 5-cwt. lots, £10 cwt.

Cobalt Oxide.—Black, delivered, bulk quantities, 13s. 2d. per lb.

Copper Carbonate.—2s. 6d. per lb.

Copper Sulphate.—£87 10s. per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 12s.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £86 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £13 3s. 6d. to £13 14s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 17s. 7d. per lb., in 28-lb. lots.

Iodoform.—£1 6s. 7d. per lb., in 28-lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton; dark tech., 44 per cent by weight £70 per ton ex-works; dark chemical quality, 44 per cent by weight, £109 per ton, ex-works; 1-ton lots, usual container terms.

Lead Acetate.—White: About £147 to £149 per ton.

Lead Nitrate.—About £120-£125, 1-ton lots.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £134 5s.; orange lead, £146 5s. Ground in oil: red, £151 15s.; orange, £163 15s.

Lead, White.—Basis prices: Dry English in 5-cwt. casks, £139 5s. per ton. Ground in oil: English, 1-cwt. lots, 178s. per cwt.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£136 5s. per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, about £28 per ton.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex wharf), £14 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—Crystals, £14 per ton.

Mercuric Chloride.—Technical Powder, £1 8s. 9d. per lb., in 5-cwt. lots; smaller quantities dearer.

Mercury Sulphide, Red.—£1 11s. 3d. per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers U.K. £154 per ton. Nominal.

Nitric Acid.—80 Tw., £32 per ton.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, about £131 per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £93 10s. per ton for 1-ton lots; Liquid, £36 5s.

Potassium Carbonate. — Calcined, 96/98%, about £63 per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, about £22 per ton.

Potassium Dichromate.—Crystals and granular, 11⅞d. per lb., in 1-ton lots, d/d UK.

Potassium Iodide. B.P., 14s. 1d. per lb. in 28-lb. lots; 13s. 7d. in cwt. lots.

Potassium Nitrate.—In 4-ton lots, in non-returnable packaging, paid address, £63 10s. per ton.

Potassium Permanganate.—B.P., 1-cwt. lots, 1s. 8½d. per lb.; 3-cwt. lots, 1s. 8d. per lb.; 5-cwt. packed in 1-cwt. drums, £8 12s. 6d. per cwt.; packed in 1 drum, £8 11s. 6d. per cwt.; 1-ton packed in 5-cwt. drums, £8 7s.

Salammoniac.—Per ton lot, in non-returnable packaging, £45 10s.

Salicylic Acid. — MANCHESTER: Technical 2s. 7½d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s. 6d. per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77%; spot, £26 to £28 per ton d/d. (4 ton lots).

Sodium Acetate.—Commercial crystals, £80 to £85 per ton d/d.

Sodium Bicarbonate.—Per ton lot, in non-returnable packaging, £15 15s.

Sodium Bisulphite.—Powder, 60/62%, £39 to £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—Per ton lot, in non-returnable packaging, paid address, £59 5s.

Sodium Chlorate.—£75 per ton in free 1-cwt. drums, carriage paid station, in 4-ton lots.

Sodium Cyanide.—96-98%, £114 15s. per ton lot in 1-cwt. drums.

Sodium Dichromate.—Crystals, cake and powder, 10d. lb. Net d/d UK, minimum 1-ton lots; anhydrous, 11½d. lb. Net del. d/d UK, minimum 1-ton lots.

Sodium Fluoride.—Delivered, 1-ton lots and over, £4 10s. per cwt.; 1-cwt. lots, £5 per cwt.

Sodium Hyposulphite.—Pea crystals £34 a ton; commercial, 1-ton lots, £30 15s. per ton, carriage paid.

Sodium Iodide.—BP, 17s. 1d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £127 per ton.

Sodium Metasilicate.—£22 15s. per ton, d/d UK in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £37 10s., anhydrous, £81; tri-sodium, crystalline, £39 10s., anhydrous, £79.

Sodium Silicate.—75-84 TW. Zoned. Drums delivered station. Lancashire and Cheshire, 4-ton lots, carriage paid station, £10 10s. per ton.; Dorset, Somerset and Devon, £3 17s. 6d. per ton extra; Scotland and S. Wales, £3 per ton extra. Elsewhere in England, excluding Cornwall and Wales, £1 12s. 6d. per ton extra.

Sodium Sulphate (Glauber's Salt).—About £8 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £32 2s. 6d. per ton, d/d, in drums; broken, £33 2s. 6d. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton; pea crystals, £37 12s. 6d. per ton d/d station in kegs; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £23 11s. to £26. according to fineness.

Sulphuric Acid.—Net, naked at works. 168° Tw. according to quality, per ton, £9 17s. 6d. to £11; 140° Tw., arsenic free, per ton, £7 17s. 6d.; 140° Tw., arsenious, per ton, £7 9s. 6d.

Tartaric Acid.—Per cwt.: 10 cwt. or more, £11 10s.

Titanium Oxide.—Standard grade comm., with rutile structure, £155 per ton; standard grade comm., £135 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d: white seal, £98 10s.; green seal, £97 10s.; red seal, £96.

Solvents and Plasticisers

Acetone.—Small lots: 5-gal. drums, £129 per ton; 10-gal. drums, £119 per ton. In 40/45-gal. drums less than 1 ton. £94 per ton; 1 to 9 tons, £91 per ton; 10 to 49 tons, £89 per ton; 50 tons and over, £88 per ton. All per ton d/d.

Butyl Acetate BSS.—£169 per ton, in 1-ton lots; £167 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £154 per ton d/d.

***sec.*-Butyl Alcohol.—5 gal. drums £159; 40 gal. drums: less than 1 ton £124 per ton; 1 to 10 tons £123 per ton; 10 tons and over £122 per ton; 100 tons and over £120 per ton.**

***tert.*-Butyl Alcohol.—5 gal. drums £195 10s. per ton; 40/45 gal. drums: less than 1 ton £175 10s. per ton; 1 to 5 tons £174 10s. per ton; 5 to 10 tons, £173 10s.; 10 tons and over £172 10s.**

Diacetone Alcohol.—Small lots: 5 gal. drums, £177 per ton; 10 gal. drums, £167 per ton. In 40/45 gal. drums; less than 1 ton, £142 per ton; 1 to 9 tons, £141 per ton; 10 to 50 tons, £140 per ton; 50 to 100 tons, £139 per ton; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s. per lb. d/d; 45 gal. drums, 2s. ¾d. per lb. d/d.

Diethyl Phthalate.—In drums, 10 tons, 1s. 10¼d. per lb. d/d; 45 gal. drums, 1s. 11¾d. per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s. 7¼d. per lb. d/d; 45 gal. drums, 1s. 8¾d. per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s. 8d. per lb. d/d; 45 gal. drums, 2s. 9½d. per lb. d/d.

Ether BSS.—In 1 ton lots, 1s. 11d. per lb; drums extra.

Ethyl Acetate.—10 tons lots, d/d, £133 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s. 9d.; 2,500-10,000 p. gal., 2s. 11½d. per p. gal., d/d in tankers. D/d in 40/45-gal. drums, 1d. p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d. p.p.g. extra.

Methanol.—Pure synthetic, d/d, £43 15s. per ton.

Methylated Spirit.—Industrial 66° o.p.: 500 gal. and over in tankers, 4s. 10d. per gal. d/d; 100-499 gal. in drums, 5s. 2½d. per gal. d/d. Pyridinised 64 o.p.: 500 gal. and over in tankers, 5s. 0d. per gal. d/d; 100-499 gal. in drums, 5s. 4½d. per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton d/d

Methyl *iso*Butyl Ketone.—10 tons and over £162 per ton.

***iso*Propyl Acetate.**—In drums, 10 tons, £128 per ton d/d ; 45 gal. drums, £133 per ton d/d.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton ; 50 tons and over, £80 per ton.

Rubber Chemicals

Carbon Bisulphide.—£61 to £67 per ton, according to quality.

Carbon Black.—8d. to 1s. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £76 10s. per ton.

India-rubber Substitutes.—White, 1s. 6¾d. to 1s. 10½d. per lb. ; dark, 1s. 4½d. to 1s. 8d. per lb.

Lithopone.—30%, about £54 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, about £50 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton, in 6-ton lots, d/d farmers' nearest station: December, £17 12s. 6d. ; January, £17 15s.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

'Nitro-Chalk.'—£15 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station : December to February, £26 5s.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's, 5s. ; pure, 5s. 4d.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6¼d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6¼d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/100%, 5s. 7d. per gal. : 99.5/100%, 5s. 9d. per gal. D/d UK in bulk : Pale A.D.F., from 5s. 6d. per Imperial gallon, f.o.b.

Naphtha.—Solvent, 90/160°, 5s. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 9½d. per gal. for 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in sellers bags, £16 6s. to £24 2s. per ton, according to m.p. ; hot pressed, £34 10s. per ton in bulk ex-works ; purified crystals, £58 per ton d/d.

Pitch.—Medium, soft, home trade, £9 per ton f.o.r. suppliers' works ; export trade about £11 10s. per ton f.o.b. suppliers' port.

Pyridine.—90/160°, £1 15s. to £2 per gal.

Toluol.—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal. d/d. MANCHESTER : Pure, 5s. 8d. per gal naked.

Xylol.—For 1000-gal. lots, 5s. 10d. to 6s. per gal., according to grade, d/d London area.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol 98/100%.**—3s. 9d. per lb. d/d.

***o*-Cresol 30/31° C.**—1s. 4d. per lb. d/d.

***p*-Cresol 34/35° C.**—3s. 9d. per lb. d/d.

Dichloraniline.—3s. 6d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 7d. per lb.

Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 9d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

Dimethylaniline.—3s. 1d. per lb., drums extra, carriage paid.

Chemical & Allied Stocks & Shares

AFTER an uncertain trend when sentiment was affected by talk of a possible increase in the bank rate, stock markets regained most of an earlier decline. In fact, industrial shares came into renewed demand in anticipation of financial results early in the New Year showing further increases in profits and dividends. British Funds rallied moderately, though it is realised that, should there be a higher bank rate in the future, it would mean a general adjustment in money rates, which in its turn would mean a higher yield and lower prices for British Funds.

Increasing Production

Chemical and allied shares remained active in response to latest news indicating that production and earnings of most sections of the industry are continuing to increase. Imperial Chemical have moved up to 41s. 10½d. at the time of writing, which compares with 40s. 10½d. a month ago, the view persisting that the total dividend on the doubled capital is likely to be 10 per cent. Fisons have been a strong feature with an advance to 58s. 1½d., which compares with 56s. 3d. a month ago, but Monsanto did not hold best levels, having eased from 32s. 9d. a month ago to 30s. 6d., though there are widespread hopes of higher dividend prospects. Reichhold Chemical 5s. shares strengthened further from 14s. 9d. to 15s. 3d., Lawes' Chemical 10s. shares kept at 16s. 1½d., while Laporte 5s. shares at 16s. 9d. were within 3d. of the level a month ago. Albright & Wilson 5s. shares, however, receded from 28s. to 26s. 9d., having lost part of their earlier advance. British Chrome Chemicals 5s. shares lost a few pence at 12s. 6d., while Hickson & Welch 10s. shares at 18s. 7½d. have been well maintained. Yorkshire Dyeware & Chemical 5s. shares have kept at 10s. 9d. William Blythe 3s. shares remained a very active feature, and changed hands around 21s., Brotherton 10s. shares were 31s. 6d. and Greeff-Chemicals 5s. shares 13s. 7½d. There was again a large business in Borax Consolidated shares, which after fluctuating sharply, came into renewed demand up to 92s. Earlier in the year, before there was a possibility of a bid from the US for control, they were 37s. 9d. It is still not certain whether there will be a take-over bid, nor whether the Treasury would allow control to pass from Britain. The directors have issued profit figures for nine months showing a good rise, which in the opinion of the market, should justify a considerably higher dividend. The view, therefore, persists that even if there is no take-over bid, the shares are probably worth at least their current value. This is based on the assumption that in the event of no bid the directors might revalue assets and perhaps make a free scrip issue to shareholders. It is possible, of course, that the shares will continue to fluctuate sharply until the position is clarified. Among plastics and kindred issues, Kleeman 1s. shares were up to 13s. 3d. on the scrip issue news. British Xylonite were 44s. 6d. against 45s. 3d. a month ago, and British Industrial Plastics 2s. shares little changed at 5s. 7½d. Elsewhere, Coalite & Chemical 2s. shares have been firm at 3s. 10½d. xd. The units of the Distillers Co. advanced from 26s. a month ago to 28s. in response to the raising of the interim dividend from 7½ per cent to 10 per cent and the proposed writing up of the nominal value of the 4s. shares to 6s. 8d. The latter necessitates capitalising over £16,000,000 of reserves and will bring issued capital of this big group more into line with the resources actually used to earn profits. The group's resources have increased over many years as a result of the large sums added to reserves.

Considerable Activity

Unilever and Unilever NV shares have been active around 77s. 3d. and 85s. 6d. respectively now they are 'ex' the scrip issues. Boots Drug 5s. shares were 26s. 9d. compared with 28s. 6d. a month ago. United Molasses 10s. shares strengthened to 37s. 7½d. after an earlier reaction. Elsewhere, Triplex Glass 10s. units held steady at 36s. 3d. Oils were active with BP touching the new high record of £19, before easing to £18¼ and then rallying to £18¾. Although the chairman was cautious at the recent meeting, the view is that a very good dividend is likely from BP on the much increased capital that will result from the four-for-one free scrip issue. Compared with a month ago, Shell have risen from 115s. 7½d. to 117s. 6d. xd.

Law & Company News

Commercial Intelligence

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

Mortgages & Charges

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

BAXENDEN CHEMICAL CO. LTD., London N.W. 17 November, charge to District Bank Ltd., securing all moneys due or to become due to the bank; charged on land and buildings at Lower Booths. *Nil. 26 June, 1953.

BROWN & FORTH LTD., London N.W.. chemical manufacturers, etc. 12 November, mortgage and debenture to the bank; charged on specified properties at Lower Booths, Haslingden and Brooks Bar and a general charge. *£37,126. 22 October, 1954.

New Registrations

Ceca (Northern Ireland) Ltd.

Private company. (541,756.) Capital £100. Manufacturers and suppliers of or dealers in activated charcoal and all other chemicals, etc. Directors: Alfred Mazuir and Maurice V. Gerard. Reg. office: 175 Piccadilly W.1.

W.G.C. Products Ltd.

Private company. (540,799). Capital £5,000. Objects: to enter into an agreement with Wm. H. Wheeldon, Thos. J. L. Walker and Frank Gleave for the purchase of the plant equipment and records in connection with the extraction of ochre from the Delph, Worsley, etc. Directors: Wm. H. Wheeldon, Thos. J. L. Walker, Frank Gleave, and Edward Casey. Reg. office: 74 Corporation Street, Manchester, 4.

British Chrome and Chemicals (Manufacturing) Ltd.

Private company. (541,041). Capital £100. So long as British Chrome and Chemicals Ltd. hold not less than 95 per cent of the issued shares they have the right to appoint and remove the directors. The directors are: Michael J. C. Hutton-Wilson and Arthur C. J. Burningham. Reg. office: Urlay Nook, Eaglescliffe, Co. Durham.

K. Wasserman (Chemicals) Ltd.

Private company. (540,836). Capital £1,000. Manufacturers of and wholesale and retail dealers in chemicals, gases and disinfectants of all kinds, etc. Directors: Kurt S. Wassermann, and Martin S. Warner. Reg. office: 8 St. Martin's Place, Trafalgar Square, W.C.2.

Mendip (Chemical Engineering) Ltd.

Private company. (540,840). Capital £100. Specialists in the chemical treatment and reconditioning of metals, engineers, founders, etc. Directors: Wm. T. Nunn and John C. Newson. Reg. office: 59 Molesey Close, Hersham, Walton on Thames.

Aliphatic Research Co. Ltd.

Private company. (540,662). Capital £10,000. To conduct and promote research and other scientific work in connection with plasticisers and generally in connection with all chemical products, compounds and materials, etc. The first directors are: Harry Jones, Bernard Holmes-Walker, Wilfred H. Wood, and Ernest A. Whitlock. Reg. office: 21 Spring Gardens, Manchester.

Irish Paint & Chemicals Ltd.

Private company. (15,404.) Registered in Dublin. Capital £500. The subscribers (each with one share) are: Anthony Hughes and Francis Donnelly. The first directors are not named.

North Eastern Tar Distillers (Sadlers) Ltd.

Private company. (541,466). Capital £100. To acquire the business now carried on by Sadler & Co. Ltd. at Middlesbrough and elsewhere and the undertaking, property and assets relating thereto (excluding the trade debts owing to and due from the said company in respect thereof and also the business of the said company now carried on at Evenwood, Co. Durham and such parts of the business now carried on by it at Middlesbrough as are connected with the manufacture of sulphuric acid, hydrochloric acid, nitric acid, distilled water, HDS fluid and with the storage and shipment of creosote, benzole and petrol). The

[continued on page 1364

continued from page 1362]
subscribers (each with one share) are: Michael B. Boreham and David M. Dixon. The first directors are to be appointed by the subscribers. Reg. office: 78/80 Cornhill, E.C.3.

Company News

The Distillers Co. Ltd.

The directors of The Distillers Co. Ltd. have declared an interim dividend of 10 per cent on ordinary capital raised by loan stock conversions from £23,375,761 to £25,029,883 for the year ending 31 March, 1955. The increase, it is stated, is to reduce the disparity between the interim and final payments, which last year were 7½ per cent and 17½ per cent respectively. Capitalisation of reserves in writing up the 4s. units to 6s. 8d. each, equivalent to a 66⅔ per cent free issue, is also proposed.

Erinoid Ltd.

Export sales by Erinoid Ltd. in the last financial year were a record for the company in both weight and value, the chairman, Mr. C. E. Cleeve, reported at the annual general meeting on 9 December. Substantial progress had been made towards full production of cellulose acetate flake, he said, although because of intense competition it was not yet on a profitable basis. There was an increase in production and sales in all departments of the factory of Stroud.

James H. Dennis & Co. Ltd.

Net trading profit of James H. Dennis & Co. Ltd., copper refiners and manufacturers of copper sulphate, fell during the year ended 31 July from £100,649 to £69,381 (both before tax). The reason, said the chairman, Mr. James H. Dennis, at the annual general meeting on 16 December, was the increased cost of raw materials. Tax adjustments and abolition of the excess profits levy, however, increased the net profit after tax to £33,385 (£31,184). A final dividend of 9 per cent (less tax) was approved, making a total dividend for the year of 18 per cent (less tax).

British Petroleum Co. Ltd.

At an extraordinary general meeting on 16 December, approval was given for the change of name of the Anglo-Iranian Oil Co. Ltd. to the British Petroleum Co. Ltd. The new name came into effect the following day. At the meeting, the chairman, Sir William Fraser, said that capital expenditure would be on a smaller scale during the next year or two and it should be possible to distribute a larger proportion of the profits. He expected that earnings in 1954 would not be greatly different from those of 1953.

Scottish Agricultural Industries Ltd.

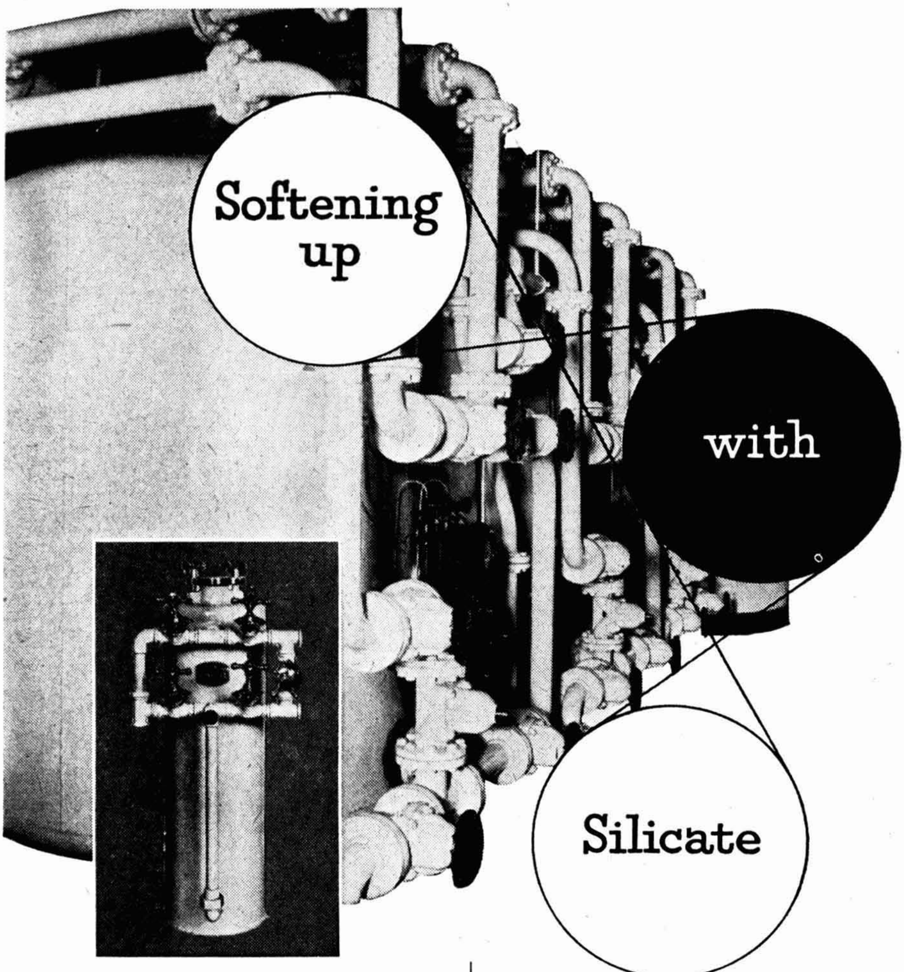
Scottish Agricultural Industries Ltd. are embarking on reconstruction schemes for the Leith fertiliser works, the Glasgow feeding stuffs mill and the granary at Aberdeen. The total cost over the next few years is estimated at £3,000,000. As reported last week (p. 1318) the firm, a subsidiary of I.C.I., recommend a dividend on the ordinary capital of 11 per cent, compared with 9 per cent for the previous year.

Hickson & Welch (Holdings) Ltd.

The directors of Hickson & Welch (Holdings) Ltd. announce that they have acquired the whole of the share capital of John W. Leitch & Co. Ltd., Milnesbridge, Huddersfield. Both companies have been actively engaged during their career, and especially since the end of the first World War, on the manufacture of specialised organic chemicals involving dyestuff intermediates and chemical intermediates of this nature, for other trades such as drugs, pigments, insecticides, soap and other products. John W. Leitch & Co. Ltd. will continue to be run as a separate company, but the manufacture and sales programme of that company and Hickson & Welch (Holdings) Ltd., Castleford, will be co-ordinated and there will be common directors and senior staff. Mr. Donald J. Leitch and Dr. A. E. Everest are resigning their directorships of the Leitch company, but Mr. C. F. Chambers, who has been the secretary and a director, will remain with the company for at least another 12 months. The new directors nominated by Hickson & Welch (Holdings) Ltd. are: Mr. Bernard Hickson, Dr. T. Harrington, Mr. G. K. Day, and Mr. Tom S. Smith. Mr. Smith will be appointed general manager of the Leitch company, and will take over his duties on 1 January, 1955.

Indian Science Congress

Among countries which have accepted invitations to attend the 42nd session of the Indian Science Congress in Baroda early in January are the United Kingdom, the United States, France and Italy. It is expected that delegates from Japan, China, Russia and Pakistan will also be present.



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PATENTS

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