The Chemical Age

VOL LXVIII 28 FEBRUARY 1953 No 1755

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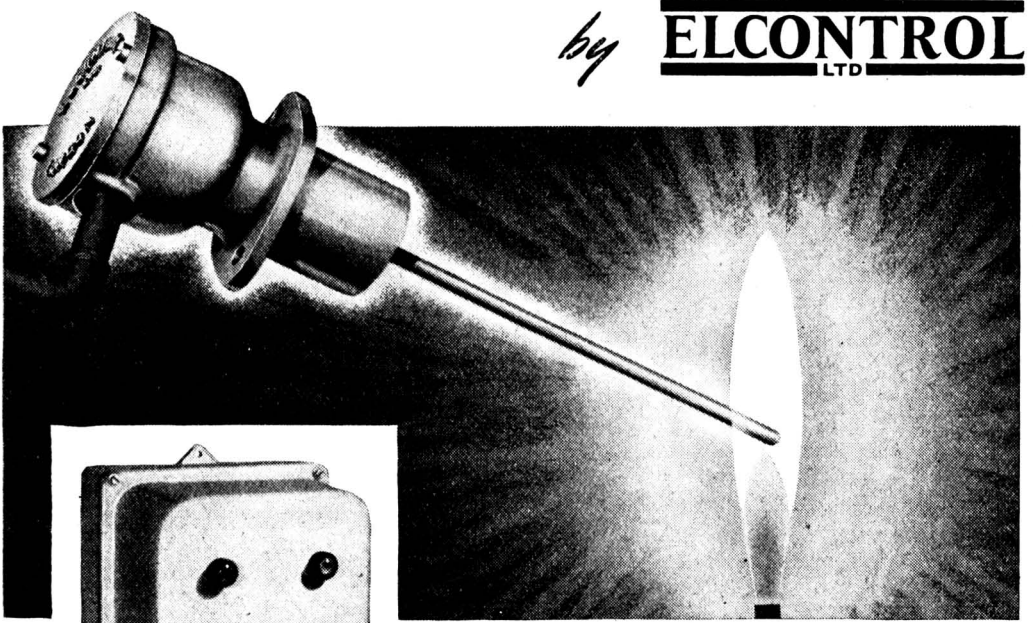

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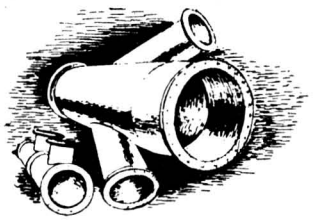

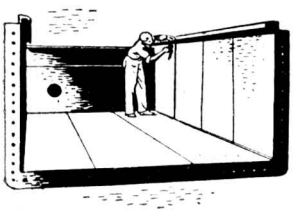

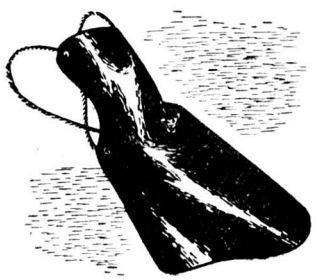

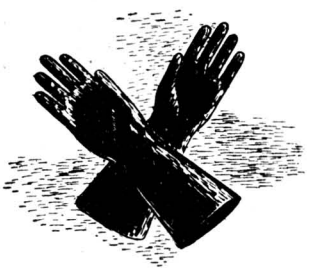

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Bangs & Bubbles

IT might be supposed that materials like nitroglycerine or T.N.T. represent a closed chapter in the story of explosions and explosives. In the latest *Times Science Review* (1953, No. 7, 3), Dr. F. P. Bowden reminds us that this is far from true. Despite the huge number of explosions, both intentional and accidental, that have occurred by molecular fission, we are, it seems, only now beginning to understand how and why mere mechanical shock can make certain substances explode. Yet the fact that some substances will 'go off with a bang' if hit with appropriate force is one of the oldest-known cause-and-effect combinations in this dangerous branch of science. It is not a sufficient explanation to say that such molecules are unstable. The strength with which their atoms are bound together must surely be too great to allow disruption by simple mechanical shock. Some explosives will act up to their name if sufficient rubbing occurs, and it is even less likely that the mechanical disturbance of shear will initiate molecular fission.

The reason why certain molecules are explosive is simple enough. The break-up of the molecule, once initiated, leads to a re-configuration of the constituent atoms, and there is a huge change of state—solid or liquid into gas—together with a release of energy as heat. But why should a mere blow be able to start such a process off with, say, nitroglycerine? The modern research work at Cambridge that Dr. Bowden has described shows that minute air bubbles play a most significant part. The gentlest of blows will explode nitroglycerine if tiny air bubbles are present. A 40-gram weight falling only a few centimetres will explode nitroglycerine if the chemical contains an air bubble of as little a diameter as a few thousandths of a centimetre. With nitroglycerine free from such bubbles, the necessary impact energy to cause explosion may be 100,000 to 200,000 times as great. This remarkable effect of entrapped air bubbles has been observed for most explosives, and they would seem to make the difference between precarious sensitivity and safe handling. It has been shown that momentary temperature rises of 1,000°C. or more can occur—in the occluded air-space of the bubble—as a result of fairly gentle impact forces. A temperature rise of

450-500°C. is sufficient to initiate explosion, and this is reached if the compression ratio caused by force is only 25 to 1.

To some extent this bubble effect is hypothesis but good evidence for its proof can be presented. If originally the explosive material is under high pressure, the compression ratio produced by the force of an impact must be less and therefore greater impact forces will be needed to initiate explosions. This has been found to be the case when measured impact tests are carried out in pressure chambers. The temperature developed in a bubble depends on the heat capacity of the gas itself. If air bubbles are replaced with methane bubbles explosion cannot be initiated unless greater impact force is applied.

But bubbles cannot explain the explosive substances that are sensitive to friction. Here the explanation would seem to be that surfaces of solids which rub together are in fact contacting at only a few 'molecular summit' points, and momentarily all the work of friction is concentrated at those points—minute and isolated points where very high temperatures momentarily develop. It has been shown that when steel slides on a glass surface the temperature reached at the 'hot spots' and at the lowest sliding speed is about 580°C. A 'hot-spot' temperature of 450-500°C. was found to be the minimum to initiate frictional explosion of nitroglycerine when this was placed between surfaces of glass and metal.

The implications of this new work for safety measures in handling explosive substances would seem large and far-reaching. These blow- or friction-started explosions are not necessarily catastrophic in their consequences. The 'hot spots' of the bubble or point of contact are of micro-second duration. The explosion may be equally minute, a violent change that is resisted by the surrounding material and one that affects less than a cubic millimetre of the substance. Most of these explosions fortunately are still-born, but the necessary size of an explosion nucleus likely to cause a serious explosion can be calculated. If the rate at which heat is developed by chemical decomposition is greater than the rate at which it is carried away by the surrounding substance, a serious chain-action can start. Under favourable conditions the micro-effect can become a macro-effect. Those disasters that have occurred without apparent cause may well have their true explanation in this important Cambridge research.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 42s. Single copies, 1s.; post paid, 1s. 3d. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784/5). LEEDS OFFICE: Martins Bank Chambers, Park Row, Leeds, 1 (Leeds 22601). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited.

Notes & Comments

Farm Chemicals

THE review of animal diseases by Sir Thomas Dalling in the Royal Agricultural Society's *1952 Journal* which has just been issued, mentions several cases of cattle poisoning by farm chemicals. These were not all cases of failure in proper use but of disastrous consequences from misuse. Sulphur, often given to livestock beneficially at a rate of 1 ounce per day, was given to a group of cattle at a rate of 3 ounces per animal. Twenty-four became ill and three died. Tetrachlorethylene, used in treating sheep for worm infections, has caused the death of a few sheep in several flocks, 18 out of 426 treated, 11 out of 410, and nine out of an unstated total number. The danger of using carbon tetrachloride is already known but it is suggested that similar precautions should be taken with tetrachlorethylene. When a dangerous chemical is given in error, poisoning cannot perhaps be classified differently from any other accident of careless origin. Five milking cows died when lead arsenate was mixed with their feed instead of calcium oxide; strangely, however, nine heifers and yearlings who received the same feed scarcely developed any symptoms of poisoning. For use as a sheep dip or insecticide, BHC (benzene hexachloride) is fast becoming a common farm chemical. Seven six month old calves were in error given four teaspoonfuls each of a concentrated gamma-isomer BHC product, and all died within five hours. There seems to be some moral to be drawn from three of these four cases—that with chemical substances not ordinarily recognised as poisons, clear precautionary labelling that warns against over-dosage or incorrect use should be attached to the containers. In the case of lead arsenate its known toxicity should have ensured adequate labelling. Labels should be of a type that resists detachment or obliteration by moisture. Stencilling, particularly on textile bag surfaces, is often very impermanent.

Phosphorus

A CURRENT U.S. survey (*Chemical Week*, **72**, 6, 61) reveals that since 1951 American furnace capacity for producing elementary phosphorus has doubled. Total annual capacity is now 310,000 tons, and of this the TVA output is only 36,000 tons. Over-supply rather than a balanced market situation is immediately expected. In terms of tonnage the new market for organic compounds of phosphorus is still relatively small. The organo-phosphorus insecticides, surface-active chemicals, anti-foaming agents, anti-oxidants, etc., do not totally consume more than about 10,000 tons a year of phosporus itself. With 150,000 more tons of phosphorus than in 1951, the market for organic compounds of phosphorus would have to be expanded 15 times if this alone was to absorb the new output; and this, of course, is an impossibility. Furnace phosphorus must instead enter the phosphoric acid market on a greater scale, there competing with acid made from the wet-process. The use of dicalcium phosphate as a cattle feed is probably the most helpfully expanding influence. Total consumption (of the phosphate) has already risen from 60,000 tons two years ago to a present rate of 120,000 tons, and so far furnace phosphorus has had the lion's share of this market; but wet-process dicalcium phosphate is steadily making up for lost time. Unless large new markets for phosphorus compounds develop, it looks as if the prospects for elementary phosphorus as a major intermediate have been inflated. In this country there has been a tendency to envy American technologists their ability to make use of cheap power at favoured sites for producing furnace phosphorus. It may well prove in time, however, that outside the much smaller organic compound market, the wet-process can still compete successfully. If so, we are not at any great disadvantage in being forced by high costs to use the wet-process for all but organic compound and high purity phosphate production.

Electrochemistry in India

New Research Institute Opened

A NEW chapter in the industrial history of India seems likely to have been begun with the opening on 14 January, 1953, of the Central Electrochemical Research Institute at Karaikudi, South India, by Dr. S. Radhakrishnan, vice-president of India.

India is fortunate in possessing the two main requirements for developing a successful electrochemical industry—availability of electrical energy and ample supplies of indigenous raw materials.

With major irrigation and hydro-electric power projects already begun or being launched by both the Central and the State Governments, large sources of electric power will be available for industry in the near future. Among the many raw materials available are: caustic soda and chlorine; calcium carbide and derived products; aluminium; manganese; chromium; rare-earth metals including beryllium, cerium, lithium, thorium and zirconium; refractories and abrasives; graphite; fluorine; and so on.

The Central Electrochemical Research Institute is the latest institution belonging to a network created by the Council of Scientific and Industrial Research under the direction of Dr. S. S. Bhatnagar with the co-operation of industry. The new institute of Karaikudi was largely made possible by the gesture of Dr. Alagappa Chettiar, who offered a donation of $300,000 and a gift of 300 acres of land for the site of the building.

Questionnaires Circulated

Establishment of the institute has been guided by the suggestions and advice received by the Planning Committee, in response to questionnaires circulated to important electrochemical establishments and specialists both in India and abroad. The total built-in area is about 60,000 sq. ft. The workshop and the heavy investigation and pilot plant laboratories occupy 25 per cent of the area; the research laboratories for small-scale investigational work 32 per cent; the library, the lecture theatre and the conference rooms 20 per cent; and the general offices, exhibition room 23 per cent.

There will be a number of major divisions dealing with electrometallurgy and electric furnace products, electrolytic cells, electrodeposition and allied processes and electrochemistry of gases.

Besides the usual laboratory services and general chemical measuring instruments, some special work facilities and equipment such as liquid air plant, X-ray diffraction equipment, spectrographic and metallographic apparatus, a constant temperature room, and machines for the repair and standardisation of precision instruments, are also intended to be provided.

Each division will be under the charge of an assistant director who will work in collaboration with 14 or 15 other research workers. Investigations will be pursued from the laboratory scale to the pilot plant stage.

Anniversary Dinner

TO CELEBRATE their 21st birthday Asbury, Brodie & Co., Ltd., distributors of electrical resistance materials, stainless steel, cadmium, nickel anodes, oxides and salts, etc., held a dinner and dance at The New Inns, Handsworth, Birmingham, on 6 February.

Among the principal guests were Mr. R. M. Parry, managing director of British Driver-Harris Co., Ltd., M. I. A. Bailey, managing director of Henry Wiggin, Ltd., and Mr. George Tinker, managing director of Birlec, Ltd.

In proposing the toast of the company coupled with the name of Mr. E. W. Asbury, the founder, Mr. R. M. Parry said that the company was an outstanding example of success against adversity through faith and courage. They had started in 1932 during a bad trade depression and it had needed considerable courage to set out at that time and in the face of opposition which seemed to be powerfully entrenched.

Mr. E. W. Asbury, who at one time had been sales director of Henry Wiggin & Co., Ltd., referred in his reply to their long association and friendship with British Driver-Harris Co., Ltd., and to the support they had received from Henry Wiggin & Co., Ltd.

During the course of Mr. I. A. Bailey's speech replying to the toast of the 'Guests,' he said it was gratifying that the various companies engaged in the nickel business were on such friendly terms.

Modern Methods of Drug Production

Crookes New Laboratories Opened

PRODUCTION and packaging of the latest types of injection drugs under highly specialised conditions were demonstrated on 18 February when the new £100,000 extension of Crookes Laboratories at Park Royal, London, was formally opened by Mr. H. R. Mackeson, Secretary of Overseas Trade.

In welcoming the many distinguished guests and introducing the Minister, Captain R. C. Kelly, chairman of Crookes Laboratories, described the growth of the company since its beginnings in Paddington in 1912. During these 40 years development had been wholly from earnings, there were no debentures or loans.

The laboratories were playing an important part in Britain's export drive. In the course of 12 months sales overseas had been nearly £500,000, and would have been more but for the present import and currency restrictions. Apart from its associate, Crookes Laboratories, Inc., in New York, U.S.A., the company had its own organisations in Australia, New Zealand, South Africa, India, Pakistan, Burma, Colombo, and Malaya, and was personally represented in 43 countries.

Before inviting the Minister to open the new building, Captain Kelly concluded with a tribute to the loyalty and co-operation of the staff.

Mr. Mackeson expressed his pleasure at having the opportunity to inaugurate the extension and referred to the tremendous growth of the British pharmaceutical industry's share in overseas trade. The total value of production by the industry in 1952 was £90,000,000. Of this amount exports last year were £32,000,000 or £11,000,000 more than the total output of 1937.

Harmful Germs Eliminated

Modern injection drugs such as ACTH, Efocain and Neo-ferrum must be produced and packed under conditions from which all harmful germs have been eliminated. Girls wearing white sterilised overalls, masks, headwear, gloves and surgeon-type boots work in glass-panelled rooms supplied with pressurised and filtered air.

In the new laboratories the first aseptic ampoule filling room deals with all dry (powder) injection material. Girls were seen filling and capping vials of ACTH, which is conveyed from the place of manufacture to the filler in a sterile container and by tube feed to the sterilised vial under conditions of strict asepsis. In addition to the sterilised air, an aseptic 'Perspex' cabinet is mounted beneath the nozzle of the Alite vial filling machine which is screw-fed and measures to the accuracy of $7\frac{1}{2}$ milligrams by weight of powder. Output is 600 vials an hour. The girls work in the aseptic filling rooms in shifts of not more than four hours.

Control of Air

Flow of air through the filling room is controlled by a Vokes filter, in which a microfilter removes particles down to 0.2 microns. An identical apparatus is used for filtering radioactive dust at an atomic plant. This exceptionally severe asepsis is observed as it is not possible to include any antiseptic in dry-injection material such as ACTH.

Sterilised air is supplied at the rate of upwards of 50,000 cu. ft. an hour.

The filter comprises a metal cylinder carrying a compressed element of resin-treated wool lap. The object of the resin treatment is to introduce a mild form of electrostatic precipitation of extremely fine particles, which otherwise might succeed in passing through even the smallest interstices of filter medium.

Under test in a special rig using a stain method of assessing efficiency, the Vokes' canister type filter shows an efficiency of 99.9 per cent, at a flow rating of 75 c.f.m. To obtain this low rate of flow through individual units, the usual practice is to mount the filters in multiple banks with the requisite headers and ducting. The resistance to air flow at the rating quoted is approximately 0.35 in. water gauge.

Pre-filters of heavier dust-loading characteristics (Vokes K.600 Kompak type) are inserted in the system to relieve the submicron filters of coarse dust loads.

Liquid injection material is filled into ampoules in filling room No. 2, where the air is filtered to remove particles to the size

of one micron. Ampoules were shown being sealed by flame as they passed along an automatic conveyor. Girls were also seen filling ampoules with Neo-ferrum by a semi-automatic process.

The next section of the new building is devoted to transfusion solution manufacture, and output reaches 15,000 bottles a week. The distilled water plant produces 800 gallons in a normal day's working. The Manesty steam heated automatic water stills operate entirely without attention. Steam of a pressure between 25 and 60 p.s.i. is needed, but for the most efficient working 30 to 40 p.s.i. at the still is found to be the best. By means of the Manesty pre-heating and vapour baffling features dissolved gases in the raw water are expelled and there is no contamination of distilled water by frothing or spraying.

Steam Consumption

In average conditions steam consumption of Manesty's stills, using steam at 40 p.s.i., is 1½ lb. of steam per lb. distilled water. The stills are fed through pyrex glass tubing and all water used is electrically treated to prevent 'furring up.'

Transfusion preparation of solution and components were demonstrated, and also the ampoule filling and capping. In the latter operations time and study motion have to be scientifically considered. To ensure both speed and accuracy necessary accessories must be easy to hand, while lighting, height of chairs and tables, and so on, all combine to aid efficient production. Filling and capping is at the rate of 1,500 bottles an hour and labelling at the rate of 1,000 bottles an hour.

An essential part of the processing of the ampoules is the purifying and sterilising of the liquid. This is carried out by means of a filter press supplied by British Filters, Ltd. This press, the PF.30, is constructed of polished stainless steel with filter plates of ferobestos, an asbestos filled thermosetting plastic combining a high resistance to corrosion and temperature with complete sterility.

Two large autoclaves (each holding 700 of the standard 560 cc. transfusion bottles) sterilise the complete outfit at 120°C. Indicators on the autoclaves record both temperature and time. Overheating is as dangerous as under-heating since it can cause caramelisation of the solution.

Finally, and perhaps most important of all in the new building, came the inspection of the analytical laboratory. Here a 24-hr. service of analysis is maintained. Before being passed to production all raw material is subjected to severe tests, and no finished product is allowed to be issued until the necessary authority has been given by the laboratory after critical examination.

Tests of the various products have been usually carried out on rats. In some cases, however, frogs have been used. This presented a new problem as their feeding had to be considered. A supply of bluebottles had to be specially bred, and it was found that a diet of three bluebottles a day was sufficient for an individual frog!

Crookes is, of course, known for its production of halibut oil preparations, ACTH (the hormone for alleviation of rheumatoid arthritis), Efocaine (the new analgesic which kills pain for at least six to 12 days), and other major developments. Sulphanilamide and stilboestrol were first made in the Crookes laboratories and other outstanding items include phenytoin and Auro-calcium.

To 'Sell' Chemistry

THE American chemical industry is taking steps to make more information available to students on opportunities and preparation for careers in the industry, Dr. W. A. Bishop, chairman of the student guidance committee of the Manufacturing Chemists' Association, said recently. The stepped-up programme, according to Dr. Bishop, is based on the results of an MCA survey which indicates that three out of four high school science teachers want more information in order to advise students.

Teachers want data on types of jobs available in the industry at all levels of skill, university training required, salary levels and chances for advancement, according to the survey. They would also welcome plant tours for students and classroom talks by industry representatives.

'Because of the vital importance of chemistry to the nation's future—in defence, in agriculture, in health, in all manufacture, and in the conservation and use of our natural resources—it is imperative that potential future scientists be fully aware of the opportunities for personal achievement and public service in the field,' Dr. Bishop said.

Education in Chemistry

RIC & BAC Hold Interesting Discussion in London

NEED for greater integration and more flexibility of the various forms of training and courses were the main points emphasised in a lively discussion on 'Education in Chemistry' held in London on 18 February at a joint meeting of the Royal Institute of Chemistry (London Section) with the British Association of Chemists, London (Areas 1 and 2).

The importance of the subject and the general interest it aroused was clear from the good attendance which included representatives from the Midlands and North of England and Scotland.

Before the general discussion, special aspects of the subject were dealt with by five principal speakers.

Professor C. K. Ingold, D.Sc., A.R.C.S., F.R.I.C., F.R.S (professor of chemistry, London University), opened the proceedings with a talk on 'The Aim of the Revised Regulations in Science,' with particular reference to the London Special Degree in Chemistry The primary object said Professor Ingold was to train specialists, and for this there were two main reasons. The first was vocational need and the second that in science, unless a man specialised he had no right to an opinion of his own on any scientific matter and could not develop any sense of self confidence or authority.

Revolution in Chemistry

A revolution had occurred and was continuing in chemistry, so that barriers between its conventional divisions were breaking down. It was therefore vital to keep the structure and content of courses in chemistry and ancillary subjects under continual review for it was in the future years that the merits or defects of present training would become apparent.

The student product was better than it used to be. A man who now achieved a pass, would have been worth 2nd Class Honours in the old degree. There was some decline in the number of part-time students. This was due to a certain extent to the fact that the new courses were longer, and partly also because in a welfare state an increasing proportion of students were able to take full-time courses.

Speaking on 'External Degrees in Science,' J. W. Skellon, B.Sc., M.Sc., Ph.D., F.R.I.C., head of the department of chemistry, Acton Technical College, outlined the curricula for chemistry and ancillary subjects. Some doubt existed, he maintained, as to the true worth of some ancillary subjects—particularly biology, and he considered that the whole aspects should be reviewed at the end of a five-year period.

Science Training Too Narrow

In conclusion, Dr. Skellon said that even with all the ancillary subjects, science training was, in the opinion of many, too narrow. Some universities were considering the inclusion of the humanities in the curriculum, and this also had the support of a number of industrialists as such courses would result in scientists with much greater thinking and reasoning powers.

The vice-president of the Royal Institute of Chemistry, Professor Harold Burton, D.Sc., Ph.D., F.R.I.C., with some facts and figures about 'Professional Qualifications in Chemistry.' At the end of last year, he said, there were 3,174 registered students of the RIC, whose ages ranged from 17½ to over 40 years of age. There were 300 entries for the institute's forthcoming Associateship examination in April.

'National Certificates in Chemistry' was the subject dealt with by R. W. Blount, B.Sc., F.R.I.C., H.M. Chief Inspector, Ministry of Education, who outlined the scheme which was administered by a joint committee of the Ministry of Education and the Royal Institute of Chemistry.

The course for the ordinary National Certificate was a part-time one of three or four years' duration (mainly three years in the south and four in the north of England) and a further two years led to the Higher Certificate in Chemistry.

Colleges prepared a suitable course for their joint part-time students which was submitted to the joint committee. The committee considers its content and the conditions under which it will be carried out, that is laboratory, equipment, and so on. Examinations are set by the staff of the college but assessors are appointed by the RIC

to review papers and the marking of script.

A college could, if it wished, adopt a course prepared by one of the regional examining unions. These were also liable to the RIC assessor.

Points in favour of this scheme were its flexibility to meet requirements of a particular area, and the fact that the certificate was awarded as a result of regular and progressive study over a period of years—attendance and laboratory work throughout being taken into consideration.

Encouraged Part-time Courses

Two main achievements of the scheme were that it encouraged organised part-time courses and had raised the standard of accommodation and equipment in the colleges.

Increasing numbers were coming forward for the Ordinary and Higher Certificates in Chemistry. For the Ordinary certificate in 1946 there were 358 candidates of whom 245 were successful. By 1952 entries had increased to 1,285, with 729 gaining the award. In the Higher certificate there were 112 candidates in 1946, 83 being successful, while by 1952 the entries had risen to 593 of whom 364 were awarded certificates.

In the final paper Norman Booth, B.Sc., Ph.D., F.R.I.C., chairman of the London Section, RIC, and assistant general manager, research and development, of the British Oxygen Company, summed up 'The Requirements of Industry' and outlined the percentage of scientists engaged in research, on production, industrial administration, technical, sales and so on.

Answering the question 'What does industry want?' Dr. Booth said he thought that the aim should be to turn out a man with the fundamentals of chemistry, but more thorough practical training. What was needed was someone who could readily assimilate the problems of industry. Desirable qualities were: intelligence; a trained mind; clear thinking; breadth of outlook; ability to co-operate; and the ability to express himself clearly both verbally and in writing.

It seemed desirable that methods of selection should be amended and more attention paid to personal attributes. There should be more integration between the ARIC and the Higher Certificate.

Opening the discussion, H. L. Howard, B.Sc., A.R.C.S., D.I.C., M.I.Chem.E., F.R.I.C., honorary registrar, British Association of Chemists, said that although the BAC was not an examining body, it had from the outset tried to tackle the problem of education in chemistry.

The effective life of a chemist was growing shorter. Longer courses meant that he entered his career at a later age while the tendency at present was to regard him as obsolescent at an earlier age.

Another speaker emphasised the need for broadening the philosophical attitude towards science. Too much importance, he declared, was placed on degrees. A degree was only an entry. What a man was really worth came afterwards. The curricula of most courses were getting overloaded with details.

One class of would-be students, he said, did not appear to be catered for at all. These were the good intelligent fellows already in industry, who had a high degree of understanding of processes. Technology was best learnt in the works, but nothing was done to help them. Could not courses be organised to give them the fundamental ideas of chemistry?

Expansion of College

Referring to the proposed expansion of the Imperial College of Science and Technology in South Kensington, London, a member from Edinburgh asked where the increased numbers of students was coming from? Technology, he considered, was best taught in small units.

A word on behalf of the part-time student who often put in three, four, or five nights a week on a long and arduous course, was expressed by a speaker from Lancashire. Part-time students, he declared, should be given a chance of getting a degree. It was high time, he declared, that the RIC and National Certificate bodies got together for integration between courses.

Other points raised were: the need for teaching of good English, that is the ability to express a fact or an idea; a redress of the balance between practical and theoretical chemistry; the alteration of syllabuses to decrease the volume of detail work and insist more on quality; and the steps to be taken to halt the dwindling of the number of science masters, because of the attractive salaries in industry?

A vote of thanks was proposed by Dr. H. J. T. Ellingham to the main speakers.

Detergent Solutions

Dr. Pankhurst Discusses their Physics & Chemistry

A MEETING of the London section of the Royal Institute of Chemistry was held on 11 February in the Chemistry Department of the South-West Essex Technical College, Walthamstow, with Mr. R. W. Jukes in the chair. Dr. K. G. A. Pankhurst delivered a lecture, illustrated by lantern slides, entitled 'The Physics and Chemistry of Detergent Solutions' of which a summary is given below:—

Owing to the shortage of fats, occasioned by the first world war, attempts were made to find substitutes. These were not very effective and it was not until 1925, when the sodium alkyl sulphates were introduced, that the modern era of detergents began.

These compounds were not only good detergents, but overcame many of the disadvantages of soap, especially its low solubility, curding with calcium salts and poor stability in acid solutions.

The requirements of a detergent were that it should possess a hydrophilic or water attracting group and a hydrophobic or better oleophilic group (usually hydrocarbon) which was the 'active' group.

Detergents were classified into ionic and non-ionic types. The ionic class included the anionic type such as soap, sulphonated long chain hydrocarbons, the alkyl sulphates and recently more especially the sulphates of the dibasic esters, and also the cationic type such as cetyl pyridinium salts. Anionic and cationic referred, of course, to the 'active' or oleophilic group.

Non-Ionic Types

Non-ionic types included particularly the condensation products of phenols with long hydrocarbon chains and ethylene oxide and also the substituted betaines, which acted as 'zwitterions' and formed with acids active cationic groups and with alkalis active anionic groups.

A good balance between hydrophilic and oleophilic groups was essential and the hydrocarbon chain should contain more than 8 carbon atoms and preferably 12-16.

The combination of low osmotic properties with high conductivity had led to the micellor theory of Hartley. In this there is an equilibrium between single oleophilic ions and aggregates of 'micelles.' This aggregation containing about 50 single ions was probably spherical with the hydrophilic or polar groups orientated on the outside with virtually a body of liquid hydrocarbon within. The process of aggregation was accompanied by a considerable decrease in surface free energy of the order of 10^{-11} ergs per molecule and was thus highly probable thermodynamically. Moreover, the effect of concentration, length of hydrocarbon chain and neutral electrolytes all gave effects which were in accordance with this theory. Application of the law of mass action to detergent solutions indicated clearly that micelle formation occurred at a critical concentration which became sharper the larger the number of ions per micelle. This change of property with concentration was indicated graphically when the osmotic coefficient or the equivalent conductivity was plotted against the square root of the concentration.

Tendency to Adhere

Due to the high charge on the micelle, a large percentage of the oppositely charged ions, or gegen-ions, tended to adhere and were transported with the micelle during current flow. Consequently abnormal and negative values were obtained for transport numbers.

A rapid fall in surface tension occurred with concentration in dilute solutions until the critical concentration was reached and thereafter remained constant. This was consistent with the view that there was an almost stationary concentration of single ions and increased concentration merely increased the number of micelles, the latter being extremely soluble. A similar explanation applied to the effect of temperature on solubility. At low temperatures the solubility was very small, but within a range of a few degrees it became remarkably high, and was in accordance with the attainment of the critical concentration above which the bulk of the detergent went to form micelles.

The spherical form of the micelle had been challenged particularly by the McBain school who preferred an alternative laminated structure in which the polar groups

were again orientated outwards with an inner body of hydrocarbon chains. Such a structure was now believed to exist in more concentrated solutions and was indeed supported by X-ray evidence. However, the question of structure did not in general affect the validity of the micellar theory.

In the ensuing discussion Mr. Prentice inquired why wetting agents were not necessarily good detergents. Dr. Pankhurst replied that wetting power was purely a result of hydrophilic groups, whereas the oleaphilic groups were the active agents in the detergent and a good balance between both groups was essential.

In reply to Mr. Hill, Dr. Pankhurst explained that non-ionic detergents followed the same pattern as ionic types as far as the ethylene oxide condensates are concerned and these were particularly well-balanced types. The betaines and zwitter-ion types were not particularly important.

Mr. L. E. Atkins was told in a reply that the negative solubility of non-ionic detergents probably involved an inversion of the micelle structure.

Reason for Curious Minimum

Dr. Pankhurst explained in reply to Mr. A. Mackenzie that the curious minimum obtained in the surface tension—concentration graphs arose from incorporation of small amounts of alcohols into the micelle giving rise to an extraordinarily surface active complex. Also in reply to Dr. Burger it was stated that there was no royal road to success in selecting detergents and that it depended on the specific application in mind.

Mr. Hymas asked if the micelle had any self-protection against entry of materials from outside. In reply it was indicated that the structure was in dynamic equilibrium and that interchange with ions occurred rapidly. Penetration was thus unhindered provided the entering molecule had no charge.

In reply to a question by Dr. Sreben on the mechanism of water in oil emulsion promoting detergents, Dr. Pankhurst gave a pictorial representation involving an inversion of the positions of polar and oleophilic groups.

Mr. P. S. Simson was told that orientation of the polyethylene oxide chains at the oil-water interface was reasonable in view of the flexibility of the molecules in oil in water emulsions.

Dr. Epton suggested that the anomalous solubility effects occurring with the non-ionic detergents was due to hydrogen bonding which occurred at low temperature but which was negated by thermal effects.

Microchemistry Group

THE ninth annual general meeting of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists was held on 29 January at the Sir John Cass College, London, E.C.3.

The following were elected officers of the Group for the ensuing year: *Chairman*, Dr. A. M. Ward, F.R.I.C.; *vice-chairman*, Dr. G. F. Hodsman, A.Inst.P.; *hon. secretary*, Mr. D. F. Phillips, A.R.I.C., 101 South Promenade, St. Annes-on-Sea, Lytham St. Annes, Lancs.; and *hon. treasurer*, Mr. G. Ingram, A.R.I.C.

After the business meeting, the retiring chairman, Dr. Cecil L. Wilson, F.R.I.C., addressed the meeting on 'Microchemistry: An Appraisal.' During the afternoon preceeding the meeting a party of members visited the new factory and laboratories of Messrs. L. Oertling, Ltd., at St. Mary Cray, Orpington, Kent.

Magistrates Grant Permission

LOUGHBOROUGH magistrates gave assent on 18 February to a formal application by Genatosan Ltd., manufacturing chemists, to erect an explosives store near the centre of Loughborough, to hold not more than 600 lb. of TNT. Three residents opposed the application, and produced a petition bearing the names of 234 people.

For Genatosan Ltd., Mr. R. V. Baron told the court that TNT was required for the manufacture of phloroglucinol, which was used to impregnate paper on which plans are prepared. This preparation used to be imported from the U.S.A., but now Genatosan Ltd. produce almost all the U.K. requirements. Plans for the building had been approved by Loughborough Corporation, and the Home Office had granted a draft licence. The only way to detonate the TNT would be by means of detonaters, which certainly would not be stored.

I.G. Farben Reorganisation

Successor Firms Optimistic Concerning the Future

BUT for a few points of detail, full agreement has now been reached by the German Government and the Allied High Commission on the distribution of the assets of I.G. Farbenindustrie between the successor companies set up in the course of recent years. At the same time reports and figures released by these companies suggest that the post-war reorganisation and rehabilitation is, by and large, complete. The time has thus come for an assessment of the situation as it presents itself as a result of the splitting up of the all-powerful I.G. Farben combine, the demolition and dismantling of war factories, and the modernisation and extension of other plants.

The three major successor companies are Farbenfabriken Bayer AG (with a labour force of 30,500 compared with a high of 32,400 in 1951), Badische Anilin- und Soda-Fabrik AG (over 26,000) and Farbwerke Höchst AG vormals Meister, Lucius & Brüning (over 22,000). The second rank of I.G. Farben successors is formed by Cassella Farbwerke Mainkur AG, Chemische Werke Hüls GmbH (nearly 9,000 workers), Dynamit AG vormals Alfred Nobel & Co. (nearly 7,000), and Kalle & Co. AG which may yet be attached to Farbwerke Höchst. Of other I.G. Farben interests the 50 per cent share in Dr. Alexander Wacker GmbH has been reduced to 45 per cent and transferred to Farbwerke Höchst, leaving a clear majority of the capital with the Wacker family, while the works at Rottweil and Rheinfelden have been leased to French firms and the interest in Titan GmbH, Chemie-Werk Homburg, and some non-chemical works have been handed over to I.G. Farben's former partners in these enterprises. The East German I.G. Farben works at Leuna, Bitterfeld, Piesteritz, Schkopau and Wolfen are either under Soviet management and control or nationalised.

Badische is Largest

The largest chemical works in Western Germany and indeed one of the largest in the world is the big complex of Badische Anilin- und Soda-Fabrik AG at Ludwigshafen. The Badische is distinguished from the two other big successor companies in that its production is concentrated entirely at this one works and includes substantial tonnages of basic and heavy chemicals for direct sale. Although war damage to the works was put at DM. 400,000,000, to which must be added a loss of DM. 40,000,000 through dismantling and DM. 80,000,000 by the heavy explosion in July, 1948, the major part of the damage has been made good by now and various new production units have been erected. In addition to the three major groups of basic chemicals and nitrogen fertilisers, dyestuffs and intermediates, and plastics, the production includes raw materials for the pharmaceutical and cosmetic industries, solvents and plasticisers, metal oxides, weed-killers and insecticides, washing agents, tanning and adhesive materials. The Ludwigshafen plant is almost self-sufficient because of its wide range of activities and in research at present devotes special attention to plastics, synthetic fibres and lacquers. After the record turnover of DM. 679,000,000 in 1951 sales declined in the first half of last year, but after the recovery in the second half the turnover for 1952 was about the same as in the preceding year.

Labour Forces

With a labour force of approximately 21,000 the Leverkusen works of Farbenfabriken Bayer AG are less important than the Ludwigshafen plant with its more than 26,000 workers, but Bayer employs another 9-10,000 workers at branch factories. The 1952 turnover was 7 per cent below the 1951 peak of DM. 827,000,000. Of the damage due to war and dismantling, put at DM. 164,000,000 and DM. 20,000,000 respectively, 80 per cent have by now been made good, and in addition there have been substantial new investments. The sulphuric acid capacity at Leverkusen and the branch works at Uerdingen has been increased by 40 per cent, that of chlorine and soda lye at Leverkusen by 25 per cent. The vanadic acid plant has been rebuilt, plants for activated carbon and bichromates have been extended, and production facilities for fine chemicals for the pharmaceutical industry and materials for the plastics industry have also been enlarged. A new penicillin plant,

as well as an older one at Leverkusen, has been in production at the branch factory at Elberfeld since 1951 and is now being enlarged; a new anti-tuberculosis drug, Neoteben, is being made here since last summer. The photographic film factory at Leverkusen has been greatly extended and is about to produce ciné-film. A perlon plant is under construction at the branch works at Dormagen and is expected to come into production later this year. Polyacryl nitrile fibre and several new plastics are still in the experimental stage. Unlike Badische, Bayer is chiefly interested in higher-priced chemical products. Last year's decline in sales was largely due to an export recession after exceptionally heavy shipments in 1951.

Firms within the Combine

The Farbwerke Höchst combine includes Chemische Fabrik Griesheim, Naphtol-Chemie Offenbach, Knapsack-Greisheim AG, Lech-Chemie Gersthofen, Behring-Werke AG Marburg and Bobingen AG für Textilfasern as well as the works at Höchst which employ 12,300 of the group's 22,000 workers. Dyes, textile and tanning agents, pharmaceuticals, solvents, plasticisers, refrigerants, fire extinguishers, cleaning agents, pest control agents and fertilisers are being made at Höchst, while Offenbach chiefly supplies naphthol dyes, Griesheim produces intermediates from benzole and toluole, and Gersthofen provides Höchst with chlorine and soda lye and in addition owns one of the largest camphor plants in the world. All these smaller factories are either situated near the Höchst works or favourably placed with regard to raw and auxiliary materials. Knapsack-Griesheim AG at Knapsack near Cologne is the largest German producer of calcium carbide and also supplies acetic acid and anhydride, cyanamide, ferro-silicon and, of late, phosphorus which was not previously produced in the German Federal Republic. Bobingen AG is a producer of perlon and Behring of pharmaceuticals. The pharmaceutical interests of the group will be increased further if German moves for the attachment of Kalle & Co., Wiesbaden, to Höchst prove successful. Dyes and drugs account for nearly half the group's turnover and two-thirds of its exports which in 1951 absorbed almost two-fifths of total sales. The heavy fall in exports during the early part of last year did not prevent Farbwerke Höchst from approaching the high 1951 turnover of DM. 638,000,000. Recent research has led to the development of Omnacillin, an antibiotic preparation, Hostaflon, a new fluorine plastic, several vinyl acetate derivatives and a number of new dyestuffs.

The smaller I.G. Farben successors are more specialised than the three big units. Cassella Farbwerke Mainkur AG, Frankfurt, achieves more than two-thirds of its sales in the coal-tar dyestuffs field. It also produces pharmaceuticals, insecticides and synthetic resins including melamine resins, and it is in these fields that progress is expected to be swiftest in the next few years. The company intends to produce polyacryl nitrile fibre. Due to the preponderance of finished manufactures, Cassella in 1951 disposed of about two-thirds of the total turnover of DM. 61,000,000 in foreign markets and had to accept a corresponding decline in sales last year.

Chemische Werke Hüls GmbH in 1951 resumed the production of buna rubber at a rate of about 5,000 tons a year, compared with a wartime peak of 45,000 tons, and has been pursuing plans for an expansion of the present small production, though somewhat halfheartedly in view of the heavy capital expenditure involved. Other products are likely to be more important in future. Hüls produces, e.g., polyviny chloride (of which it claims to be the largest supplier in Western Europe) polystyrol, mixtures of vinyl chloride and vinyl acetate and of vinyl chloride and styrol, caprolactam for the production of perlon, and of late, a polymer of vinylidene chloride and vinyl chloride. The company is closely allied to Ruhr coal interests which own half its capital and receives some of its raw materials from hydrogenation works and oilfields nearby; in return Hüls supplies the hydrogenation plants with hydrogen.

Producer of Plastics

Dynamit AG vorm. Alfred Nobel & Co., Troisdorf, near Cologne, in addition to its explosives and ammunition interests is an important producer of plastics. Production in the three factories at Troisdorf, Schlebusch and Würgendorf continued to increase by 7 per cent last year after a 51 per cent rise in 1951, which had brought the turnover to DM. 100,000,000. Phenol and carbamide resins, cellulose derivatives, vulcanised fibre and bakelite are being made, but half the plant capacity only is being used.

As part of I.G. Farben, Dynamit Nobel's plastics interests were confined to the processing end. The company has therefore set up its own facilities for producing raw materials for its plastics processing works, including phenol and polymerisation plants.

It may be said that most I.G. Farben successors aim at a status of greater self-sufficiency in raw material supplies which involves some measure of vertical expansion but are in general content to pursue the pre-war trends of development. New capital, however, is being invested only in promising fields, and some of the war-damaged plants for which there did not appear to be a ready market have been left unreplaced. Some of the successor companies' productions, new and old, enjoy a quasi monopoly, but in most sections there is a certain amount of competition. All the major dyestuffs producers are making great efforts to enlarge their market by bringing out new products, and such fields as synthetic fibres, antibiotics, plastics and agricultural chemicals seem to offer a great attraction to most of the successor companies.

Following Swiss Practice

It is, however, noteworthy that while the bigger units endeavour to spread their risks and interests vertically and horizontally as wide as possible, others seem inclined to follow the Swiss practice of concentrating on specific manufacturing activities based on raw materials bought from other firms. All, however, devote considerable attention to research. On an average research expenditure amounts to about 4 per cent of the turnover, and it is not aimed at producing quick results. Exports are of considerable interest to almost all the firms concerned, and in a good year approach 50 per cent of domestic sales. The loss of markets and sources of supply in Eastern Germany and Eastern Europe has been mostly overcome with relatively little difficulty; some of the new plants have the definite objective of making up for supplies previously obtained from East German I.G. Farben factories. It is interesting to record that the damage due to dismantling is admitted to be less than that due to neglect of maintenance and modernisation before and during the war. The future, however, is viewed with considerable confidence by the managements of the I.G. Farben successor companies, in view of the swift recovery in the latter part of last year.

Leather Trades' Chemists

Manchester Group Discuss Syntans

A MEETING of the Manchester Group of the Society of Leather Trades' Chemists was held at the Engineers' Club, Manchester, on 31 January, with Mr. G. Forsyth (president of the Society) in the chair. Dr. W. S. Short gave a paper on 'The Structure and Characterisation of Syntans.'

The development in syntans resulted from examinations of phenolic bodies, and there was no greatly marked basic change in the syntans of today, said Dr. Short. They had a low molecular weight, and tanning properties depended on the OH groups. Various types of syntans were mentioned and it was stated that those of the Neradol type would not tan at a *p*H over 3.5.

Structure Explained

The lecturer explained the structure of syntans and discussed the possible tanning properties of various structures. He also outlined methods used to produce a replacement tanning agent, including activation of the OH groups to improve tanning properties. The use of urea had enabled syntans to tan at *p*H 3.0, but the resultant leather was not perfect, while the extensive use of sulphite cellulose as a base for syntans had not proved particularly satisfactory. Work on the production of syntans to give a white or light coloured leather fast-to-light had met with some success.

In the amino resin tannage, urea reacted with formaldehyde to form dimethourea. The leather produced had a very high shrinkage temperature and was absolutely fast-to-light, on which account it was developed.

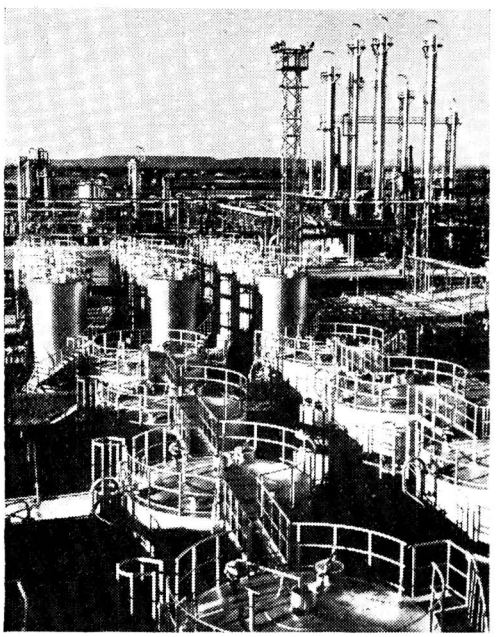
During the discussion, Dr. Short said that the naphthalene type of syntans used for bleaching chrome leather were successful owing to the formation of light-coloured complexes on the surface of the leather.

Mr. R. Denyer spoke on the 'Application of Syntans.' He divided the syntans into groups and described the properties of each group and those of the leather produced. The replacement types of syntans for complete tannage were limited to where the production of white leather was required. Paste-drying problems were eliminated by the use of syntans, and the sulphonyl chloride type produced good gloving leather.

New French Solvents Plant

Shell-St. Gobain Project at Berre

PRODUCTION of 7,500 tons of acetone and mixed solvents a year will result from the new £2,000,000 chemical plant which was officially opened at Berre, near Marseilles, at the end of last month.



A Shell photograph of the new petroleum-based solvents plant at Berre, near Marseilles, France

By means of techniques similar to those employed for the same purpose in British and American petroleum chemical plants, tonnages of the individual chemicals will be varied to suit the needs of a large number of important industries such as textiles, plastics, paint and lacquer, perfumery and cosmetics, and so on. Raw material for manufacture will be gas—propylene—derived from petroleum and obtained from the nearby refinery of Shell-Berre.

Jointly owned by Shell and the Société de Saint-Gobain and begun in July, 1951, this new petroleum-based solvents plant, was completed last November when the first installation came on stream. With the exception of some of the special equipment, the plant was entirely manufactured in France, and French labour and workmanship were employed throughout for its construction.

Hitherto, France has had to import a large proportion of her solvents requirements from the U.S.A. With the completion of this plant, the first of its kind in France, imports will be able to be cut substantially with a consequent saving in foreign exchange.

Sulphur Control Removed

Restrictions Retained for H_2SO_4

THE Minister of Materials has made the Control of Sulphur Order, 1953 (S.I. 1953, No. 232), which revokes, with effect from 23 February, 1953, all Statutory control on the supply and use of sulphur except for the manufacture of sulphuric acid.

It was possible to do this, it was stated, because of an increase in world production of sulphur and because of economies in its use and its substitution by other materials, such as pyrites and anhydrite, in the manufacture of sulphuric acid.

Sulphur is still not available in unlimited quantities, but provided that economy in its use continues, including all possible means to ensure its recovery in industrial processes, sufficient should be obtainable to meet the essential needs of the United Kingdom.

Control of sulphur for making sulphuric acid is being retained because it is necessary that sulphur should be used only to the extent that requirements for acid cannot be met by using other materials. Apart from pyrites, these include anhydrite, of which there are large deposits in this country, and spent oxide, which is a by-product of gas works. There has been a considerable expansion of plant using these materials which is now coming into use. It is necessary to ensure the full operation of this plant in order to lessen the dependence of industry on imported sulphur and to conserve supplies. There can be no assurance that there will not be another serious shortage of sulphur within a few years. For these reasons, imports of sulphur will continue to be restricted to the level necessary to meet essential requirements.

Copies of the Control of Sulphur Order, 1953, may be obtained from H.M. Stationery Office or through any bookseller, price 2d.

Development of Photography

Royal Photographic Society's Centenary Exhibition

SIMPLICITY and efficiency of the modern high-speed camera have made photography today so universally popular that it is hard to appreciate the tremendous advances that have been made since the work of William Henry Fox Talbot and other early pioneers.

To commemorate the attainment by the Royal Photographic Society of 100 years of continuous existence a fascinating exhibition of photographs, books and apparatus is being held (until 28 March) at the Science Museum and the house of the society, 16 Princes Gate, London, S.W.7. The exhibits are drawn partly from the society's collections and partly from those belonging to or on loan to the museum.

The series of photographs at the museum begins with a representative selection of the work of W. H. F. Talbot from 1841 onwards which includes the erecting of the Nelson column in 1843, views of the photographic studio he established at Reading, and a copy of his 'The Pencil of Nature' 1844, the first book to be illustrated with photographs. There is also a pencil sketch of Lake Como made by Talbot in 1833 which it is claimed prompted his experiments which led to the invention of photography.

It is interesting to trace the development of various photographic processes. The earliest form was photography on metal plates and is exemplified by heliogravures on pewter or silvered plates. This was really the beginnings of photo-engraving rather than photography as it is recognised today, and examples are exceedingly rare. The society has three specimens dated 1826 and 1827.

Description of Delicate Process

In 1839 Daguerre described his delicate process of taking photographs on silver or silvered copper plates. Some of the drawbacks were that with the ordinary camera lens the picture was reversed as regards left and right, and each exposure yielded only a single picture. Daguerreotypes were displayed by the 'wet' plate process in 1851.

The basis of photography as it is known today was the invention of 'Photogenic Drawing' announced by William Henry Fox Talbot at a meeting of the Royal Institution in 1839. This process patented by Talbot under the name of Calotype, consisted essentially of the production of a paper negative from which positives could be obtained by contact printing as required.

With the introduction of his wet collodion in 1851 Frederick Scott Archer had a big influence in advancing the practice of photography both for professionals and amateurs.

The glass plate was coated with a layer of iodised collodion which had to be sensitised by immersion in a bath of nitrate of silver and exposed in the camera while still wet. This necessitated the photographer carrying a dark tent and supplies of water and chemicals about with him. Exposures were by this method reduced to a matter of seconds instead of minutes.

Examples of Process

Examples of the wet collodion process are notably the architectural studies of Roger Fenton (1819-1869), and a picture 'The Two Ways of Life' by Oscar G. Rejlander (1813-1875). This was probably the first conscious attempt to build up a picture from a number of separate negatives. In 1858, Rejlander gave an account to the society of how this had been done, stating that over 30 separate negatives were used.

In the middle of the 1850's a 'dry' collodion plate was brought out by Dr. Hill Norris. This eliminated much of the messy manipulation involved in the 'wet' process, but was so much slower that it never gained success.

The next step forward was the successful production of the gelatin dry plate usually associated with the name of R. L. Maddox in 1871. Much greater speeds became possible and procedures were simplified, but they were not widely used until 1880. Elliott and Fry being one of the first firms to adopt them.

After this, developments of glass plates were in the direction of increased speeds and greater colour sensitivity. Papers were evolved for specialised uses, more carefully standardised as regards speeds, variety of surface and general reliability. New processes such as Bromoil, Bromoil Transfer,

Carbro, Gum Bichromate, and so on were introduced, specimens of which are to be seen in the exhibition.

There are many intriguing items in the apparatus section. Among the earlier equipment is the 'solar microscope' with which Fox Talbot took some of the earliest photomicrographs. The cumbersome box-tent on wheels designed by Thomas for wet-plate photography is shown, together with a portable set of chemical reagents which had to be carried about by the photographer.

Forerunner of the cinematograph is the stroboscope of 1832, which although imperfect in design was the first apparatus to present the illusion of a true living picture. Other early forms of motion picture include the zoopraxiscope of Muybridge (1880) to project on a screen a cycle of natural movements from photographic originals and a stereoscopic camera used by William Friese-Greene in 1890.

A particularly interesting exhibit is the Edison kinetescope of 1891. This was one of the earliest types of kinematograph to use celluloid film. It was provide with a phonograph working in synchrony with the pictures, and thus may be said to represent one of the first machines for producing 'talking pictures.'

The exhibition in the Science Museum is open from 10 a.m. to 6 p.m., from Monday to Saturday, and from 2.30 p.m. to 6 p.m. on Sunday. That in the society's house is open from 9.30 a.m. to 5.30 p.m. from Monday to Friday, and from 9.30 a.m. to 5 p.m. on Saturday. Admission is free in each case.

Indian Rare Earths

Monazite Sands Processed at Alwaye

AMONG the valuable natural assets of India are the mineral sands of the Travancore-Cochin beaches. One of these, monazite, occurs in grains and occasionally as crystals. It has a yellowish colour and is about five times heavier than an equal volume of water. The main products are rare earth chlorides and carbonates.

The occurrence of monazite in Travancore-Cochin State was discovered by a German chemist in 1909, and was followed almost immediately by an investigation of the area by the Geological Survey of India.

Particulars of the factory started by Indian Rare Earths, Ltd., at Alwaye, Travancore-Cochin, which was formally opened by the Prime Minister, Shri Jawaharlal Nehru a short while ago, are given in the January, 1953, issue of *Indian Trade and Industry* (Vol. IV, No. 18), published by the High Commissioner for India, Commerce Department.

A committee was set up by the Government of India in July, 1949, 'for administering a company to be formed for processing certain minerals,' and in September the following year Indian Rare Earths, Ltd., came into being.

Chairman of the board of directors is Mr. J. D. Choksi, a representative of industry. The nominees of the Government of India are Dr. H. J. Bhabha, F.R.S., chairman of the Atomic Energy Commission; Dr. S. S. Bhatnagar, secretary, Ministry of Natural Resources and Scientific Research and director of CSIR; Mr. K. R. K. Menon, secretary, Ministry of Finance; and Dr. K. S. Krishnan, director of the National Physical Laboratory. The Chief Secretary and the Finance Secretary of the Government of Travancore-Cochin are the other two members of the board.

Yearly Capacity

The factory can process 1,500 tons of monazite sands a year. The sand will be supplied by the Government of Travancore-Cochin. The main products are rare earth chlorides and rare earth carbonates. The plant is capable of producing the entire earth as either chloride or as carbonate. This is required due to the fluctuating nature of the demand for these products. It can produce a maximum of 1,650 tons of chlorides or 1,150 tons of carbonates. Normally it will produce approximately 1,000 tons of chlorides and 450 tons of carbonates.

By-products are between 1,500 to 1,800 tons of crystalline tri-sodium phosphate and 900,000 gallons of caustic soda lye in 10 to 12 per cent. soluton. The residue, after all this extraction, when suitably treated, can yield approximately 205 to 228 tons of thorium nitrate, provided all the thorium is converted to nitrate. These figures are variable as the thorium oxide content of monazite is known to vary from 8 to 9.5 per cent. This residue will be treated by a factory being set up by the Atomic Energy Commission for the production of uranium and thorium compounds and the extraction of uranium.

Cosmetic Chemists Discuss Detergents

No More Irritating than Soap says Speaker

THE second scientific meeting of the 1952/53 winter session of the Society was held in the conference room of the British Colour Council, London, W.1, on 5 December. A paper on detergents was read by A. Taylor, M.P.S.

Mr. Taylor reviewed the history of the rapid growth of the use of synthetic detergents and summarised the chemistry of the major detergent products under the classification anionic, cationic and non-ionic types.

The anionic detergents were dealt with in detail, this large group being sub-divided into four sections: Carboxylic acids, sulphuric esters, alkane sulphonates and alkyl aryl sulphonates, and the formula, methods of manufacture and uses of each kind of detergent were described.

From the cosmetic chemists' point of view the sulphuric esters were by far the most important, said Mr. Taylor, the two basic types being distinguished by the sulphate group being attached to the hydrophobic group either directly or via an intermediate link. The sulphated oils, alcohols and olefines were representative of the former. The latter type could be subdivided according to the links joining the sulphate and hydrophobic groups:—

ester link—sulphated monoglyceride,
amide link—sulphated alkylolamide,
ether link—sulphated alkylene oxide, or alkyl phenol,
miscellaneous—sulphated fatty alkyl mercaptans, etc.

Commercial methods for the production of higher fatty alcohols and the methods of sulphation were described.

Most Important Detergents

Mention was made of the alkyl aryl sulphonates which, with respect to tonnage, were the most important group of detergents and were based on dodecyl benzene, keryl benzene or dodecyl toluene. Industrially these products possessed many economic advantages and provided the bulk of synthetic detergents used for domestic purposes. So far, however, they had not found a major outlet in cosmetics.

Cationic types of detergents were classified as amine salts or quarternary ammonium compounds. The former included the sapamines, the latter were represented by cetyl trimethyl ammonium bromide.

The nonionic detergents possessed the advantages that:

(a) they are relatively stable to high concentrations of electrolytes
(b) the degree of solubilisation conferred by polar groups is more readily controlled than is the case with ionising surface active agents.

Preparation of Polyethers

The ethyleneglycol polyethers could be prepared by the condensation of an insoluble compound containing reactive hydrogen atoms, e.g., a carboxylic acid, amine, amide, or mercaptan, with the alkylene oxide.

Oil soluble surface active agents, e.g., spans, pentaerythritol and glycerol esters, were manufactured by heating together alcohols (e.g., glycerol, mannitol, etc.) with the requisite fatty acid in the presence of a catalyst.

Sequestering agents were of considerable importance, in particular those based on the sodium salts of ethylene diamine tetra acetic acid.

Methods of analysis of detergents were outlined, the more important criteria being, total, active and free fatty matter contents, water content, pH value and inorganic salt content.

To determine the value of a detergent for cosmetic purposes other qualities that could be examined included surface tension, wetting properties, foaming properties and efficacy as a shampoo. The three standard methods of determining foaming properties were mentioned, but the best method of evaluating surface active agents intended for use in shampoos was said to be by practical tests carried out under strictly controlled conditions.

Shampoos provided the major outlet for surface active agents in the cosmetic industry, although considerable quantities were used as minor constituents in other cosmetic preparations.

Liquid shampoos had recently achieved

considerable popularity in this country; they might be formulated from alkali-neutralised lauryl sulphates, thickened and opacified with carboxyl-methyl-cellulose, soaps, magnesium stearate, etc.

Cream shampoos, usually based on the sodium fatty alcohol sulphates, were purchased in powder or paste form. The consistency of the final product might be adjusted by the incorporation of soaps, cellulose derivatives or alginates.

Powder shampoos were often totally spray dried, in this form they possessed many advantages including homogeneity, ease of solubility and increased packing volume. The detergent contents varied from about 15 to 45 per cent and 'builders' such as borax, phosphates, sodium sulphate, etc., were incorporated, following in some cases fairly closely the formulae of the older soap shampoo powders.

Irritation to the Eyes

Irritation to the eyes caused by shampoos had recently been the subject of much discussion, particularly in the U.S.A. Tests had been made in which a solution of the shampoo was instilled into the conjunctival sac of one of the eyes of a rabbit, the other eye being used as a control. Regular observations for inflammation and injury were made. Tests indicated that the gradation of possible irritation was:—

(1) Cationics were greater than anionics
(2) Anionics were greater than nonionics.

A ratio had been suggested of 10:1:0.5 to 1.0.

A lively discussion ensued, in which difficulties encountered in the analysis of 'unknown' non-ionic detergents were considered.

With respect to the effect of detergents on the skin Mr. Taylor stated that he had no evidence that their irritant effect was more pronounced than that of soap; the molecular weights of the alcohols, in particular of the free alcohols, were important in this respect.

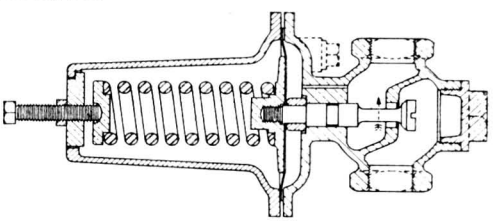
Liquid soaps had been shown to be quite as irritant to the eyes as the majority of shampoos prepared from synthetic detergents.

At the conclusion of the meeting the president, Dr. R. H. Marriott, moved a vote of thanks to Mr. Taylor which was carried with acclamation.

New Type Reducing Valves

A DEAD-TIGHT shut off with no load, resulting in absence of pressure build-up, is said to be a leading feature of the range of Bailey's new range of Foster 'Class A' reducing valves. An initial pressure of up to 250 p.s.i. can be lowered in one reduction to 5 p.s.i. The range of outlet pressures extends from 5 to 125 p.s.i. These new valves are suitable for steam, air, water or gases and their simplicity of design is said to make them extremely easy to maintain.

Being all metal and of the diaphragm type, there are no glands and no packing to give way. There is a quick release spring chamber top to ease spring changes. Spring ranges are 5/60 p.s.i., 20/80 p.s.i., 40/125 p.s.i. The chamber is of cast aluminium to B.S.S. 'L' 33. The bronze body and valve are to B.S.S. 1023-46, and the diaphragm is of phosphor bronze being fully dished and annealed.



The valves are fitted for remote control if desired and may be mounted in any position. They are available in ½ in., ¾ in., 1 in., 1¼ in., 1½ in. and 2 in. sizes, the overall height ranging from 10½ in. to 20½ in. The steam capacities range from 59 lb./hr. at 50 lb. inlet and 25 lb. outlet with the smallest valve, to 3,900 lb./hr. at 250 lb. inlet and 125 lb. outlet with the largest size.

Full details can be obtained from the manufacturers, Sir W. H. Bailey & Co., Ltd., Patricroft, Lancs.

New Pavilion Planned

Whist drives, exhibitions of home hobbies and dances will be means used by the employees of Quickfit and Quartz, Ltd., manufacturers of industrial and laboratory chemical glassware of Stone, Staffs., to raise funds for a new sports pavilion. Organising sub-committees have been nominated at a special meeting of the Quickfit and Quartz club executive committee.

Pigment Strength Testing

Automatic Muller Method Examined by Colour Chemists

WHETHER the automatic muller provides a more reproducible method of testing pigments than a palette method has been the object of an investigation undertaken by Dr. G. E. P. Box, M. T. Hobbs, and F. North, of the Dyestuffs Division of Imperial Chemical Industries, Ltd.

A paper describing the behaviour of an automatic muller and conclusions so far arrived at was presented by F. North to the London Section of the Oil and Colour Chemists' Association on 17 February.

An existing palette method of testing pigments for strength, it was pointed out, had shown that the variation in the amount of grinding applied, represented a potentially larger source of error. Statistically designed comparisons of the reproducibility of an automatic muller and the palette method were discussed, using a range of pigments.

The automatic muller consists essentially of two steel plates, fitted with detachable glass grinding surfaces, of which the upper is fixed in a horizontal plane and the lower is rotated by a constant speed electric motor controlled by a trip-switch. The upper plate may be swung upwards through approximately 120°, being opened for charging the machine and closed by a spring-catch during grinding. A varying weight of approximately 150, 100, 50 or zero lb. can be applied to the upper plate by detachable weights working through a lever system, the weights being applied, and the plates brought into close contact, by an operating lever. A revolution counter is fitted to the machine which may be set to 100, 75, 50 or 25 revs.

Method of Grinding

Method of grinding was to place the measured amounts of pigment and medium on the lower plate, and lightly mix with a palette knife to wet out the pigment. The weights and revolutions were set as desired, the upper plate closed and locked, and the operating lever raised. On switching on the motor, grinding was carried out for the preset number of revolutions, and the motor was automatically switched off.

The grinding applied was not constant over the area of the plates, being theoretically zero at the centre and increasing to a maximum at the periphery. It was therefore advisable to carry out a grinding in at least two stages, with a thorough mixing of the paint between each stage.

Inconstant Grinding

It was also conceivable that the position of the bulk of the mix on the plate prior to grinding might be a source of error, due to the inconstant grinding force applied over the plates. The authors suggested the precaution of spreading the mix in an approximate 4-in. circle round the centre of the plate.

Conclusions drawn by the authors were:—

(1) The reproducibility of the muller depended as did the palette, largely on the type of pigment tested; but results of the investigation showed that the muller was in general of equivalent accuracy to the palette over a range of typical pigment types.

(2) This conclusion referred to the palette method used by a single skilled operator. For unskilled operators using a standard method of test it would be expected that the reproducibility of the muller would be less adversely affected than that of the palette, since all the known variable factors (for example, weighing) which affected the muller, also affected the palette, but the main variable factor affecting the palette, that of grinding, did not apply to the muller. The same considerations applied in regard to reproducibility between operators.

(3) The muller appeared to be a promising means of comparing development of strength in oil, which was difficult to compare reliably on the palette.

(4) Although there was no great difference in the times taken by the two methods, the muller caused less fatigue, which might possibly affect the accuracy of routine testing where large numbers of samples had to be examined.

(5) There was a possibility, however, of certain factors existing which did not affect the palette to the same extent as they did the muller. An example was the heat factor, which was liable to give misleading results with certain types of pigments. It was, therefore, most desirable to carry out preliminary tests before accepting the results given by the muller.

Fan Performance Tests

Proposed Revised Code Prepared by FMA

THE importance of fans of all types in a wide variety of industries such as chemicals, gas, water, refrigeration, transport, and so on, was emphasised at a meeting held in London on 17 February by the Fan Manufacturers' Association to introduce its proposed new code for 'Fan Performance Tests.'

Before dealing with particulars of the suggested code, Mr. M. Geoffrey Woods, honorary secretary-treasurer, spoke of the origins and present state of the Fan Manufacturers' Association.

Industry not Perfect

The fan industry in Britain, said Mr. Woods, was far from all it ought to be, and while there were, of course, many good fans, there were also a number which were not beyond criticism. Technique and production were well known in Britain, but design and marketing were better in the U.S.A.

Referring to the work of the association, Mr. Woods said that it had played its part in helping to establish the National College for Heating, Ventilating, Refrigeration and F.A.N. Engineering, London, S.E.19, now in its fourth year. The college was doing valuable work for the industry in turning out a small number of men well trained in the art of fan engineering.

One of the main achievements of the association, however, was the preparation of the new FMA fan test code, to introduce which the present meeting had been called.

The first code for testing of fans for general purposes (B.S. 848: 1939), had been issued 13 years ago by the British Standards Institution and it was felt that the code had some shortcomings and needed revision.

A technical committee was accordingly set up and its deliberations extended over five and a half years. During that period 40 meetings had been held and a considerable amount of experimental and other work had been carried out.

As the existing B.S.848 was familiar to both industry and the user, alteration was avoided as far as possible, and revision made only where it was felt that the original did not conform to modern practice.

Symbols and formulae had been revised and extended, and the section (part V), containing test methods applicable to various types of fan had been completely re-written. Certain test methods had been dropped, and others, primarily for testing of axial and very small fans, had been introduced.

Scope of the code had been widened, as the test methods now adopted were suitable for testing fans where the pressure rise exceeds one p.s.i., and corrections for compressibility were included for pressure rises up to 200 in. water column.

Questions were then invited, and the first was why the FMA had produced its proposed code rather than let it be done by the British Standards Institution? Mr. Woods replied that it was well-known that British Standards were overwhelmed in trying to deal with the introduction of new and revision of old standards. It would be many years before BSI could have tackled this particular problem, which was felt of sufficient importance for the FMA to deal with it. It was hoped, therefore, that it would be universally accepted and adopted as the standard test code.

Another questioner asked how the proposed new code could be expected to be universally accepted 'if the FMA which produced it, on its own admission, only represented a minority of a small and specialised industry? Mr. Wood's answer was that the majority view was not necessarily correct, and that the FMA code had the support of technical people.

Copies of the new code may be obtained from the Fan Manufacturers' Association, Copthall House, Copthall Avenue, London, E.C.2, price 9s. 6d.

Ramsay Fellowships

THE Trustees of the Ramsay Memorial Fellowships Trust will consider in June applications for Ramsay Memorial Fellowships for Advanced Students of Chemistry. One of the fellowships will be limited to candidates educated in Glasgow, who can apply for either fellowship. The value of each will be £400 per annum, to which may be added a grant for expenses of research not exceeding £100 per annum. They are normally tenable for two years.

Full particulars can be obtained from the Joint Honorary Secretaries, Ramsay Memorial Fellowships Trust, University College London, Gower Street, W.C.1. Completed application forms must be received not later than 17 April.

The Chemist's Bookshelf

INSTRUMENTAL METHODS OF ANALYSIS. By H. H. Willard, L. L. Merritt and J. A. Dean. Second edition. Van Nostrand & Co., Inc., New York: Macmillan & Co., Ltd., London. 1951. Pp. v + 344. 41s.

This book has been completely revised and considerably enlarged since the appearance of the first edition in 1948. The increasing use of instrumental methods in the past decade has raised as an immediate question the problem of how much of this branch the properly trained, but non-specialist analytical chemist should know. The present book answers this by presenting a course designed to give a sound groundwork in the main instrumental procedures.

Details of actual instruments are drawn from the American field, but this will cause little difficulty to the British user, since it will only affect seriously the more advanced instruments which, in any case, are normally accompanied by full manufacturers' instructions. The remainder of the book should not only fulfil its primary function as a student's textbook, but it should enable the practising analyst to extend the scope of his operations widely.

Each instrumental method is considered theoretically in the first instance, and these discussions of principles are on the whole well-balanced introductions to the various topics. There then follow details of a variety of instruments available for each method, and well-chosen laboratory exercises designed to give practice in the use of these.

The methods included are colorimetry, fluorimetry and nephelometry, both visual and photoelectric, spectrophotometry and flame photometry, spectrography, X-ray methods, radioactivity, the use of the refractometer and interferometer, polarimetry, thermal conductivity, mass spectrometry, the use of the centrifuge, *p*H determination, potentiometric and conductimetric methods, electrodeposition, polarography, amperometric titrations, and a chapter of miscellaneous methods. Although not strictly within the terms of reference of the book, there is also a chapter on chromatography.

In their preface the authors point out that it is impossible, because of the rapidity with which new instruments are being introduced, that a book of this type should be completely up-to-date. Nevertheless, here is an excellent presentation of the fundamentals, and apart from its undoubted worth as a textbook, the book should prove of very great use to anyone in the early stages—even in the planning stages—of using an instrumental method, whether the actual instrument to be used is described in detail in the book or not.—C.L.W.

THE GERMAN RAYON INDUSTRY DURING THE PERIOD 1939-1945. Prepared by A. R. Urquhart, D.Sc., F.R.I.C., F.T.I. BIOS Survey Report No. 33. HMSO 1952. Pp. 362. 25s.

The term 'rayon' in this report covers, not only cellulosic, but also protein, inorganic and synthetic polymer rayons. As the author points out in the introduction, a survey of such a large field could be either an extended index to individual reports or an attempt to provide a more or less complete picture of the industry. The second of these alternatives has been successfully used.

The survey is divided into ten sections, these including an extensive bibliography and index.

Section One surveys briefly the whole field and indicates the general application of research and production in the preparation of rayon, in relation to the German problem of raw material supplies.

Section Two considers the production of all raw materials with the exception of heavy chemicals. Of particular interest are the methods of obtaining wood pulps from domestic wood sources. Unusual syntheses

of monomers, acids and solvents are sufficiently detailed to be interesting.

Section Three discusses methods used in Germany for the preparation of viscose rayons, giving details of both conventional and novel methods. All stages of processing are described including spinning, stretch spinning and the usual methods of preparing staple fibre, also purification, desulphuring and the recovery of chemicals. Descriptions of novel methods are helped by line diagrams. Tables comparing methods, and summarising conditions of various processing steps, giving useful data. Certain special staple viscose rayons are mentioned.

Section Four: Preparation of solution and methods of spinning of cuprammonium rayon are described. Recovery of copper from the processing liquors makes interesting use of an ion-exchange resin, ammonia recovery is also discussed.

In Section Five four methods of producing cellulose acetate flake are described and compared in tables, one method being for the preparation of tri-acetate. Of particular interest is the 'Dormagen Process' which economises in the use of acetic acid by using more easily recovered methylene chloride. Preparation of spinning solutions, spinning of filament, preparation of staple fibre, including crimped forms, recovery of acids and solvents used, complete the section.

Section Six describes the miscellaneous natural polymer rayons. Details of the manufacture of glass rayons and a brief account of the protein rayons are given. The protein rayons do not appear to have great importance in Germany. Certain cellulose rayons modified by the addition of synthetic compounds containing basic groups to their spinning solutions are mentioned.

Section Seven, synthetic polymer rayons, gives information on the German developments of the polyamide rayons. The '6' polymer obtained from aminocaprolactam is more favoured than the '6.6.' Methods of production and the research information on 'new polyamides' makes interesting reading. Also in this section are details of the polyvinyl rayons and the chlorinated PVC rayons 'Pe.Ce.' Descriptions of methods of polymerisation, types of rayons and monofils, and a novel staple fibre spinning machine are discussed and illustrated. Related types of polymers are mentioned.

Section Eight covers the textile processing of rayons. An interesting section in this chapter reviews the methods available in Germany of preparing 'rayon top from tow,' four systems are mentioned and in some cases illustrated with line diagrams. Twisting, winding and warping are considered and again novel aspects of each process are illustrated. Sizing, weaving and knitting are briefly mentioned. Crepeing processes are discussed in some detail, especially continuous methods, dyeing and printing procedures are briefly considered, but, two winches are illustrated and described which allow considerably shorter liquor ratios than is usual. In the section on mechanical finishing and drying some interesting new machines are described. Chemical finishes and textile auxiliaries, details finishing treatments and chemicals used in the processing of rayons.

A very complete index and bibliography make this survey report a useful, self-contained volume.—G.E.S.

PHARMACEUTICAL FORMULAS.—Vol. 1. Twelfth Edition. 'The Chemist and Druggist,' London. 1953. Pp. xv + 1139. 37s. 6d.

The appearance of a number of new and revised editions of British and foreign pharmacopœias and formularies since 1944 made inevitable the twelfth edition of 'Pharmaceutical Formulas.' No doubt its advent will be welcomed for it has been entirely revised and extended and consists of several thousand formulas covering the whole field of galenical preparations. Material has been taken from no less than 26 pharmacœpias and a large number of formularies.

Two innovations have been included. In a table, 'Pharmacœpial Equivalents' foreign official titles and synonyms are given alongside the designations of equivalent preparations in this country. A second table gives the concentration of acids, alcohols and alcohol solutions figuring in various sources of information.

Of particular interest to many are the notes included on improvements and new methods introduced in the manufacture of pharmaceutical preparations.—A.S.R.

HOME

Price Increase Sought

The Iron and Steel Corporation of Great Britain have asked the Minister of Supply, Mr. Duncan Sandys, to authorise an immediate increase in maximum iron and steel prices to reflect in full the additional costs which will fall on the iron and steel industry as a result of the increase in the price of coal. As a result of the higher price of coal the average cost of producing steel will increase by about 1-1½ per cent.

Cosmetic Chemists' Meeting

The fourth scientific meeting of the Society of Cosmetic Chemists of Great Britain of the 1952-53 winter session will be held in the Conference Room of the British Colour Council, 13 Portman Square, London, W.1, on Tuesday, 3 March, at 7 p.m. when a paper will be read by J. K. Barraclough, B.Sc., A.R.I.C. The paper will deal with dyes and pigments with particular reference to their use in cosmetical products. The meeting is an open one.

Alcohol Prices Reduced

A reduction in price of £20 per ton for their secondary butyl alcohol with effect from 23 February is announced by Shell Chemicals, Ltd. The new price is £122 per ton for the 10-ton rate, for delivery in returnable 40/45 gallon drums. As from the same date 5 gallon and 10 gallon drum lots will be supplied in free non-returnable containers.

Chemicals Overseas

Value of chemicals, drugs, dyes and colours exported from the United Kingdom in January was £10,760,463. This was £3,206,998 less than the same month of the previous year, but £322,999 better than January, 1951.

Orders Greatly Increased

The Council of British Manufacturers of Petroleum Equipment have announced that orders to the value of £21,480,100 were placed by oil companies in Britain during the fourth quarter of 1952. While this figure was lower than the £24,991,200 spent during the previous quarter, it brought the total for 1952 up to £91,400,600. The 1951 total was £83,991,400.

Scottish Section's A.G.M.

The 18th annual general meeting of the Scottish Section of the Society of Public Analysts and Other Analytical Chemists was held on Wednesday, 28 January, in the Rhul Restaurant, Glasgow. The following were elected officers of the Section for the forthcoming year: chairman, Mr. R. S. Watson, F.R.I.C.; vice-chairman, Dr. F. J. Elliott, F.R.I.C.; and hon. secretary and treasurer, Mr. J. A. Eggleston, B.Sc., A.R.I.C., Boot's Pure Drug Co. Ltd., Motherwell Street, Airdrie, Lanarkshire.

Gypsum to be Free

The Minister of Housing and Local Government in the course of a recent debate in the House of Commons, announced that farmers will not be asked to pay for gypsum required for rehabilitating flooded land, but may have to pay local transport costs from the nearest railway station. The necessary arrangements for providing gypsum will be made as soon as possible, and farmers notified.

New Chairman Elected

At the 28th annual general meeting of the North of England Section of the Society of Public Analysts and Other Analytical Chemists, held on 31 January at the Engineers' Club, Manchester, Mr. T. W. Lovett, F.R.I.C., was elected chairman. Mr. J. R. Walmsley, A.M.C.T., F.R.I.C., Ph.C., was elected vice-chairman and Mr. Arnold Lees, F.R.I.C., 87 Marshide Road, Southport, Lancs., was elected honorary secretary and treasurer. Mr. A. A. D. Comrie, the retiring chairman, delivered an address on 'Beer Foam.'

Chemicals in Scotland

Expansion of the reinforced plastics industry during the year to assist in providing additional raw materials is to be encouraged by the Scottish Council (Development and Industry) according to a statement by the chairman, Lord Bilsland, at a conference in Glasgow on 17 February. The council is also determined to develop the growth of new chemical industries based on the expanding petroleum refining plant at Grangemouth.

• OVERSEAS •

Increase in Aluminium Price

The Aluminium Company of Canada has announced that with effect from 16 February the price of aluminium ingots has been raised from 18 to 19 cents per pound f.o.b. smelter but with carload freight allowed to destination. It is understood that increased railway freight rates and a desire to spread the cost of them evenly among all customers is the reason for the increased price. The additional cent per pound of ingot will be collected into a freight cost pool and paid out via the producer to the benefit especially of customers at points distant from the smelters.

Contract to Kellogg

Esso Standard Oil Company has awarded the contract for a 60,000 barrel-per-day crude distillation unit at its Bayway, New Jersey, refinery to the M. W. Kellogg Company, refinery and chemical engineer-contractors of New York City. This addition to Esso's production facilities will provide a major increase in the crude capacity of the Bayway refinery, largest on the East Coast of the United States. The unit will be a three-stage plant.

Tungsten Ore Price

The open market price for foreign tungsten ore f.o.b. port of shipment was quoted in New York on 18 February as $40-41 per short ton unit, a reduction of $3.50 on the previous price.

To Study Overseas Methods

Dr. S. Husain Zaheer, M.A. (Oxon.), D.Sc. (Heidelberg), Director of the Central Laboratories for Scientific and Industrial Research and Head of the Department of Chemical Technology, Osmania University, Hyderabad-Dn, India, will be proceeding to Europe and the United States in March on a United Nations Economic Development Senior Fellowship. While visiting the United Kingdom, Germany and the United States Dr. Zaheer will examine the coal, ceramics, oils and fine chemicals and other industries. He will study current industrial research, development projects and modern methods for adapting pilot-plant processes for large scale manufacture.

To Hunt for Power

A short while ago it was reported that the Canadian authorities had turned down an application by the Aluminum Company of America for permission to use Canadian water-power resources in connection with their proposed aluminium reduction plant at Skagway, Alaska. Now it is reported from Vancouver that a survey is to be made of the water power available in the Yukon and it is thought that this might be a prelude to the construction of the Aluminum Company's plant.

Finnish Scientific Grant

To mark the 50th anniversary of the establishment of the 'Suomen Osuuskauppojen Keskuskunta' in 1954, the board of directors has decided to make a grant of Fmk. 5,000,000 (645 Finnish Marks—£1) for scientific and cultural purposes. So that the money may be used to the best advantage, university authorities and leading scientific and cultural associations in the country have been asked for their collaboration and suggestions. SOK was the first commercial enterprise to establish a chemical laboratory in Finland in the early part of this century.

Mexican Nylon Fibres

It has been reported that nylon-type artificial fibres will be manufactured in Mexico before the end of 1953. It is understood that a factory will be established by the Swedish firm of Beijer Continental S.A., and orders have already been placed in Germany for plant and equipment. The fibres will be manufactured under German patents.

Mineral Engineering Conference

Mineral engineering techniques for chemical engineers will be the main feature of the Biloxi, Mississippi, meeting of the American Institute of Chemical Engineers, to be held 8-11 March. The programme consists of an all-day symposium on flotation and a day devoted to panel discussions on fine sizing, sizing devices, sink and float separation methods and concentrating devices. The third day of the meeting will be devoted to chemical process papers, a symposium on fluid mechanics, and a symposium on 'Streamlining Paper Shuffling.'

PERSONAL

MR. G. C. P. IVESS, managing director of Fleetwood Paints, Ltd., has tendered his resignation as a director of the company. Mr. Ivess is a director of Associated Paint Manufacturers and is a member of the council of the National Paint Federation. Fleetwood Paints was formed as a private company in 1947 to acquire the undertaking of Fleetwood Chemical Company and was later converted into a public company.

MR. N. F. PATTERSON, general manager of production of Monsanto Chemicals, Ltd., announced on 18 February that with effect from 1 March, MR. SYDNEY SMITH, at present works manager of Monsanto's Newport factory, will be personnel adviser to the general manager of production. DR. NEVILLE DYSON, at present assistant works manager, succeeds Mr. Smith as works manager.

Mr. Smith, who joined the company in 1929, was promoted works manager at Newport in 1948. Since that time he has had the onerous task of staffing the factory and recruiting and training an adequate labour force in an area of labour shortage.

Dr. Dyson, who joined the company in 1934, was promoted assistant works manager at Newport in 1950.

On 27 February, at the Lecture Hall of the Institute of Civil Engineers, MR. S. C. TYRRELL, F.C.W.A., F.I.I.A., this year's president of the Institute of Cost and Works Accountants, delivered a paper on the 'Education and Training of the Cost and Works Accountant,' to the Association of Technical Institutions. Mr. Tyrrell is a local director and chief accountant of Newton Chambers & Co., Ltd. He recently joined the board of governors of Loughborough College of Technology.

The Council of the Institute of Metals has awarded the 1952 W. H. A. Robertson Medal and a premium of 50 guineas to MR. JOHN FRANCIS WAIGHT, West Midlands Gas Board, for his paper on 'Gas Equipment for the Thermal Treatment of Non-Ferrous Metals and Alloys,' published in the *Journal of the Institute of Metals*, 1952, Vol. 80, pp. 269-285.

The Medal and premium of 50 guineas, placed at the Council's disposal by W. H. A. Robertson & Co., Ltd., is awarded annually for the encouragement of the writing and publication in the Institute's *Journal* of papers on engineering aspects of non-ferrous metallurgy.

DR. F. R. N. NABARRO, of the metallurgy department, University of Birmingham, has been appointed to the Chair of Physics at Witwatersrand University, South Africa.

MR. H. TREFOR JONES, M.Sc., F.R.I.C., deputy provincial director, Yorks. and Lancs. province, has been appointed provincial director, Yorks. and Lancs. province, National Agricultural Advisory Service, in succession to the late Mr. D. H. Findlay.

Canadian Resins & Chemicals, Ltd., associate company of Shawinigan Chemicals, Ltd., have announced the appointment of MR. WALTER E. SMITH, hitherto director of laboratories, to the newly created post of manager of development. DR. R. E. HUGHES, previously assistant technical director, will succeed Mr. Smith as laboratories director.

Both Mr. Smith and Dr. Hughes, a McGill University graduate, have been with the company at Shawinigan Falls, Quebec, since 1946. In 1945, while in the United States, Mr. Smith received the U.S. Government's silver award in recognition of his work on the atomic bomb project.

DR. GEORGE LEWI has announced that as from 1 January, 1953, MR. DAVID LEE, B.Sc., A.R.I.C., who has been his personal assistant since 1946, has been admitted into partnership. The practice of industrial consultants will in future be known as George Lewi & Partners.

The Royal Photographic Society has awarded its progress medal to DR. C. F. K. MEES, F.R.S., for his researches, discoveries, and publications in the physics and chemistry of photography. This is the second time Dr. Mees has received this premier award, a distinction shared only by Sir William Abney. The citation is exactly the same as for the previous award in 1913.

DR. ALFRED NISSAN, technical executive director on the board of Bowaters Development and Research, Ltd., has been appointed by the council of Leeds University to the Research Chair of Wool Textile Engineering. The council have also appointed to the Chair of Organic Chemistry DR. B. LYTHGOE who, since 1946, has held the post of lecturer in the department of organic and inorganic chemistry at Cambridge University.

Bakelite, Ltd., have announced that MR. W. E. PATTMAN has been appointed purchasing manager. Mr. Pattman joined the Damard Lacquer Company in 1921 and soon after its transformation into the present company became assistant to the works manager. Later he took up the post of sales development engineer and started the company's sales development department. During the war he was seconded to the Plastics Control Section of the Ministry of Supply.

MR. J. M. LASSEN has been appointed sales manager of Vybak P.V.C. materials. Mr. Lassen joined the company as an engineering trainee in 1940, before serving with the Royal Navy. Returning in 1946 he was appointed to the new Vybank Thermoplastics Unit and has since been concerned with developing sales of these materials. With the expansion of production at Aycliffe, a supporting sales organisation has been established.

The Council of the Institute of Welding has awarded the Sir William J. Larke Medal for 1952 to MR. J. RANNIE, M.Sc., M.I.N.A., for his paper "Shipyard Changes, with Special Reference to Steelwork Construction in Oil Tankers." Mr. Rannie is welding engineer to John Brown & Co., Ltd., of Clydebank.

Obituary

Mr. L. Orange

MR. LIONEL ORANGE, of Mansfield, Notts., past-principal of the County Technical College at Mansfield, died on 19 February, aged 63. Mr. Orange was manager and chief chemist to the Barnsley Chemical Co., Ltd., 1919-1921, and later became head of the chemical department at Rutherford Technical College, Newcastle-on-Tyne. He was awarded the M.B.E. after the first World War for his work on explosives.

Mr. H. B. Fergusson

It is with regret that we announce the sudden death on 20 February of MR. H. B. FERGUSSON, M.I.N.A., M.I.Mech.E., M.E.I. (Canada), senior director of G. A. Harvey & Co. (London), Ltd. A memorial requiem was held at the Church of the Immaculate Conception, London, W.1, on 27 February.

Mr. Fergusson was educated as a mining engineer at the Royal School of Mines, Freiberg, Germany, and was later articled to his father, a member of the Institution of Civil Engineers.

For about six years Mr. Fergusson was a partner with Fergusson & Burr and afterwards with Colonel Du Cane, later head of Sir John Woolf-Barry & Partners, in consulting engineering offices in Vancouver, B.C., where in 1914 he joined the Royal Volunteer Engineers. Next year he led 750 skilled Canadian railway men to North Russia, where he was in charge of the construction of the Murmansk railway. In 1916 he became works manager of the Royal Ordnance Factory, Gretna, which employed a staff of 60,000. At the Armistice he was recommended by Lord Moulton for appointment as chief technical advisor to the British Military Governor at Cologne, where he stayed for about a year.

The next four years Mr. Fergusson spent in Spain as consulting engineer on hydro-electric plants and railway electrification projects. This was followed by five years in South America as chief agent for railway construction, during which time Mr. Fergusson was in charge of the construction of the main Trans-Andine highway from Cucuta to Bogota. Among a great variety of engineering projects, Mr. Fergusson was responsible for the heaviest section of Canadian Railways, that of the Canadian National line between Yale and Hope on the Fraser River.

Mr. Fergusson joined G. A. Harvey & Co. (London), Ltd., in July, 1933, as manager of their heavy construction department, and was very largely responsible for the growth and development of their activities in the oil, chemical and heavy engineering industries. He was appointed to the board of directors in May, 1938. His wide experience, ability and foresight provided a moving force behind the development of oil refinery equipment in this country, and he will be remembered for his pioneer work in this field.

Publications & Announcements

THE importance of making fuller use of instrumentation and of automatic control was one of the points emphasised in the report of the Productivity Team representing the British heavy chemical industry which visited the U.S.A. last year. Measurements of level, flow, pressure, temperature, electrical quantities, and so on, are transmitted by the Evershed electronic repeater described in its latest publication (No. 266) now available from Evershed & Vignoles, Ltd., London. Control of the SO_2 in the kerosene extraction plant at Llandarcy of the National Oil Refineries, Ltd., is achieved by the Evershed electronic repeater system, which is believed to be the first refinery plant in the world to be completely controlled electronically. Another useful publication now issued by the company is the Evershed 'Ducter' instruction book (Publication No. 269) printed in pocket book size, giving full details of its operation and examples of its uses.

* * *

MODERN industrial processes have, in many cases, increased the necessity for protection against gas hazards, and it is of first importance that wearers of breathing apparatus should have complete confidence in the efficiency and safety of their sets. This prerequisite is claimed to be implicit in all the apparatus described by Siebe, Gorman & Co., Ltd., of Tolworth, Surbiton, Surrey, in its latest illustrated brochure. Types of apparatus dealt with are designed to cover a wide range of conditions, such as mines, chemical and gas works, oil refineries, refrigeration plants and so on, for durations requiring sustained work of two hours to rapid inspection jobs of from 10 to 20 minutes. The 'Protosorb' CO_2 absorbent employed with the company's 'Proto' and other types of oxygen breathing apparatus has been evolved after many years of investigation by its research department.

* * *

THE second edition of The British Drug Houses booklet on adsorption indicators has just been published and can be obtained from the BDH Laboratory Chemicals Group, Poole, Dorset. The first edition of this booklet was written by A. W. Wellings, M.Sc., in 1936 and several impressions, with occasional additions and amendments, has been printed since. In this new edition the theoretical section has been extensively revised and the practical section completely re-written in the light of more recent knowledge. It provides ample practical instructions for the use of a carefully chosen selection of new and established indicators. Notes on technique are given and the bibliography has been extended to include work in this field up to 1951. The additional information the new edition contains has been derived from the chemical literature and from the practical work in the BDH Analytical Laboratories, while W. I. Stephen, of the Chemistry Department, Birmingham University, has lent valuable assistance. While it has not been found practicable to deal with all the new adsorption indicators which have been suggested in the last 20 years, detailed consideration has been given to 12 of the most useful and others are briefly mentioned. It is a clearly written and convenient guide to the subject and should prove most valuable to the experienced chemist as well as to the student.

* * *

SEALING by means of 'O' rings, either as a static seal where there are no moving parts or as a moving seal, developed rapidly during the last war because of its simplicity and long fool-proof service. Manufacture of 'O' rings calls for a specialised technique in regards to compounds, mould design, and rubber processes which have to be modified and refined to meet entirely new and exacting standards of precision. Dimensional tolerances are closer than for any type of moulded article and mould registration must of necessity be perfect. Howard Clayton-Wright, Ltd., of Wellsbourne, Warwickshire, has developed a new department to give special attention to its Clatonrite 'O' Ring service, which is described in a newly issued folder part of which is designed to embody an inquiry form. Three simple questions are asked: What fluids or gases must the parts be proof against? what are the maximum and minimum temperatures? for what duration do these temperatures apply? From these details the company can quote 'custom built' components specially made to suit particular requirements.

Company News

Bakelite Limited

According to the preliminary figures, the group profits for Bakelite, Ltd., dropped to £526,660 in 1952—a decrease of £124,471, compared with the previous year. Profits available for appropriation declined from £320,341 to £241,360. A final dividend of 9½ per cent is recommended, making 12½ per cent on the ordinary capital as increased by a 100 per cent scrip issue last April. In 1951 the total distribution was 25 per cent. The annual meeting will take place on 23 April.

Borax Consolidated, Limited

The valuable service of its pilot plants in the study and elucidation of problems to reduce costs and improve production is referred to by the chairman D. Abel Smith, in his statement relating to the accounts to be submitted at the 55th annual general meeting of Borax Consolidated Limited, on 16 March. Neobor, a semi-anhydrous form of borax introduced some two years ago, is gaining favour and seems likely to become a regular industrial chemical. Net profits for the year ended 30 September, 1952, were £445,866 (£791,391) parent company, and £510,521 (£892,462) group. Following the interim dividend of 2 per cent on ordinary stock, a final dividend of 5½ per cent and a bonus at the rate of 2½ per cent on ordinary stock are recommended.

Negretti & Zambra, Limited

During the 12 months ended 30 September, 1952, the stock and work in progress of Negretti and Zambra Limited, increased by £83,967 and £15,019 was spent on machinery. In his statement to be submitted at the seventh annual general meeting of the company in London on 17 March, P. E. Negretti, the chairman, states that so far it has been possible to finance requirements by ploughing back profits, but if the Government persists in its present attitude it may become necessary to resort to borrowing or curtail expansion. Profits were slightly lower due to increased expenses caused mainly by rises in salaries. The final dividend is recommended to be maintained at 17½ per cent on the ordinary share capital. With the interim of 5 per cent already made, this would make a total of 22½ per cent for the year. It was proposed to start a branch in Canada.

New Registrations

Davis (Chemicals) Ltd.

Private company. (515,943). Capital £500. Manufacturing, research, dispensing and analytical chemists. Directors: R. L. F. Harding, V. Goldman. Reg. office: 56 Beaufort Avenue, Kenton, Harrow.

Fullaterra Ltd.

Private company. (515,910). Capital £500. Importers, exporters and manufacturers of chemicals. First directors to be appointed by subscribers. Reg. office: 319 High Holborn, W.C.1.

Nylo Laboratories Ltd.

Private company. (29,283). Capital £4,000. Manufacturing chemists and druggists, etc. First directors are not named. Reg. office: 938 Argyle Street, Glasgow.

Changes of Name

The following changes of name have been announced: EAGLESCLIFFE CHEMICAL MANUFACTURING CO., LTD., to EAGLESCLIFFE CHEMICAL CO., LTD.; WESTMINSTER CHEMICALS, LTD., to WESTMINSTER CHEMICALS & PRODUCE, LTD.

Increases of Capital

The following increases of capital have been announced: BALE & CHURCH, LTD., from £2,000 to £5,000; PETER SPENCE & SONS, LTD., from £350,000 to £500,000; MIDLAND TAR DISTILLERS, LTD., from £1,000,000 to £1,500,00; COUNTY CHEMICAL CO., LTD., from £50,000 to £69,750.

Retirement Presentation

On his retirement after 51 years of service Mr. Jesse Sutton on 19 February was presented with an oak chiming clock on behalf of the directors and staff of the Prince Rock, Plymouth branch of British Glues & Chemicals, Ltd. The presentation was made at the works by the manager, Mr. T. Finney.

Next Week's Events

MONDAY 2 MARCH

Society of Chemical Industry

London: Institution of Electrical Engineers, Savoy Place, W.C.2, 10 a.m. Joint meeting with the Institute of Petroleum. Symposium on: 'Production and Utilisation of Petroleum Raw Materials in the U.K. Chemical Industry.'

Institute of Metals

Sheffield: The College of Commerce and Technology, Pond Street, 7.30 p.m. Annual general meeting Sheffield Local Section followed by joint meeting with the Institute of British Foundrymen. F. Hudson: 'The Economic Use of Non-Ferrous Metals.'

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. Cantor Lectures, Dr. F. C. Thompson (professor of metallurgy, Manchester University): 'The Safety Factor in Construction' (part 2).

TUESDAY 3 MARCH

The Chemical Society

Leeds: The University, 6.30 p.m. Professor H. W. Melville: 'The Non-steady State in Chemical Kinetics.'

Leicester: University College, 5 p.m. Dr. H. W. Thompson: 'Molecular Vibrations and Chemical Problems.'

Incorporated Plant Engineers

Cardiff: South Wales Institute of Engineers, Park Place, 7.15 p.m. Lecture and discussion: 'Gland Packing *v.* Mechanical Seals.'

Institute of Metal Finishing

Birmingham: James Watt Memorial Institute, Great Charles Street, 4.30 p.m. Election of Midland Branch Committee for 1953/54. Annual Practical Platers Forum, chairman: C. Wharrad.

Institue of Metals

Oxford: Black Hall, St. Giles, 7 p.m. Stephen Toulmin: 'John Dalton and Modern Thought.'

Swansea: University College, Singleton Park, 6.30 p.m. E. S. W. Eardley: 'Recent Advances in Furnace Design.'

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Physical Methods Group. 'Absorptiometry and Fluorimetry.'

WEDNESDAY 4 MARCH

Royal Institute of Chemistry

London: West Ham College of Technology, Romford Road, E.15, 6.30 p.m. Film display.

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7.15 p.m. A. B. Sowter and R. K. Hilton: 'Pressure Welding.'

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. H. K. Hardy: 'Precipitation Hardening.'

THURSDAY 5 MARCH

The Chemical Society

Dundee: University College, 5.15 p.m. Dr. E. J. Bowen: 'Light Scattering.'

Institute of Welding

Newcastle-on-Tyne: The Mining Institute, Neville Hall, 7 p.m. North Eastern Branch. E. C. Houghton: 'Welding in Heavy Machinery.'

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. Dr. E. Voce: 'Copper and Copper Alloy Developments.'

London: 4 Grosvenor Gardens, S.W.1, 7 p.m. Dr. B. A. Bilby: 'Dislocation in Crystals.'

Leeds Metallurgical Society

Leeds: The University, 7.15 p.m. A. E. McAulay: 'Lubrication in Cold-working Processes.'

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. Sir Harold Hartley: 'Sir Humphry Davy, P.R.S.'

Textile Institute

Belfast: The College of Technology, 7.30 p.m. Dr. R. L. Wormell (Courtaulds Ltd.): 'Fibrolane.'

FRIDAY 6 MARCH

The Chemical Society

Belfast: Queen's University, 7.45 p.m. Joint meeting with the Andrews Club, the RIC and the SCI. Dr. A. E. Werner: 'The Scientific Examination of Paintings.'

Society of Public Analysts

London: Burlington House, Piccadilly, W.1. 3.15 p.m., annual general meeting; 3.45 p.m., address of the retiring president. Hall of the Worshipful Society of Apothecaries of London, Blackfriars Lane, E.C.4, 7.30 p.m. Biennial dinner.

[continued at bottom of following page

Chemical & Allied Stocks & Shares

BUOYANT conditions have continued in stock markets, particularly in the industrial sections where there has been a general advance in share prices. British Funds displayed firmness and a feature was the buying of the shares of South African gold mines which are scheduled to install plants for the production of uranium. Markets generally have been helped by the assumption that the Budget is likely to bring lower taxation. It is realised, however, that this will depend in the main on whether the Government makes material reductions in expenditure in the next financial year. The City is now rather less hopeful income tax will be reduced, but is talking of the possibility of tax concessions on profits earned in export markets. Financial results coming to hand show much less uniformity in the trend of profits than in recent years when shortages, controls and inflation were the dominating factors.

Competition is now much keener both in home and export markets, and prices of commodities and materials fluctuate more on pre-war lines. In the circumstances, it is being argued in the City, that as profits are likely to vary still further from year to year, it is only fair to shareholders that they should have a higher dividend in a good year. The assumption is that the very conservative policy which has featured many company results since 1939 will be relaxed to some extent in future. This, of course, partly explains the upward trend in industrial shares this year.

Chemical and allied shares have made a mixed showing, because response to the upward trend in stock markets has not been general, though there have been a fair number of good features. Imperial Chemical at 47s. 7½d. have not held best levels, but have been active again on market hopes that, unless it is planned to make a fresh application to distribute a share bonus, the dividend may be somewhat higher than the 13 per cent paid last year. Monsanto 5s. shares were 23s. 6d., Fisons strengthened further to 33s. 6d., while Eaglescliffe 5s. shares were 17s. Laporte Chemical 5s. shares 9s. 9d., and Albright & Wilson 5s. shares were higher again at 17s. 10½d. in response to market hopes of an increased dividend.

Burt Boulton & Haywood were 27s., at which there is a yield of over 7⅛ per cent on the basis of last year's 10 per cent dividend. J. & J. White were 11s. 9d., Pest Control 4s. 7½d., Hickson & Welch easier at 8s. 9d., while Greeff Chemicals Holdings 5s. shares kept at 17s. In other directions, Brotherton 10s. shares were more active and higher at 22s. 6d., W. J. Bush were 41s. 3d., F. W. Berk 2s. 6d. shares 5s. 9d., Bowman Chemical 2s. 6d. and Amber Chemical 2s. shares were quoted at 1s. 6d. Elsewhere, L. B. Holliday 4½ per cent preference were 15s. 9d. Reichhold Chemical 5s. shares changed hands around 7s. 9d.

Plastics shares were firmer generally with British Xylonite 26s. 9d., Kleemann 1s. shares, 7s. 10½d., and British Industrial Plastics 2s. shares 4s. 6d. Elsewhere, Borax Consolidated were back to 35s. 6d. following publication of the results. The 4s. units of the Distillers Company strengthened to 17s. 4½d. Unilever were 47s., and United Molasses 6s. 8d. units 31s. 3d.

Associated Cement were 105s., and British Plaster Board 5s. units moved up to 15s. 1½d., in response to the big demand expected for gypsum. Boots Drug 5s. units were 20s 10½d., and Turner & Newall strong and active around 105s. 9d. Staveley were 74s. 9d., and Powell Duffryn 30s. Oils have been a little uncertain, though Anglo-Iranian strengthened to close on £6 following the latest moves for a settlement of the Persian Oil dispute. Shell were better at 81s. 3d.

NEXT WEEK'S EVENTS

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SATURDAY 7 MARCH

Society of Chemical Industry

London: Dorchester Hotel, Park Lane, W.1. 6.30 p.m., reception; 7 p.m., dinner; 8.15 p.m. (approximately), dancing until midnight. 21st birthday celebrations of the Food Group.

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. North Western Branch. K. Greenwood and Dr. M. Pearce (Associate Member): 'The Effect of Packing Size on the Absorption of Carbon Dioxide from Air with Caustic Soda Solutions.'

British Chemical Prices

LONDON.—Conditions in the industrial chemicals market have shown little change during the past week and the volume of new business continues reasonably good but limited to nearby requirements. The overseas demand is keeping up fairly well despite keen competition. Interest in textile chemicals continues to expand.

The price position is generally steady at recent levels, the exceptions being the lead compounds which follow the fluctuations in the price of metal, and prices for many of the soda products have been revised.

In the coal tar market there has been a good demand for pitch, and crude tar is in good request. The creosote oils and carbolic acid are fairly active items but interest in cresylic acid is on a small scale.

MANCHESTER.—Prices on the Manchester chemical market during the past week have shown a slightly easier tendency in one or two lines, though most products are well maintained and the general opinion is that the substantial increase in coal prices cannot but have a stiffening influence in many sections of the chemical market. The past few days have witnessed a fair number of new inquiries for the alkalies and other leading heavies for both home users and for shipment, and there is a reasonably steady flow of deliveries under contracts. Fertilisers are now moving in relatively good quantities and a fair amount of new business has been reported in the tar products.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 1 ton, £96 ; 80% pure, 10 tons, £102 ; commercial glacial 10 tons, £98 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £149 per ton.

Acetone.—Small lots : 5 gal. drums, £143 per ton ; 10 gal. drums, £125 per ton. In 40/50 gal. drums less than 1 ton, £105 per ton ; 1 to 9 tons, £104 per ton ; 10 to 49 tons, to £103 per ton ; 50 tons and over, £102 per ton.

Alcohol, Industrial Absolute.—300,000 gal. lots. d/d, 3s. 7½d. per proof gallon ; 100,000 and less than 200,000 gal. lots, d/d, 3s. 8½d. per proof gal.

Alcohol, Diacetone.—Small lots : 5 gal. drums, £162 per ton ; 10 gal. drums, £172 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.

Allyl Alcohol.—Less than 40 gals., 3s. 10½d. per lb. ; 40 gal., 3s. 6½d. per lb. ; 2 to 5 40 gal. drums, 3s. 4½d. per lb. ; 1 ton and over, 3s. 2½d. per lb.

Alum.—Ground, £24 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £12 per ton d/d. MANCHESTER : £14 to £15.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £47 per ton.

Ammonium Chloride. — Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £25 to £27 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER : £6 2s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £93 and £91 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots as to grade, etc., 2s. 3¼d. to 3s. 1½d. per lb. Crimson, 3s. 4¼d. to 4s. 5¼d. per lb.

Arsenic.—Per ton, £59 5s. nominal, ex store.

Barium Carbonate.—Precip., d/d ; 2-ton lots, £35 5s. per ton, bag packing.

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

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £38 per ton d/d ; 2-ton lots, £38 5s. per ton d/d.

Bleaching Powder.—£21 per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags; commercial, granular, £39 10s.; crystal, £42; powder, £43; extra fine powder, £44; B.P., granular, £48 10s.; crystal, £51; powder, £52; extra fine powder £53.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £68; crystal, £76; powder, £73 10s.; extra fine powder, £75 10s.; B.P., granular, £81; crystal, £88; powder, £85 10s.; extra fine powder, £87 10s.

Butyl Acetate BSS.—£181 per ton, in 20-ton lots.

Butyl Alcohol BSS.—£161 per ton in 10-ton lots.

***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.

Calcium Chloride.—70/72% solid £12 10s. per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chromic Acid.—2s. 0½d. to 2s. 0¾d. per lb., less 2½%, d/d U.K.

Citric Acid.—1 cwt. lots, 201s. cwt.; 5 cwt. lots, 196s. cwt.

Cobalt Oxide.— Black, delivered, 13s. per lb.

Copper Carbonate.—MANCHESTER: 2s. 7d. per lb.

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

Cream of Tartar.—100%, per cwt., about £11 2s. d/d.

Ethyl Acetate,—20 tons and upwards, d/d, £151 per ton.

Formaldehyde.—£35 10s. per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £82 5s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G. £14 19s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, 12s. to 16s. 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., 21s. 3d per cwt. in 28 lb. lots.

Iodoform.—25s. 4d. per cwt. in 28 lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton; dark tech., 44 per cent by weight £67 per ton ex works one ton lots; dark chemical quality 44 per cent by weight £102 per ton, ex works; Usual container terms.

Lead Acetate.—White: £137 10s. per ton.

Lead Nitrate.—£105 per ton.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £125 5s.; orange lead, £137 5s. Ground in oil: red, £151 15s.; orange, £163 15s.

Lead, White.—Basis prices: Dry English, in 5-cwt. casks, £141 5s. per ton. Ground in oil: English, under 2 tons, £162.

Lime Acetate.—Brown, ton lots, d/d, £30 to £34 per ton; grey, 80-82%, ton lots, d/d, £34 to £39 per ton.

Litharge.—125s. 5d. per cwt. in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, £22 to £24.

Magnesium Carbonate.—Light, commercial, d/d, £87 15s.; cwt. lots £97 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £240; cwt. lots £250 per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—19s. 3d. per lb. in 28 lb. lots; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 6s. 4½d. per gal.; pyridinised 64° O.P. 100 gal., 6s. 6d. per gal.

Methyl Ethyl Ketone.—5 gal. drums, £183 per ton ; in 40-45 gal. drums, less than 1 ton, £153 per ton ; 50 to 100 tons, £150 per ton ; 100 tons and over, £149 per ton.

Methyl *iso*Butyl Ketone.—5 gal. drums, £203 per ton in 40-45 gal. drums, less than 1 ton, £173 per ton ; 1 to 10 tons, £172 per ton ; 10 to 50 tons, £171 per ton ; 50 to 100 tons, £170 per ton ; 100 tons and over, £169 per ton.

Nickel Sulphate.—D/d. buyers U.K. £140 10s. per ton.

Nitric Acid.—£35 to £40 per ton, ex works.

Oxalic Acid.—Home manufacture, £170 per ton ; foreign manufacture £137 10s. per ton.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £87 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £98 10s. per ton for 1-ton lots ; Liquid, £37 15s.

Potassium Bichromate.—Crystals and granular, 10⅝d. per lb. ; ground, 11⅝d. per lb., standard quantities.

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

Potassium Chloride.—Industrial, 96%, 6-ton lots, £20 to £22 per ton.

Potassium Iodide.—B.P., 18s. 7d. per lb. in 28 lb. lots ; 18s. 1d. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 9½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 8½d. per lb. ; technical, £8 11s. 6d. per cwt. ; for 5 cwt. lots.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £156 per ton ; 10 gal. drums, £146 per ton ; in 40-45 gal. drums : less than 1 ton, £126 per ton ; 1 to 9 tons, £125 per ton ; 10 to 50 tons, £124 per ton ; 50 to 100 tons, £123 per ton ; 100 tons and over, £122 per ton.

Salammoniac.—Dog-tooth crystals, £72 10s. per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £9 10s. to £14 10s. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £25 to £27 per ton d/d. (4 ton lots).

Sodium Acetate.—£85 to £91 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £13 10s. to £15 10s. per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 9¾d. per lb. ; anhydrous, 11¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

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

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£87 to £95 per ton.

Sodium Cyanide.—100% basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £28 a ton ; commercial, 1-ton lots, £26 per ton carriage paid.

Sodium Iodide.—B.P., 20s. 1d. per lb. in 28 lb lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £123 ton.

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

Sodium Nitrate.—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £29 15s. per ton.

Sodium Nitrite.—£31 for 1 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, £78 10s. ; tri-sodium, crystalline, £39 10s., anhydrous, £75 10s.

Sodium Prussiate.—10d. to 10½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

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

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £7 per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £30 15s. per ton, d/d, in drums ; broken, £32 5s. 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, £22 16s. 6d. to £25 6s. according to fineness.

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

Titanium Oxide.—Standard grade comm., with rutile structure £143 per ton ; standard grade comm., £130 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d ; white seal, £112 10s. ; green seal, £111 10s. ; red seal, £110.

Rubber Chemicals

Antimony Sulphide.—Golden, 2s. 3¼d. to 3s. 1½d. per lb. Crimson, 3s. 4¼d. to 4s. 5¼d. per lb.

Carbon Bisulphide.—£65 5s. per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£74 10s. per ton.

India-rubber Substitutes.—White, 1s. 6¾d. to 1s. 10¼d. per lb. ; dark, 1s. 4½d. to 1s. 8½d. per lb.

Lithopone.—30%, £50 per ton.

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

Mineral Rubber, 'Rupron.'—£20 per ton.

Sulphur Chloride.—British, £55 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 farmer's nearest station, £16 18s.

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

'Nitro-Chalk.'—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots d/d nearest station, £28 15s. per ton.

Coal-Tar Products

Benzole.—Per gal, ex works : 90's, 3s. 8½d. ; pure, 3s. 11½d. ; nitration grade, 4s. 2½d.

Carbolic Acid.—Crystals, 1s. 6d. to 1s. 8d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 6d. to 1s. 8d. 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%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 10½d. per gal. for 1000-gal. lots ; heavy, 90/190°, 4s. 3½d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots.

Naphthalene.—Crude, ton lots, in sellers' bags, £18 16s. 3d. to £34 per ton according to m.p. ; hot-pressed, £50 to £60 per ton, in bulk ex works ; purified crystals, £68 10s. to £79 3s. 4d. per ton.

Pitch.—Medium, soft, home trade, 130s. per ton f.o.r. suppliers' works ; export trade, 200s. per ton f.o.b. suppliers' port. MANCHESTER : £8 f.o.r.

Pyridine.—90/160°, 42s. 6d. per gal. MANCHESTER : 42s. 6d. to 45s. per gal.

Toluol.—Nitration grade, 5s. 3d. per gal. MANCHESTER : Pure, 4s. 7½d. per gal. naked.

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

Intermediate 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.—2s. 8½d. 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., 2s. per lb.

***p*-Nitraniline.**—4s. 5½d. per lb.

Nitrobenzene.—Spot, 9¼d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 7d. per lb., in 8/10-cwt. drums, drums extra.

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

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

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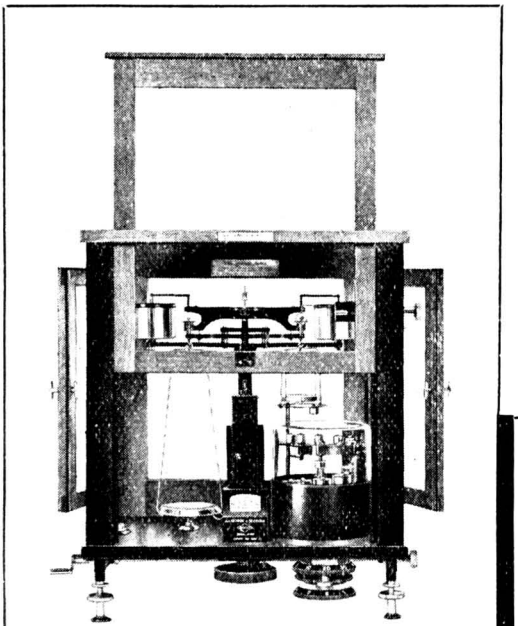

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Apply in writing to the **DIRECTOR OF RECRUITMENT, COLONIAL OFFICE, GREAT SMITH STREET, LONDON, S.W.1,** giving briefly age, qualifications and experience. Mention the reference number shown (27106/57/52).

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1953. Interviews will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1953, may eventually be announced. The Scientific posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of Fundamental and Applied Science; in Biology the number of vacancies is small. The Patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

Candidates must have obtained a University degree with first or second-class honours in an appropriate scientific subject (including Engineering) or in Mathematics, or an equivalent qualification; or for Scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer and Patent posts taking their degrees in 1953 may be admitted to compete before the result of their degree examination is known.

Age Limits: Senior Scientific Officers, between 26 and 31; for Scientific Officers and Patent Classes, between 21 and 28 during 1953 (up to 31 for permanent members of the Experimental Officer class competing as Scientific Officers). London Salary Scales: Senior Scientific Officers (men), £812-£1,022; (women), £681-£917. Scientific Officers (men), £440-£707; (women), £440-£576. Patent Examiner and Patent Officer Classes (men), £440-£655; (women), £440-£576. Somewhat lower rates in the provinces.

Further particulars from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S.53/53 for Senior Scientific Officers and S.52/53, S.128/53 for the other posts.

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CHEMIST (B.Sc.) required for work on **RUBBER LATEX** in **MANCHESTER** area. Previous Latex experience desirable but not essential. Reply, stating age, experience and salary required, to **BOX No. C.A. 3203, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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72-IN., 60-in. and 48-in., by **BROADBENT,** underdriven, direct coupled, 3-point suspension, stee galvanised baskets.

48-in., by **BROADBENT,** lead-lined monitor, ebonite covered basket, 3-point suspension.

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48-in. and 42-in., by **WATSON LAIDLAW,** underdriven through Vee ropes from flange-mounted vertical spindle motor ; 3-point suspension, copper tinned baskets.

ALL suitable for 400/3/50 supply and complete with starters.

Smaller sizes, belt- and electric-driven, in stock.

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100g., 150g. and 200g. new Jacketed Pans, all welded, mounted on three legs ; with or without mixing gear.

MIXERS

MORWARD " U "-shaped **TROUGH MIXERS** in various sizes up to 3 tons capacity with scroll- or paddle-type mixing gear ; jacketed or unjacketed.

One New 100g. Glass-lined **JACKETED EVAPORATING PAN** by **PFAUDLER,** 70 lb. p.s.i. w.p. in jacket.

One Glass-lined Totally Enclosed **RECEIVER** in cast iron, 50g. capacity, with two sight glasses in top.

One 300g. **COPPER JACKETED BOILING PAN,** with stainless steel agitator, direct coupled to electric motor.

One 500g. **JACKETED AUTOCLAVE,** arranged with detachable cover, 150 lb. p.s.i. in jacket, 100 lb. internally.

WE SPECIALISE IN THE CONSTRUCTION OF ALL TYPES OF MIXING VESSELS MADE TO REQUIREMENTS.

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Various **MONO** and other **PUMPS** in stock, 2 in. to 6 in., new and second-hand, in stainless steel, gunmetal and cast iron.

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LIMITED number of new **' STIRRER GATE '** agitators fitted with vertical moss 5 h.p., 1,000 to 20, worm reduction gears, 3½ in. diam., stainless steel drive shafts with S.S. paddle gates attached ; also several new 10 h.p. Wallwork reduction gears, 9 in. centres ratio 210 by 18, vertical output shaft, can be supplied mounted on 6 ft. 6 in. by 1 ft. 10 in. C.I. bed plate if required.

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30 ft. by 9 ft. **CYLINDRICAL ENCLOSED,** 12,000 gallons. Ditto, 6,750, 6,000, 5,000, 4,000, 3,000, 2,000 and 1,000. Many smaller.

RECTANGULAR, Open and Enclosed **TANKS** up to 10,000 gallons.

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VEHICLE TANKS, 3,360, 2,500, 1,500, 1,250 and 600 gallons.

Ten Welded Dish-ended **CYLINDRICAL ENCLOSED TANKS,** 7 ft. 9 in. by 6 ft. diam. 1,250 gallons each. Fitted manhole and cover, etc.

MIXERS, BOILERS, CONDENSERS, HYDROS, STILLS, REFINERS, ETC.

Lists of Chemical Plant sent on request.
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3 JACKETED **INCORPORATORS,** double "Z " arms, double geared, power-driven tipping motion, with counterbalancing weights.

1—Baker Perkins **MIXER** as above, not steam jacketed, single geared, complete with 25 h.p. A.C. motor.

3—Baker Perkins and Werner Jacketed **MIXERS** screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

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

27—Various **POWDER DRESSING** or **SIFTING MACHINES,** totally enclosed with barrels from 80 in. long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven with collecting worm in hopper bottoms.

1—Simon Horizontal Tubular **DRIER,** 12 ft. long, 100 lb. steam pressure, size 3B, requiring 12 b.h.p.

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

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

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

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1—Johnson **FILTER PRESS,** 42 C.I. plates, 32 in. square, centre feed.

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

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1—24 in. **HYDRO EXTRACTOR,** self balancing, swan-neck type, self emptying bottom.

Heavy Cake CRUSHING MILL, 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam., bottom with finer teeth 12 in. diam.

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Bennett Copper-built EVAPORATOR, 4 ft. diam. by 4 ft. 6 in. high, steam-jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt-driven vacuum pump.

Douglas ROTARY PUMP for oil, soap, etc., belt driven.

6 Various Horizontal Duplex **STEAM PUMPS,** Worthington and Tangye pattern, 1 in. to 2½ in. suction and delivery.

" U "-shaped Horizontal **MIXER,** 8 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for lineoleum paste.

1—" U "-shaped **MIXER,** as above, but 7 ft. long.

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2—**TUBE MILLS,** each 20 ft. by 3 ft. 6 in. diam., mechanical worm feed and enclosed steel discharge box. Pulley drive.

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Horizontal single trough **JACKETED MIXER** by Day. Trough 7 ft. by 38 in. by 42 in. deep. Intermittent spiral Agitators on 3¼ in. diam. glanded shaft. Driven through 'V' ropes and duplex chain by 7½ h.p. Slipring motor 400/3/50.

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2 Recessed Plate type **FILTER PRESSES** by Manlove Alliott, with 54 plates 36 in. sq. by 1 in. thick. Hand op. closing gear.

Two 40 galls. **KELLIE** copper S.J. tilting **BOILING PANS,** 30 in. diam. by 26 in. deep. C.I. jacket for pressure 80 lb. sq. in. Hand tilting.

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New ½ h.p. Slow Speed Stirrers 440/3/50, totally enclosed motor, stainless steel shaft with propellers rotating at 420 r.p.m.

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1,000 gallon
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500 gallon

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250 gallon—galvanised.

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400 gallon—galvanised.
250 gallon—**NEW TVO** storage.

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Cast-iron Copper-lined **STEAM PAN,** 25 gal., on three legs.

Vertical Crosstube **STEAM BOILER,** 9 ft. by 4 ft., 80 lb. pressure.

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STORAGE
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1—**HOWARD OHL/SE** Single ended Proportiometer **PUMP.** Output 40 g.p.h. against 25 ft. head. Body "Ni-Resist." Valves, seats and plungers—Stainless Steel. Complete with ¾ h.p. Brook Flameproof 1,450 r.p.m. motor. Mounted on Baseplate.

1—**HOWARD OHL/SE** as above but output 40 **GPH.** Hydrocarbon Liquids at 100 p.s.i. and without motor. Apply **BOX No. 3199, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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30 CWT. CHAIN BLOCKS, 10 ft.-12 ft. lift, ex-Government surplus. £15 per set.

5 CAST-IRON JACKETED PANS, 36 in. diam. by 27 in. deep, 1½ in. bottom outlet. £20 each.

1 MILD STEEL WELDED OPEN-TOP TANK, 60 in. by 27 in. by 42 in. by ⅜ in. plate. £25.

THOMPSON & SON (MILLWALL), LTD.,
CUBA STREET, MILLWALL, E.14.
TEL. EAST 1844.

100-TON capacity Vertical, Totally Enclosed, Riveted Steel **STORAGE TANKS**—20 ft. diam. by 12 ft. high, 23,500 gallons each, ⅜ in. thick sides and bottom, ¼ in. thick bolted-on top cover; fitted with stirring gear, overdriven through 3.5 h.p. flameproof motor, with reduction gear and starter; 150 r.p.m., complete with manhole, catwalks, ladders, etc. New 1942. Box No. **C.A. 3197, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

WANTED

350 CU. FT. 3-in. EARTHENWARE TOWER PACKINGS, new or second-hand. BOX NO. C.A. 3202, THE CHEMICAL AGE, 154, FLEET STREET, LONDON. E.C.4.

URGENTLY wanted—USED MERCURY (QUICKSILVER) in any quantity; containers supplied. Also MERCURY SCRAP COMPOUNDS, NON-FERROUS AND PRECIOUS METAL SCRAP, and waste materials containing same. Highest prices paid. BELGRAVE BUYERS (C.A.) 5, BELGRAVE GARDENS, LONDON, N.W.8. MAI. 7513.

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WET AND DRY GRINDING Micronising, Grading and Mixing of Minerals and Chemicals for all trades. Also suppliers of ground zircon, sillimanite, fused silica, precision casting materials and a wide range of ground minerals.
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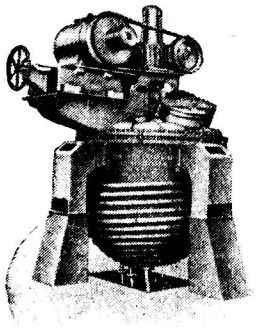

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