The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LIV
No. 1386

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The Chemical Age

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The Organisation of Research

ONCE upon a time there were great arguments upon the relative values of individual and group research. On the one hand it was argued that Germany only obtained her undoubtedly good results through the application of mass production: a large team was selected, each man was given a small part of the programme, and the results were fitted into the pattern by the Director. On the other hand it was argued that in this country we were pre-eminent in the field of discovery and that was entirely due to individualistic research; a man would work upon his pet subject, and through close application or innate genius he would be more successful than a team of mass observers. So far as we know, no supporter of one side of the controversy was ever convinced by an exponent of the other side; and in due course the argument ceased, research associations came into being, and the various methods of conducting research sorted themselves out. Now, with all the public anxiety that more, and still more, research should be undertaken, we are beginning once again to inquire what is the best method—if, indeed, there is a "best" method—of conducting research.

A contribution to this debate, to which insufficient attention has been paid, was the address given last year by the Melchett Medallist, Dr. J. G. King, to the Institute of Fuel on "The Pattern of Fuel Research." The problem of making advances has become more difficult as time went on. We have often felt that, much as we should honour the pioneers of science who proved that preconceived ideas were wrong a couple of centuries ago, their task was, in fact, much easier, once they had opened their minds to believing that accepted theories might not be correct, than is the task of those who today wrest secrets from nature. This is what Dr. King had to say about it, referring only to fuel problems: "In the early days, the field of research was so vast and so untilled that those parts of it which promised to be most fruitful were cultivated first by the simplest and most direct methods. This phase has largely passed, and although one must not belittle the value of empirical work in solving urgent problems, it must be realised that a time has come when there can be arrayed against the problems all the forces of modern science, deployed in an organised pattern so as to approach the objective from all the directions possible. The experience of the last 25 years has taught us the necessity of having such a

On Other Pages

pattern when dealing with those groups of problems which are generally termed a research programme."

It could be inferred from this that when the problems are comparatively simple Dr. King would advocate individual attack, but as they become more complex the attack should be by mass methods. He says, indeed, " In postulating the existence of a pattern, I am referring to organised research, where plans of some sort must be made in advance. The pattern can in no sense be rigid, but should be subject to frequent review in order to eliminate unnecessary or unprofitable work, and to reassemble the research forces for direction against new objectives, equipped with new methods." But he adds: " There should be room in the pattern for the work of the individualist, of whom this country has produced many, whose abilities will develop to the full only if he is allowed to work in his own way. His position will never be anomalous, however, since his discoveries may well, at a suitable stage, become team work, and thus take their place as part of the organised pattern. Finally, the existence of a pattern does not mean that all the work done shall be done in one place or by one organisation. On the contrary, if the pattern is there, it must serve as one means of promoting that true collaboration in research which alone will avoid the wastage of effort caused by undue overlapping."

What all this comes to is that a scheme of research should be planned in advance before it is started; the plan should be liable to revision as results suggest; and if there is in the team a gifted individualist who would plainly be better left to his own devices, leave him " wandering companionless among stars that have a different birth," till he comes home bringing with him some discovery which no mass research could have produced.

We rejoice that Dr. King should have found a place for the individualist, because mass research has one essential weakness: it throws far too much on the Director. Some men there are who dream of discoveries which straightway they put on paper when they awake. Some there are who get " brain-waves " when they are awake. But if these apparent gifts of kindly Fate were to be analysed—though Heaven forbid we should look a gift horse in the mouth—it would be found that the person so smiled upon by fortune had, in fact, been thinking deeply about the subject and, by the curious and unfathomed workings of the subconscious mind, the solution of the problem had at length come. These solutions do not arise spontaneously within the vacant mind, nor can they, in general, come to a mind that knows only a part of the problem and has, therefore, not entered the deeper pools of thought. Mass research in practice leaves the deep consideration of the problem to the Director who alone knows all the ramifications of the subject; to this extent it is undesirable, and this is probably why the individualist is often to be preferred. Yet there remain, of course, many problems which can be solved much more quickly by mass production of the required observations.

Summing up the whole controversy between mass and individual research, here are what may be taken as Dr. King's own conclusions: " The influence of inspiration and organised research upon one another is well illustrated by two examples from the work of Ludwig Mond, the father of the first Lord Melchett. His discovery of nickel carbonyl in 1897 took ten years of development to reach the stage of production, while ' for seven arduous years he struggled with problems before he was able to claim that the ammonia-soda process was a success.' The fundamental discovery was there in both cases. Had the wider pattern of organised research now available been conceived then, it is possible that he would have reached his objective more quickly."

Only a few days ago a further valuable contribution to the eternally fascinating subject of research and its true meaning was made by Dr. C. J. T. Cronshaw, and a summary of his suggestive and stimulating address, delivered to the North-Western Branch of the Institution of Chemical Engineers, appears later on in the pages of this issue. The application of his views to the problem of organisation would appear to throw an even heavier burden on the shoulders of the Director, if teamwork is in view. It is difficult enough for an individual to maintain the high ideals essential for a true research worker; it requires a touch of genius for a leader to infuse the true spirit of inquiry into a whole team. This can be done, however, as is testified by some of our own British research work during the war.

NOTES AND COMMENTS

Manchester Meeting

AFTER an initial year's work which might not unfairly be described as unprecedently successful, the North-Western Branch of the Institution of Chemical Engineers held its first annual meeting in Manchester on Friday last week. Some token of the importance with which the fortunes of the Branch are regarded in Lancashire (and surrounding districts) may be gathered from the fact that the day's proceedings included a civic welcome in the Town Hall, at which the Lord Mayor of Manchester, Councillor Hugh Lee, presided in person. Consistently with Lancashire hospitality, the civic welcome incorporated an excellent tea. Coming as a visitor from the South, our representative was impressed by the good fortune that the Branch enjoys by being centred in Manchester. The impersonal touch, so regularly in evidence in London, was completely absent; and though the area actually served by the Branch contains probably some two million or more souls, there was an air of intimacy about the whole proceedings which was most refreshing and encouraging. Manchester does not look kindly on the second-rate or inefficient, and this official welcome provides proof (if proof were needed) that the North-Western Branch is doing its job.

An Active Committee

CONGRATULATIONS are due to the efforts of the sectional committee in attaining such undoubted success. With a chairman who embodies a nice mixture of humour and urbanity with his professional learning, and a secretary who was justly described at the meeting as "cheerful and persistent," as well as a committee who obviously pull together well and carry out their several tasks with efficiency and no fuss, the Branch is set on a profitable course. The standard of papers at the first year's meetings has been uniformly high, and the attendances have been consistently good, even though many of the members have considerable distances to travel; and we understand that plans are afoot for meetings to be held in other centres of the sectional area, which covers Cheshire and much of the West Riding of Yorkshire, as well as Lancashire. Dr. Cronshaw's address delivered at this annual meeting was excellently chosen; all were agreed that he followed the right course in selecting a subject of general application rather than a particular problem of chemical engineering. His title "Chemical Engineering Research" was broad, and allowed him to consider the whole philosophy of the chemical engineer; and though many of his statements were challenging, such criticism as he met with in the discussion that followed was entirely constructive. Some description of the meeting, together with a summary of Dr. Cronshaw's paper, is included later on in this issue.

Lip-Service to Science

IN one way and another, Government spokesmen have been carpet-bagging the country, giving the impression that nothing was dearer to their hearts than the encouragement of scientific research, as being one of the mainsprings of the drive towards greater export trade. Even Mr. Ellis Smith, who has given proof that he does not see eye to eye with official policy, stated at the Chemical Engineers' dinner at Manchester last Friday that the Government was giving serious attention to the shortage of scientific man-power. When, however, we read a letter like that which three professors of Imperial College addressed to *The Times* on Monday—they include Professor Briscoe (Inorganic Chemistry) and Professor Finch (Applied Physical Chemistry)—we begin to suspect the presence of our old enemy, Claptrap, who is never very far away when political pronouncements are in the air.

A Distressed Graduate

AT present, the professors say (and who shall know better than they) "students of high ability and exceptional promise are being turned away . . . because of restrictive regulations imposed by the Ministry of Labour regarding the number of entrants to university science courses." In one case which they cite, a first-class graduate was refused permission (a) to accept an appointment at Imperial College; (b) to carry on his research at the College; (c) to take up any post whatsoever except through the Ministry, which, in fact, did not find

him a post; (d) to accept a research grant offered him by the D.S.I.R. This has gone on since last June, and to keep himself alive the said graduate has surreptitiously taken up the job of an electrician's mate. Perhaps this last is what the Government means by "the application of science to industry." It is not our idea of the way in which to increase to a refreshing stream the present trickle of scientists into industry. A witty exaggeration, made at the meeting of the N.W. Branch of the Institution of Chemical Engineers, put it that every large village in the United States had its Chair of Chemical Engineering. We neither ask nor desire such a state of affairs here, but we should feel more comfortable about our future if Government words about scientific research were to bear some recognisable relationship to Government deeds.

Helping Things Along

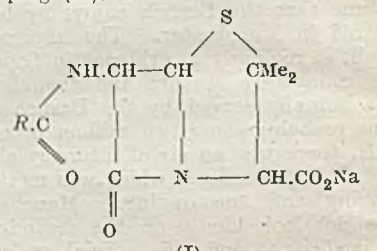
BOUQUETS are never unpleasant things to have thrown at one, and they are, perhaps, at their pleasantest in the rather drab week that follows Twelfth Night. We are especially pleased, therefore, that two of our readers should have had occasion to let us know that our efforts to help things along generally have not passed quite unnoticed. One of them, referring to a recent book, the manner of which was not up to the standard of its matter, has expressed his appreciation of the way in which we have been able to interpret to the public the facts of chemistry and the findings of chemists. We feel no pang of jealousy that in this respect he couples our name with that of other journals; it is in the highest interests of chemistry in all its aspects that technical journalism *as a whole* should be clear and comprehensible. The other reader, who is also a contributor, gives us the interesting information that he was offered what he describes as "a nice little job" because the other party to the contract had read and appreciated some of his articles in THE CHEMICAL AGE. This, says our reader, "proves that articles published in the technical journals are read by observant members of the profession, and that ideas formulated in those articles may eventually help towards the establishment of new industries and developments in this country." At this particular juncture in the industrial history of Britain such developments are urgently needed, and we are indeed glad to think that we may have been of some assistance thereunto.

Structure of Penicillin

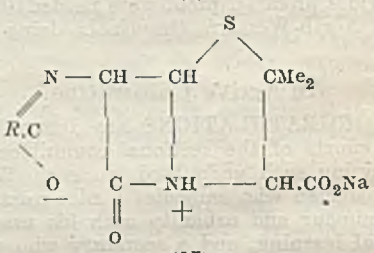
Alternative Formulæ Published

A SUMMARY of the results obtained by British and American chemists working on penicillin is contained in a recent issue of *Nature* (1945, *156*, 766). It implies some correction of published data, it discloses significant facts which have been confirmed, and it records a few essential points which are still a matter for conjecture. It does *not* claim that penicillin has been synthesised.

The structural formulæ which are now receiving the most active attention, it is stated, contain respectively a β-lactam structure (I), and an incipient azlactone grouping (II).



(I)



(II)

At least four antibiotics of the penicillin class are known. In penicillin-I, R is Δ^2-pentyl, $-CH_2CH=CH.CH_2.CH_3$; in dihydropenicillin-I, R is n-amyl; in penicillin-II, R is benzyl; in penicillin-III (X-penicillin), R is p-hydroxybenzyl; in K-penicillin, R is n-heptyl. In the U.S.A. penicillin-I and -II are known respectively as F- and G-penicillin.

The Government of India has recognised the National Institute of Sciences as the premier scientific body in India and steps are being taken with the appropriate British authorities to give it a Royal Charter.

Chemical Plant in Germany

Corrosion Problems in the Oils and Fats Industry

From a Correspondent

THE recent issue of information about German chemical and allied industries shows a few gaps, as is inevitable; and among these is the almost complete absence of any reference to oils, fats, and products thereof. In both world wars this particular branch of chemical industry caused the Germans a lot of anxiety and exercised their ingenuity in the matter of substitutes to the utmost. The "ersatz" problem was acute. And yet, despite the supreme importance of oils and fats in the national economy it is quite possible that the lack of any information of interest in the reports above mentioned may be easily explained on the supposition that there is nothing much to report. The publication in Germany a year or two ago of an up-to-date book on the production of oils and fats by Dr. R. Lüde, of Mannheim (Vol. 47 of a series of progress reports), while of general interest, does not reveal any marked technical progress in that field. Probably one of the most interesting and informative chapters, now that corrosion problems are being better appreciated as their importance merits, is that dealing with the weighty problems of plant construction and maintenance in oils and fats manufacture, with special reference to resistance to wear and corrosion.

Free Fatty Acids

Although oleaginous products from perfectly sound and ripe fruit or nuts should be completely neutral, consisting of glycerides or mixed glycerides of fatty acids—mostly oleic, stearic, and palmitic, also caproic and capronic in coconut oil—yet these glycerides may be split, with formation of free fatty acid, through various causes including the action of enzymes or ferments in the oilseeds and nuts, especially if these are mechanically damaged, and under favouring conditions as to warmth and moisture. The free acids will react with the metal of the plant or container, forming metallic soaps, particularly of iron, which have a discolouring effect on the product. In working up, for example, coconut-oil cake residues, there is a high content of iron in the residual oil obtained. There is also risk of atmospheric oxidation. The extracted oil might thus have a f.f.a. content of 30 per cent. as compared with the normal 6 per cent.; and with linseed cake, after prolonged storage, the free fatty acid may be up to 50 per cent. Unprotected iron is therefore obviously unsuitable as a plant-construction material.

Dr. Lüde describes special kinds of steel which have been developed; pure aluminium also has a high resistance to the action of f.f.a. He deals also with the different kinds of corrosion, such as chemical, electrochemical, and a combination of the two. The various forms of protection are grouped under three heads: (a) special steels, cast irons, and alloys thereof; (b) removal of active or attacking agent from the material treated; and (c) coatings.

Special Steels

Ordinary iron is not, of course, rustproof, but together with wood and stoneware it is the most commonly used material. In Germany the chromium-nickel steels have been largely studied and developed. The most used in that country are the austenitic types known as Remanit 1880, 1880 S, and 1880 SS, for which highly resistant qualities are claimed, especially for use in the food-processing industries. The 1880 SS variety is said to be specially suitable for fatty acid distillation, esterification, etc., but any free mineral acid remaining after fat-splitting must be carefully removed. Several other types of Remanit have been used in the German oils and fats industry, including R.1710 and R.1740. In modern fat-splitting methods, using high pressures and temperatures, demands on materials of construction are heavy, and the new "noble" steels in Germany have been developed to meet these requirements.

Among the copper-nickel alloys, those with about 70 per cent. nickel and 30 per cent. copper, such as Monel, are highly valued, when obtainable. They are, for example, strongly resistant to concentrated soda lye, but according to Lüde are less satisfactory with water-clear stand oils and with certain esters Silumin, containing 87 per cent. aluminium and 13 per cent. silicon, is also a valuable material, as also is Thermosilid. Both of these are well known in this country.

In regard to (b), removal of the aggressive agent, this is not always possible or convenient, but careful attention, *e.g.*, to immediate treatment after pressing or extraction for removal of impurities, gelatinous matter, etc., by centrifuging, filtration, and other methods, is obviously of value in this connection.

The third category, that of surface treatment of the metal with a view to suitable coating, is the most important and most commonly used, especially in a country where metals and alloys of the desired kind

are scarce and badly needed in other directions.

The ideal coating must have strong adhesion; must remain neutral both chemically and electrochemically, *i.e.*, must not form a metallic couple with the basic metal; must be compact or dense, *i.e.*, free from pores and discontinuities; and must resist mechanical abrasion and shock. Pre-treatment of the surface, especially pickling and cleaning, is of supreme importance, and includes sand-blasting which is often to be preferred. One of the commonest forms of coating hitherto has been that of electroplating. This may provide one homogeneous coating, or may be heterogeneous with more than one coating with different metals. Metallic coatings are also formed by hot-dipping in baths, as in tin-plating and galvanising (zinc coating); or by metal spraying. Surface treatment may take the form of heating to a fairly high temperature in a special atmosphere, with or without any other form of treatment. Enamelling preceded by phosphating or other operation has been largely used in Germany, especially in the food-canning industry.

Among ordinary paints and lacquers reference should be made to the special claims of a resistant preparation developed by the Keramchemie Berggarten, under the name of Ka-Be varnish, applied usually in three coatings: first a prime coat of Keratex which is colourless; then two coatings with Ka-Be, the second of which is colourless and unpigmented. Another such preparation developed in Germany in recent years is Inertol.

Improvements in Phosphating

For the better anchoring of metallic coatings on aluminium the surface is first roughened by the Eloxal or M.B.V. process (modified Bauer-Vogel), the latter using a solution of anhydrous soda and sodium chromate, or phosphated by the Bonder method as developed by the Metallgesellschaft in Germany, followed by 15 minutes' baking at 180°C. and still longer at 90°C. The phosphating and subsequent heating may be repeated, the heating temperature being still higher, at 230°C.

The Bonder method of phosphating, one of the best known in Germany for many years, has in recent years been further improved and developed by the research staff of the Metallgesellschaft, notably Roessner and his collaborators (Krause *et al.*), whose work has been described in numerous articles in *Korrosion und Metallschütz* (1941-1944) as also that of another well-known worker in the same field, W. Machu, of Vienna. The great I.G. devoted considerable attention to phosphating in recent years, and its Atrament process was widely used. Other proprietary processes in Germany include the Schnell-Bonder (accelerated Bonder), Granodin, Phosfix, Ferrophat, and others.

The development of phosphating in various forms in recent years has, in fact, been one of the outstanding achievements in the fight against corrosion, not only in Germany but also in this country and in the U.S.A., and forms the subject of numerous recent patents, of which a review may be given in a subsequent article. It is, of course, well known that phosphating alone, however finely crystalline and compact, is not in itself sufficient for more than a temporary protection against corrosion; but it is an excellent preliminary treatment for subsequent painting or varnishing, if the right materials are used under the right conditions.

Non-Metallic Materials

Among non-metallic materials used in the oils and fats industry in Germany, besides wood, glass, and stoneware, reference may be made to the increasing application of acid-resisting cements, such as Asplit A and F, made up of a special cement and an artificial resin of the phenol-formaldehyde type. Among the synthetic rubbers, also widely used, must be named the well-known Buna, of which there are now five kinds: Buna-85, Buna-S, Buna-SS, Perbunan, and Perbunan Extra. Dr. Lüde gives a useful table showing the percentage swelling of these rubbers compared with natural rubber, under the action of various solvents, oils, and fats, as indicated by the following notation: 0–5% swelling = 0, 5–10% = 1, 10–20% = 2, 20–56% = 3, 50–100% = 4, and over 100% = 5.

Natural rubber in practically all cases reached the No. 5 category, while the Perbunans never got beyond 3, and were often in the 0 and 1 grades of swelling. The synthetics are not, however, invariably the best, *e.g.*, in the benzol, toluol and carbon disulphide group.

Filter-press cloths in Germany are now commonly made of a synthetic textile, known as Pe-Ce cloth, based on polyvinyl chloride. Among its claims is that of complete resistance to hydrochloric acid in any concentration, and to nitric acid up to 50 per cent. concentration. But though apparently so highly efficient with HCl it is not particularly resistant to free chlorine and certain chlorine compounds.

Towards the end of the war the Dechema concern had organised a comprehensive co-operative scheme for the study of materials for chemical plant, especially for exchange of experience and knowledge in this field, in close collaboration with the Reichstelle für Metalle.

Italy plans to export 20,000 tons of sulphur in the first half of 1946.

Institution of Chemical Engineers

North-Western Branch Annual Meeting

MANCHESTER was the scene of the first annual general meeting of the North-Western Branch of the Institution of Chemical Engineers, which was inaugurated in the College of Technology there on October 7, 1944. The annual report which was circulated to members gives some indication of the success of the first year's work of this vigorous section of the Institution. Under the chairmanship of Mr. J. McKillop, with Mr. A. Rees Jones as honorary secretary and with the help of an energetic committee, the Branch has completed a most fruitful and profitable year.

The Branch started off with a membership of 300 (53 Members, 130 Associate Members, 117 Graduates and Students), and on December 31 last this figure had risen to 338 (55 Members, 159 Associate Members, 124 Graduates and Students). That few of these members are "deadheads" may be gleaned from the fact that the average attendance at meetings was over 80 when the report was printed and has now risen to over 100. This, incidentally, speaks well for the quality of the papers provided, and a glance at the list of these—together with the reports on them which have appeared from time to time in THE CHEMICAL AGE—reveals that both in authorship and subject-matter they have been of a uniformly high standard, the president himself, Mr. Hugh Griffiths, having been secured as the speaker on one occasion. On another date a joint meeting was held in Liverpool, with the Liverpool Section of the Society of Chemical Industry, and plans are afoot to hold joint meetings in the future in other large centres within the Branch's area. A happy feature of the Branch's activities has been the close and cordial relationship maintained with the Council of the Institution; many members of Council have come from London to support the Manchester meetings, and a goodly contingent attended the annual meeting, including the president, one of the hon. secretaries, and the hon. recorder.

A Civic Welcome

At the actual meeting, which was held in the conference room in the Town Hall, the proceedings were opened by an official welcome from the Lord Mayor of Manchester, Councillor Hugh Lee, who gave the section his civic blessing before vacating the chair on behalf of the Branch chairman, Mr. J. McKillop. Official business followed, beginning with the passing of the minutes of the last meeting (an extraordinary general meeting), and of the report and balance sheet for 1945.

Honorary officers and members of committee were declared elected as follows: *Chairman*, Mr. J. McKillop (re-elected); *Vice-chairman*, Col. E. Briggs; *Hon. Secretary*, Mr. A. Rees Jones (re-elected); *Committee*, Messrs. E. C. B. Bott (re-elected), F. Broadbent, E. Woollatt. The following members of committee were eligible to serve another term: Messrs. R. H. Clayton, J. F. C. Gartshore, I. P. Llewellyn, O. W. Murray, J. M. Wishart, and J. P. V. Woollam. Messrs. J. S. Hunter and H. Inglesent retired. *Ex-officio members* (members of Council resident in the area), Dr. J. P. Baxter, Dr. C. J. T. Cronshaw. The hon. auditors were re-elected and thanked for their services.

Dr. Cronshaw's Address

The title of Dr. Cronshaw's address, "Chemical Engineering Research," which followed the official business, was, as he said, chosen for him by the chairman of the Branch. In token of the universality of the occasion he treated the subject on the very broadest lines, and, at the outset, he dealt with the definition of the terms "research" and "chemical engineer."

Speaking of the increased awareness of the importance of research, Dr. Cronshaw reminded his hearers that the term took on various meanings according to the particular speaker, and cited several occasions on which the term had been degraded to mean mere ascertainment. A suitable definition, for the day's purpose, was a mental approach to a problem: in the words of Coleridge "informing all with the spirit of the mind." To define the chemical engineer was a task of greater delicacy; all existing definitions appeared to fall short of the satisfactory, as they did not give the chemical engineer any kingdom of his own. "The ability to design chemical plant," said Dr. Cronshaw, "is the unique contribution which the chemical engineer makes to his generation . . . in this circumstance lies our true definition at its highest level."

Chemistry, mainly by reason of the extending use of the synthetic weapon, Dr. Cronshaw continued, has created a demand for the chemical engineer as an urgent necessity, employing the peculiar skill of a designer. The early days of the chemical industry were frustrated owing to the dearth of ability to solve some of its problems. Instancing some of the problems which the chemical industry of other days had found difficult of solution, the speaker reminded his audience that in those days the industry

grew to have the name of a bad neighbour and for defiling a district. The state of technology then reached was inadequate to cope with the problem: the chemical engineer had failed to arrive.

The Question of Design

In the most challenging part of his discourse, Dr. Cronshaw dealt with the meaning of "design," an idea which satisfies a human craving. The urge for beauty was part of the problem of design which the chemical engineer had to take into account. In the past, he said, we believed that a chemical plant was a chemical plant, and provided it did that part of its job, that was all there was to it. But we were now faced with a new world and some new problems, and chemical industry had to fit itself in, appropriately and attractively. The chemical engineer's plants must sit well in the landscape and induce a proper feeling of pride in the people who tend them. This, Dr. Cronshaw stressed, must be achieved out of the design itself and not by the use of adventitious aid. The problem of design is indivisible; effectiveness, utility, beauty, and power of survival are each an integral and necessary part. To safeguard his hearers from the notion that this faculty of design was either easy or inevitable, he told the remarkable story of the ammonia-soda process for soda ash—thirteen unsuccessful attempts in twenty years! Chemical engineering, he said, is a pursuit which, like all creative art, makes heavy demands on skill and effort.

The need for research arises out of the burden of design; without its aid science and technology become static. Moreover, at the university level, there can be no first-class teaching without first-class research-ing; and in his own experience, Dr. Cronshaw stated, he had not observed the requisite recognition of training in research methods as a necessary part of a university course in engineering.

It was a capital error for people to believe that they might in a few years learn a science so that it could become the stock-in-trade, so to speak, of a life's work in industry. Early training in the methods of research was essential to create a mental attitude that would remain, it was the only attitude which would give "a continuing reason for learning more wherever we are." They should not neglect the laboratory for the plant; the laboratory was the cheapest, quickest, and easiest place to do experiments. Fortunately, chemical engineering was an experimental science.

The cardinal business of research was to find the repeatable experiment: the capital business of the chemical engineer was to repeat the repeatable, to define the appropriate means and materials which would ensure easy and constant repetition and so apply them to the design of a chemical plant that it could be operated to lesser skilled fingers and lesser trained minds.

Dr. Cronshaw had some interesting observations to make on that fashionable word "obsolescence." He suggested that the common belief that human ability could create only a design with a transient life might be setting too low a standard for their skill. There was, he thought, an abiding quality in all good design; and he affirmed that abidingness was a criterion of the excellence of any design; they might perhaps never achieve it, but at the highest performance of their skill it was there to be achieved.

Dr. Cronshaw's illuminating address was followed by an animated discussion, in which Mr. Hugh Griffiths led the way. His stimulating example was followed by Dr. Gartshore, Mr. M. B. Donald, Mr. Keith Fraser, and Mr. Norman Swindin, and a vote of thanks to the lecturer was moved by Mr. E. J. Dunstan, who also added a contribution to the discussion. Major V. F. Glong seconded the vote of thanks, to which Dr. Cronshaw replied, before the meeting adjourned to a civic tea in the banqueting hall. This occasion was graced by the presence of the Lady Mayoress in company with the Lord Mayor.

Dinner and Dance

In the evening the Branch entertained members and friends to a dinner and dance in the Midland Hotel. After the loyal toast, Sir Ernest Simon proposed the health of the City and Port of Manchester. In his speech he suggested that chemical engineers might apply themselves to the problem of burning Lancashire coal without producing the smoke that was only too well known as a feature of Manchester. The Lord Mayor responded, and he was followed by the new vice-chairman, Colonel Briggs, who toasted H.M. Government. Mr. Ellis Smith, M.P., sometime Parliamentary Secretary to the Board of Trade, spoke in response.

Mr. Hugh Griffiths, chairman of the Council of the Institution, in proposing the health of the North-Western Branch, offered the congratulations of a parent to a sturdy child, and mentioned the twinges of envy that were felt in London when they read of the copious attendances at the Manchester meetings on Saturday afternoons. In reply, Mr. McKillop paid special tribute to the work of Mr. Rees Jones, the hon. secretary, and of the late William Cowen of the Manchester College of Technology. Mr. Rees Jones himself proposed "the Guests," and Lord Leverhulme responded, recalling the great changes that had taken place since he had been president of the Institution in 1932-34. Whereupon the company adjourned to the neighbouring ballroom and to the pleasures of the dance.

British Association of Chemists

Annual Meeting

THE annual general meeting of the British Association of Chemists was held at the Café Royal, Regent Street, London, W.1, on December 15, 1945, with Professor R. G. W. Norrish, president, in the chair.

The president announced the presentation of the Hinchley Medal to Mr. H. N. Linstead, O.B.E., M.P., saying that the first award of this medal had been given for academic distinction, the second for distinguished work in the industrial field, and this, the third award, to a well-known chemist who had done excellent work for the profession in the Parliamentary sphere. Mr. Linstead expressed his appreciation of the distinction which had been conferred upon him and congratulated the Association on the progress which it was making. He was glad to know that the Association was adopting an active policy, and was not afraid to spend money in pursuing its objectives. He thought the B.A.C. had a great future, and hoped it would fight to retain its position as a State agent under the New National Insurance Act.

The following officers and councillors were declared elected:

President: Professor R. G. W. Norrish, Sc.D., F.R.I.C., F.R.S.; *Vice-Presidents*: A. E. Dunstan, D.Sc., F.R.I.C.; P. Haas, Ph.D., D.Sc.; T. McLachlan, A.C.G.F.C., F.R.I.C.; N. Sheldon, A.R.C.S., F.R.I.C. *Hon. Secretary*: Professor E. C. C. Baly, C.B.E., D.Sc., F.R.I.C., F.R.S. *Hon. Treasurer*: W. C. Peck, M.Sc., F.R.I.C., A.M.I.Mech.E., M.I.Chem.E. *Hon Registrar*: F. W. Stoyle, M.Sc., Ph.D., B.Sc., Oxon, F.R.I.C. *Hon. Editor*: T. Crosbie Walsh, F.R.I.C. *Trustees*: P. Haas, Ph.D., D.Sc.; F. Scholefield, M.Sc., F.R.I.C.; C. A. Wylie.

General Councillors: D. Jackson, B.Sc., A.R.C.S.; J. B. Matthews, B.Sc., Ph.D.; N. Sheldon, A.R.C.S., F.R.I.C.; Mrs. S. M. L. Tritton, F.R.I.C., M.P.S.

Section Councillors.—Birmingham: J. K. Best, F.R.I.C.; H. W. Rewell, M.I.Chem.E. *Bristol and South Western*: V. L. S. Charley, Ph.D. *Liverpool*: C. A. Wylie; E. Finklestone, F.R.I.C., A.M.I.Chem.E. *London* (Area No. 1): S. H. Biggs, M.Sc., A.R.I.C., D.I.C.; G. H. Clarke; J. Wilson, M.Sc. *London* (Area No. 2); E. L. Holmes, M.Sc., A.R.C.S.; E. L. Holmes, M.Sc., A.R.C.S.; L. L. Pearson, B.Sc., A.R.C.S. *Manchester*: J. Anderson, M.A., B.Sc.; W. Kay; J. Tomlinson, M.P.S. *Northern*: A. McGuckin, M.P.S. *St. Helens*: H. Birchall, A.R.I.C. *Scottish*: R. W. Dunlop. *Yorkshire*: L. G. Manchester, B.Sc., A.R.I.C.

Professor R. G. W. Norrish.

A special vote of thanks accorded to Professor E. C. C. Baly, the retiring hon. registrar, was carried with acclamation. Mr. N. Sheldon referred to arrangements which had been made by the Association with the General Accident Fire and Life Assurance Company, whereby members of the Association would obtain a discount of 20 per cent. on premiums in connection with motor and similar insurances. The members expressed appreciation of Mr. Sheldon's good offices in negotiating these terms, and the meeting closed with a vote of thanks to Professor Norrish.

MINES DE BOR

Extraordinary and special meetings of the Société des Mines de Bor, called by the provisional administration, have annulled the decisions taken at the extraordinary meetings of December 18, 1941, and January 16, 1942, and the ordinary meeting of December 18, 1941, including that for the removal of the offices from Paris to Strasbourg; they will now be returned to the French capital. A new board was elected, auditors were appointed and the 1940 accounts approved, and a shareholders' association formed.

The French Minister of National Economy has decided to prosecute the entire board of the Banque de Mirabaud for traffic with the enemy. This decision is linked with the Mines de Bor, since the Société de Mirabaud is accused of having ceded, as from January 1, 1941, its right to a commission of 1 per cent. on the proceeds of sales of copper and other products of the mines to a German group for the sum of 25 million francs.

U.K. Lead Supplies

A New Control Order

IN order to bring the selling prices of lead in the United Kingdom more closely into line with current purchase costs, the Minister of Supply has made the Control of Non-Ferrous Metals (No. 20) Order (S. R. & O., 1946, No. 26), which increases the maximum prices at which lead may be sold in the United Kingdom. The increase, which took effect on January 15, 1946, is £9 per ton, so that the new price will be £39 per ton for pig lead except for the quality known as "English," which will be £40 10s. 0d. per ton.

Holders of valid licences to purchase lead metal (as sold by the Directorate of Non-Ferrous Metals) granted on or before January 14, 1946, may, on application to the Directorate, cover themselves by purchases, where they have not already done so, against such licences up to and including January 28, 1946, at the maximum prices ruling on January 14, 1946.

Rationing Introduced

Owing to the world shortage of lead, it has become necessary to ration supplies available to the United Kingdom and it will no longer be possible for consumers to obtain their full requirements. For the time being, the basis of rationing will be to restrict deliveries of imported lead metal by the Directorate of Non-Ferrous Metals to each consumer of over 2 tons per month, to a percentage of his average monthly consumption of such metal in the four-months' period September to December, 1945, subject to adjustment in relation to his stock position. For the first quarter of 1946 the rate will be 80 per cent., and deliveries already made in January will count against this allocation.

Licences Required

The issue of licences for unwrought lead of guaranteed 99.97 per cent. lead content will be resumed forthwith, but the tonnage to be licensed during the first quarter of 1946 will, for each month of the quarter, be restricted to 80 per cent. of the average monthly consumption of such lead in the period September to December, 1945. Application may be made for one licence to cover the whole quarter.

Applications for licences for unwrought lead of less than 99.97 per cent. lead content and for scrap lead of all descriptions should be made on the basis in force before December 14, 1945. Inquiries concerning the above should be addressed to the Directorate of Non-Ferrous Metals, Grand Hotel, Rugby. It is requested that telephone inquiries should not be made unless absolutely essential.

Exports to Sweden

Import Licence Removed from Chemcals

ACCORDING to an announcement in the *Board of Trade Journal*, a Swedish Royal Decree has removed the following items from the list of goods which require an import licence from the Swedish State Trade Commission:

Asbestos, bauxite, plaster of Paris, antimony, emery and other natural abrasives, clay, including china clay, chromium ore, copper ore, sulphur and magnetic pyrites, manganese, wolfram, molybdenum and vanadium ores.

Graphite, benzol, carbolic acid and cresol, ozokerite, montan wax and ceresine, and crude naphthionic and naphthasulphonic acids and their alkaline salts.

Sulphur, bromine and iodine, compressed gases, freon and methyl chloride, hydrofluoric acid, chromic acid, lactic acid, caustic soda, water glass (potassium and sodium silicates), copper sulphate, potassium cyanide and sodium cyanide, magnesium chloride, calcium chloride, metallic and ammonium bromides and iodides not included in any other tariff heading, sodium sulphate (Glauber salt), potassium nitrate, soda (sodium carbonate), bicarbonate of soda, barium carbonate (artificial), barium chloride, cadmium oxide, magnesium oxide, turpentine oil, acetone and acetone oil, methylethylketone, lactoflavine (riboflavine), ipecacuanha root, emetine, its salts and derivatives, cinchona bark, ascorbic acid, nicotinic acid amide, aneurine (thiamin), medicinal cod-liver oil, butyl alcohol, amyl alcohol, carbon tetrachloride, tricresyl phosphate, urea.

Vegetable tanning materials; artificial resin; nylon bristles; wax, including synthetic wax; tanning extracts other than quebracho extract, artificial tanning materials, wholly or partly organic, including artificial carbonising agents, lampblack and similar blacks, red ochre, gelatine in sheets with a maximum average weight of 8 gr. per 100 sq. cm., also manufactures of gelatine, charcoal.

Ferro alloys, copper, nickel, mercury, magnesium, cobalt, sheets and hoops of copper or German silver including stamped, tableware blanks, pipes of copper including perforated stay bolts, copper rods. Wire, not insulated, of metals other than lead, tin or zinc or alloys thereof with each other or with antimony. Bakelite and other artificial resins intended for pressing, and manufactures of these materials.

The export of tungsten from Portugal, prohibited since July, 1944, was authorised again as from December 19, 1945.

SAFETY FIRST

Foundations for Safe Working

by JOHN CREEVEY

IT is a well-known fact that operations in the chemical industry are more hazardous than those in most other industries, and that, apart from accidents, the health of workers in the chemical industry is especially likely to be affected by a series of peculiar risks. Yet, in spite of this, the incidence of accidents and hazards throughout the whole industry has been relatively low as compared with the accident rate in other industries which are popularly considered as less hazardous. This has been due largely to the persistence with which safe working has been preached and practised in the period during which the chemical industry has been developing to its present position. Works managers and workpeople alike have co-operated to this end, and at the same time legislation has been formulated and passed for the betterment of conditions in the industry.

Acts and Orders

Some of us are often a little unmindful of the way in which safe working in the chemical industry has benefited by the passing of Acts and Statutory Rules and Orders. We regard some as necessary evils and not as a safe-conduct for the chemical engineer and process worker. Moreover, they are a safeguard to all concerned in attending plant at chemical and allied works. If such Acts and Orders had a little less legislative jargon in their wording it would perhaps be better for those who should read and attempt to "inwardly digest," but cannot. The phraseology common to such documents may be essential from the legal point of view, but in many cases it might be rendered into readable language and rather with an air of fatherly advice in the presentation of facts, and published in leaflet form. Thus treated, Acts and Orders applying to certain aspects of industry would become easier to read, and more likely to help in attaining those conditions for which the law has been passed. Laws applying to safe working in industry have, without exception, been formulated in good faith of real and immediate needs. They include the Explosives Act 1875, the Boiler Explosions Acts 1882-90, the Factories Act 1937, and more specialised legislation, such as the Lead Paint (Protection against Poisoning) Act 1926, and the Petroleum Consolidation Act. Among Statutory Rules and Orders, we have Chemical Works Regulations 1922 (No. 731), and Regulations for the Generation, Transformation, Distribution and Use of Electrical Energy 1908 (No. 1312); also regulations for the manufacture of paint and colours, for the smelting of materials containing lead, the manufacture of red or orange lead, and the manufacture of flaked litharge. A glance through the current list of Statutory Rules and Orders will enlighten many interested in the manufacture and use of chemical products.

The legal requirements of process work in the chemical industry are not to be passed over lightly, and so far as Acts and Orders were in force in Great Britain up to 1934, they were summarised in a paper which first appeared in the Proceedings of the Institution of Chemical Engineers 1934, and has since been published separately in booklet form by the Institution. The Association of British Chemical Manufacturers, on their part, have drawn up certain "model rules," and "detailed instructions," in order to attain safety at chemical works, and these publications are especially helpful because they incorporate the result of experience by constituent members of the Association. In addition, the Factories Department of the Home Office has published leaflets dealing with accident prevention, in particular with regard to the guarding of dangerous parts of moving machinery. Nor must we overlook the good work which has been done by the Royal Society for the Prevention of Accidents, whose "Industrial Safety Bulletins," often contain items of considerable interest to the chemical industry.

Handling Acids

The systematic inspection of plant and routine of process can do much to reveal weaknesses in safety precautions. Where some major alteration in the design of a plant, or some change in the flow sheet, is considered desirable, its aspect as regards the safety of the worker should not fail to receive attention. Acid handling, among other things, is responsible for far too many minor accidents, and at every works steps should be taken to reduce accidents to the minimum. In many small works, the use of the bucket is still too common; certain accidents arising from the handling of acids cannot be avoided until the practice of "bucketing" is entirely avoided. Corrosive liquids constitute a real hazard at chemical works, but the chemical industry is so familiar with the handling of acids and corrosives, that there is always some short-sightedness involved if serious accidents happen. The safest means of handling corrosive liquids is to store them in closed vessels, properly vented, and to convey

them to the point of use by means of closed pipelines. In lay-out, chemical plant should always aim at reducing as far as possible all manual handling of chemicals, as well as the raw material entering into the process. Ventilation also calls for more attention, because a small leakage of vapour is not always avoidable. Yet let it be remembered that some vapours are far more toxic than others; for instance, in any case where nitrobenzene is being used as a solvent it may be necessary to work in open air, or at least in a shed which is entirely open on one or more sides.

Refresher Courses

The need for safe working makes it necessary that all personnel receive detailed instruction, the extent of which will vary according to the nature and extent of their duties. But instruction when taking up work is not sufficient; it must be maintained throughout the year by regular "refreshers" and new hazards which may arise should immediately be brought to the notice of all concerned, together with new safety methods. Only by continued instruction in safety matters can there be a real approach to freedom from accidents. Employees should be encouraged to watch for hazards and to offer suggestions for safer working. At every plant, a person should personally be responsible for safety, and should have the requisite authority to see that all personnel are instructed, especially newcomers. This state of affairs does already exist at most works in the chemical industry, perhaps in different degrees of perfection, but a wider exchange of safety information between different firms might bear very satisfactory results. A safety device first introduced at a works to meet a particular need should not be regarded in the light of a works secret, but its knowledge contribute to the betterment of conditions throughout the industry, without an eye on a monetary reward. Devices protected by patent should be subject to defined limits in patent royalties to enable them to come within reach of all who may profit by their adoption and use. Better still, publication of the details of safety devices should be encouraged by reduced patent fees.

The safety policy adopted by large chemical undertakings shows that such concerns take a whole-hearted interest in making their works free of accidents. That of Imperial Chemical Industries, to quote words which appeared in a paper on works hygiene and accident prevention (*J. Soc. Chem. Ind.*, 1936, *14*, 222), is based fundamentally on the principle that "the people in charge of manufacturing operations are just as responsible for carrying through these operations without accident or ailment as they are for carrying them out with good yield, on time schedule, and at an economic cost." So it should be at every chemical works, however small or large, with the complete shutting down of plant when dangers arise which cannot be overcome without delay.

The great advances in the use of plastics and other new materials, that have been developed during the war, are likely to result in a considerable number of new fire hazards. Raymond Paré, director of the Montreal Fire Department, pointed this out in a recent report on the subject of fire prevention. "There are new materials, and new methods of using old materials," his report says, "which may be the cause of tragedy if developed without suitable study of fire-prevention methods to be adopted."

One of the new metals in use in industry is magnesium. Because of its use in warfare as part of an incendiary bomb, great fear has been expressed of a severe hazard involved in its sale and storage, and from its peace-time use. Much of this fear is unfounded. Some difference may be necessary in fire-fighting methods, but the hazard is like that of any combustible and must be cared for in its manufacture and storage.

Bacterial Warfare

Research Team's Achievements

A GENERAL statement issued by the office of the Minister of Defence makes the interesting disclosure that, since 1942, Britain, the U.S.A., and Canada have been collaborating in the provision of countermeasures against biological warfare. It had come to the knowledge of this country, before the war, that Germany was conducting experiments in bacterial warfare, in contravention of the Geneva protocol of 1925, and an organisation to deal with this was set up by the Committee of National Defence. In 1942, greater resources being essential, a working agreement was entered into with the U.S.A. and Canada.

In a report issued in Washington, it is revealed that, at the peak of its efforts, the Chemical Warfare Service of the U.S. Army employed 3900 persons. Several plants and field-testing stations were established and special equipment was designed and installed. Among the outstanding achievements of the research workers were (i) the development of methods for the mass production of micro-organisms and their products; (ii) production and isolation of a crystalline bacterial toxin; and (iii) the resultant development and production of an effective protective toxoid; (iv) information of the effects of more than 1000 different chemical agents on living plants; and (v) studies of the production and control of certain diseases of plants.

Industrial Safety Gleanings

A Christmas Tragedy

IT was a wise suggestion on the part of the Gravesend coroner recently that lab-boys and junior chemists employed in industrial laboratories should be lectured on the danger of some of the substances ready to hand. The occasion was the inquest on a lad from Cheam, Surrey, who died in Gravesend Hospital following an explosion in his hip-pocket at an A.T.C. Christmas party. The lad had been employed for some weeks in the laboratory at a local cable works. A laboratory assistant had said that he had seen his young colleague handling silver acetylide and nitrogen iodide in the works laboratory, and making "fireworks" with these and other explosive powders. He had warned him against "messing about" with the material. A chemist employed by the same firm spoke of the simplicity of obtaining all the ingredients necessary for the preparation from any pharmacist. It is probable that there can be no guarantee that adventurous youth will not "mess about" with explosive chemicals if they have access to them; the only possible course to pursue is to issue warnings and to give instruction. There has been rather a large crop lately of accidents of this nature; the enforced familiarity with explosives induced by the war must not be allowed to breed contempt, and precautions must be intensified.

Accident on Hydro-Extractor

A firm was summoned because an employee met with an accident on a hydro-extractor. His right hand was injured. There was a cover on the machine which the management said was supposed to be closed while the machine was running. However, the injured man said that he had never been given any instructions about the cover and had merely used it, until the accident, as he had seen others use it.

The management said further that there was a notice in the shop about using the cover; but an employee, not the injured man, averred that, though he had seen such a notice since the accident, he had never done so before. In one sense this evidence was of no interest because it could not affect the case either way.

In another way it was interesting, because it is not impossible that the notice was indeed there before the accident, but was so much a part of the accustomed surroundings that the employee who gave evidence had never noticed it consciously until the occurrence of an accident brought it to his attention.

Expert evidence was given that the extractor had a hinged cover but no interlock. It was therefore perfectly easy to run the machine with the cover open.

The defence attempted to contend that the cover was removed for necessary examination. This argument would appear to fall to the ground because the injured person was not a certified machinery attendant. Moreover, there would probably have been great difficulty in proving, had the argument proceeded to that point, that the examination was one which had to be carried out immediately and while the cage of the machine was in motion. The firm was convicted and fined £25.

Those who are not familiar with hydro-extractor locks should note that they are not efficient if they merely operate on the start and stop gear. Accidents are particularly liable to happen when the power has been cut off and the cage is revolving under its own momentum, as it will do for some time. For this reason interlocks for such machines are designed to ensure that power cannot be put on while the cover is open, and that the cover cannot be opened until the cage has come to rest. The latter requirement is usually met by means of a simple centrifugal lock.

Protection from Pitch

The experience of those who have handled pitch in quantity for years is that crepe veils are more satisfactory than any type of goggle. Made-up crepe veils can be obtained commercially. A further point is that, when working in strong sunlight, inflammation may extend all over the face. Protection with calamine lotion is recommended by one firm.

TETRAMETHYLENE COMPOUNDS

Tetramethylene compounds developed by E.I. du Pont de Nemours, Wilmington, Delaware, and now available in the U.S. in limited quantities for research and development, include tetrahydrofurane (tetramethylene oxide) and 1.4-dichlorobutane (tetramethylene chloride). The former compound has chemical reactions similar to those of an aliphatic ether modified by its cyclic nature. Among its reactions are dehydration to butadiene, oxidation to maleic acids, conversion to halohydrins or dihalides, and reaction with ammonia to form pyrrolidine or with hydrogen sulphide to form tetrahydrothiophene. It can be chlorinated readily, and will dissolve rubber, vinyl polymers and copolymers, polyvinyl chloride, resins of all kinds, and drying oils.

The two chlorine atoms of the dichlorobutane are highly reactive, resembling those of benzyl chloride and allyl chloride. Either one or both of them may be replaced by sulphur, cyanogen, amine, alkoxy, aryloxy and other groups. The diversity of its reactions makes it an exceptionally valuable intermediate organic (*Chem. Met. Eng.*, 1945, *52*, 11, p. 146).

Minerals in the Belgian Congo

Report of the War Years

RESTORATION of contact between Belgium and the Belgian Congo has permitted the Union Minière du Haut-Katanga to present reports of the war-time activities of its Congo plants to an extraordinary meeting in Brussels. The preliminary reports cover only the years 1940 and 1941, but additional reports bringing accounts up to 1945 are promised within the next few months.

Special conditions made 1940 an exceptionally profitable year, states the report, but by 1941 equilibrium had again been established between product costs and sale prices. Copper output was 148,804 tons in 1940 and 162,167 tons in 1941. From the invasion of Belgium up to January 31, 1945, all copper produced had been sold to the British Government at the price fixed by it for purchases of copper from the British Empire—a price lower than that prevailing in the United States. The refining of ores and concentrates had been carried out partly in the African plants and partly under contract in the United States; this was true of copper, cobalt and radium ores.

Copper Output

Total output of copper ores was 1,603,000 tons in 1940 and 1,900,000 tons in 1941; development had been restricted, but known reserves were still higher at the end of 1941 than in 1939. Concentration plants were well occupied during the two years covered. That at Jadotville-Panda, treating oxidised ores from the central groups of mines and old dumps, had produced 5700 tons of 32.9 per cent. selected ore, and 94,200 tons of 31.6 per cent. concentrates in 1940, and 4000 tons of 35.7 selected ore, and 99,500 tons of 32.8 per cent. concentrates in the gravity concentration section; and 167,700 tons of 26.6 per cent. concentrates in 1940, and 175,600 tons of 24.4 per cent. concentrates in the flotation concentration section.

The concentration plants of the Prince Léopold Mines had produced, from mixed sulphurous ores of copper and zinc, 91,100 tons of 25 per cent. concentrates in 1940, and 86,300 tons of 25.5 per cent. copper concentrates in 1941 by simple concentration; 28,300 tons of 25.5 per cent. copper concentrates, 21,100 tons of 52.2 per cent. zinc concentrates in 1940, and 53,300 tons of 26.1 per cent. copper concentrates, and 29,100 tons of 52.1 per cent. zinc concentrates in 1941. The Kolwezi concentration plant came into operation in August, 1941; it produced 19,000 tons of 32.9 per cent. copper concentrates before the end of the year.

The metallurgical plant at Elisabethville-Lubumbashi (waterjacket furnace) produced 82,857 tons of copper in 1940, and 91,942 tons in 1941; the refinery at Jadotville-Panda produced 65,947 tons in 1940, and 70,225 tons in 1941. Thus, total output was 148,804 tons in 1940 and 162,167 tons in 1941; this compares with 122,649 tons in 1939 and 123,943 tons in 1938. Sales of cobalt and radium were higher than in previous years.

The lifting of measures limiting the production of tin had allowed output of cassiterite to be increased to 1456 tons in 1940 and 1244 tons in 1941. Part of this was refined on the spot, first at the Manono refinery of the Société Géomines, and later at the Lubudi refinery of the Société Sermikat. During 1940-1, all cassiterite had been sent to Great Britain, and refined tin to the United States.

Production of Precious Metals

The concentrator at the Prince Léopold Mine had produced 21,000 and 29,000 tons of zinc concentrates in 1940 and 1941 respectively. Some of these concentrates were sent to the Jadotville sulphuric acid plant of the Sogechim, for roasting. In 1941, 18,600 tons of roasted concentrates were sent to the United States.

The recovery of small quantities of cadmium contained in the zinc concentrates started in October, 1941; 3 tons were produced by the end of the year. Platinum and palladium production had been suspended, but the recovery of silver from the Prince Léopold copper ores rose to 70,200 kg. in 1940, and 110,350 kg. in 1941. Gold output dropped to 87 kg. in 1940 and 202 kg. in 1941 as a result of the suspension of palladium and platinum output. A precipitation concentration plant for cobalt from electrolytic waste was erected at Jadotville-Shituru in 1941.

The chairman announced that copper output in later years amounted to 165,940 tons in 1942, 156,850 tons in 1943, 165,484 tons in 1944, and (scheduled output) 155,000 tons in 1945. He also stated that the company had a large-scale programme for the electrification and the putting into production of new mines, which would cost between £2,800,000 and £5,600,000 over the next four years.

Since the publication of the above report it has been announced that a new cobalt mine, with ore-treatment plant, has been opened at Kamoto; another cobalt-recovery plant has been built at Jadotville, with installations for the production of electrolytic cobalt; and two new electric furnaces for dealing with cobalt concentrates from the Kabolele mine have been constructed.

French Chemical Notes

Position at the Year's End

THE situation in the chemical industry in France during the last quarter of 1945 has been much improved, mainly owing to increased supplies of coal and the stepping-up of imports of raw materials. There are, however, several reasons why excessive optimism is unjustified. The recovery in the chemical industry must be considered as part of a general amelioration which means that other industries make increasing demands on chemical products. Sometimes, particularly in the textile and leather trades, demands are increasing more rapidly than supplies. Also, imports vary according to the different products, and this has its effect on the curve of recovery. Finally, transport is still unable to cope with heavy mineral products and fertilisers, which also will affect the level of production.

The import of pyrites has enabled the allocation of sulphuric acid to be increased from 50,000 to 80,000 tons by releasing 30,000 tons for phosphate treatment. Imports are increasing; the 200,000 tons of acid received have enabled 80,000 tons to be used in manufacturing phosphate fertilisers, which is as much as this branch can consume at the moment after being so long in a state of almost complete inactivity. Further increases are, however, expected early in 1946, and small and medium users are beginning to receive allocations.

Soda Products Improve

Soda products are rising as a result of better fuel supplies. In the fourth quarter the distribution was raised to 55,000 tons for sodium carbonate, and 15,000 tons for caustic soda. Needs have increased at a greater rate, however, and supplies are still far from satisfactory. Allocation of sodium carbonate to glassworks was 18,000 tons against a demand for 26,000 tons, and caustic soda for artificial fibres was 6000 tons to meet a demand for 7000. Production is still almost entirely concentrated in Eastern France and the output has to be spread all over the country, a great strain on resources.

Calcium carbide production shows an increase, stock in factories now being 14,000 tons, but this is still much below the requisite amount. Increased supplies of coke and electric energy are necessary to attain the objective of 30,000 tons, of which 24,000 tons will be produced in France and 6000 tons imported. It may be possible shortly for a distribution to be made to the public of 3 kg. per month per household.

Conditions in the sulphur and copper sulphate industries are relatively satisfactory, and the plan for 1946 envisages the satisfaction of all demands.

France has always had to import large quantities of petrol to cover industrial needs. National resources produced only 75,000 tons a year from the vein at Pechelbronn, and this was richer in lubricants than in fuel fractions. Synthetic petrol produced in the Nord amounted to 20,000 tons a year. The heavy destruction sustained by French refineries makes it unlikely that pre-war production will be regained very soon.

Before the war, France received petrol from Iraq, to cope with which 15 refineries were built after 1928, and were capable of treating 8 million tons of crude spirit, producing 80 per cent. of the petrol, 60 per cent. of the gas oil, 90 per cent. of the kerosene, 75 per cent. of the lubricating oil, and almost 100 per cent. of the bitumen required in the country. This refining capacity fell to 1,200,000 tons at the liberation; out of the 15 refineries only three were left intact, nine others had suffered damage, and three had almost disappeared. By the end of 1945, production at the annual rate of 2 million tons had been attained.

New Oil Refineries

If present plans mature, refining should rise to 2,700,000 tons during 1946, and reach the 4-million ton rate in the first months of 1947. Besides reconstructing damaged refineries, extensive new and powerful additions are projected, until eventually production becomes higher than before the war. The complete realisation of the programme is expected to take about ten years. There are also plans for reconstructing refineries so as to produce a better selection of special spirit, or particular lubricants such as oil for metalwork or textiles, or for the preparation of road grease. Full assistance will also be given to works where research on synthetic lubricants is being carried on.

Work is in progress at Séverac-le-Château (Aveyron), France, on the construction of a factory for treating the oil-bearing schists of the region. Rotating hearths of the Petit type are to be employed in the carbonisation, and the factory is expected to be in operation this year. The great merit of the deposit is that it can be won by open quarrying; on the other hand, the oil content is low. Not more than 45 litres per ton of rock can be expected, according to *L'Industrie Chimique*. Tests conducted in the pilot-plant at Grenoble indicate that the oil is particularly suited to the manufacture of lubricants.

British Science in America

Dr. King on the British Mission in Washington

IN a recent statement to the Parliamentary and Scientific Committee, Dr. A. King, Director of the British Scientific Mission in Washington, told the Committee something of the work done in Washington, which had been to some extent along the lines recommended in the Committee's discussions from time to time.

In 1941, following the mission of Sir Henry Tizard to America, it was decided to set up a British Central Scientific Office in Washington, and Sir Charles Darwin was the first director. That mission had fulfilled an extremely useful purpose in the early days of the war, in passing to the Americans many of our basic ideas and basic projects of war research, and in a reciprocal manner in obtaining from the Americans many of their projects at the early stages of development, at which stage they were very suitable for incorporating into some of our own research ideas. As the progress of the war made technical matters more and more predominant, much of the work of Sir Charles Darwin's initial mission passed to the individual Service Missions, but the Central Scientific Office was still maintained, and busied itself chiefly with those matters which were of predominant interest to more than one of the Services.

Working with the Dominions

An interesting development occurred in 1943, when the various scientific missions of the British Dominions which were present in North America moved into the same office as the British Central Scientific Office. In that year there was a federation of the individual British missions in North America to form the British Commonwealth Scientific Office. That office consisted of the United Kingdom Scientific Mission, the Liaison Office of the National Research Council of Canada, the Australian Scientific Liaison Office, the New Zealand Liaison Office, and the South African Central Office.

A great deal of saving was effected by having a common Services section, but collaboration went a long way beyond that, because each man, no matter which of the missions he belonged to, was willing to work for his own country and for the whole Commonwealth on the subject with which he was competent, by his past experience, to deal. For example, during the critical year of 1943, the only biologist in the office was an Australian. He happened to be a first-rate entomologist, and working in collaboration with Dr. King, who was interested in the chemical side of insecticides, they were able to take up on behalf of the whole Empire the matter of insecticide control, and were able to obtain the necessary information to send home. Another Australian happened to be an expert on the prevention of the deterioration of equipment in the Tropics. A South African was their medical research expert. New Zealand produced a scientist who specialised in nutrition and food preservation. Instead of having a small office for the United Kingdom, consisting of half a dozen scientists to cover an enormous field, who would have been unable to use their own particular specialised experience, they had now an office containing 20 to 25 scientists from the whole Empire, so that their particular individual experience enabled them to cover a wide field with some degree of specialised application.

That system has been working successfully for the last year and a half, and Dr. King thought that through its services they had enabled the mission in Washington to retain a really live research atmosphere, where there are day-to-day discussions of problems. Secondly, it has had enormous importance in that they have been able to make a single approach in many cases to the Americans for a piece of information for the whole Empire.

Future Development

With the end of the war the interest in Service matters diminished considerably, and there was a natural tendency to use the office for peace-time purposes. They had had a large number of medical research people, agriculturists, entomologists, physicists, and representatives of the Ministry of Fuel. A further development was in connection with Colonial research. At the request of the Secretary of State for the Colonies, the Governor of each West Indian Colony appointed one single representative —the senor scientist of one colony, the director of Agriculture in another—as a correspondent with the British Commonwealth Scientific Office in Washington and the Colonial Products Research Council in London.

One of the simplest functions of the office was to ensure the rapid and comprehensive dissemination of routine information and reports. A second task was to look after scientific visitors. A third and much more important matter was, by personal contacts with the American scientists, to bring to light new developments and new researches of which we had not previously been aware, and to report home. Much more of the cultural aspect had come into prominence, and they were asked to attend scientific meetings, to give speeches to American

societies, attend functions, and in every possible way bring British science prominently in front of the Americans.

Dr. King said he could not say much about the future of this organisation. The Department in London was keen that it should continue as a permanent peace-time body, but no official decision had yet been made.

In the discussion which followed, Sir Wavell Wakefield, M.P., said that Sir Ernest Simon had suggested that the Committee might send a party out to the United States to study their scientific set-up there. Did Dr. King think that such a visit would be helpful or desirable, say, next year or the year after?

Dr. King thought it was quite a practicable suggestion, but he would say that Government departments were being kept fully informed of the amazing transformation taking place in the American set-up. He thought the visit would be more useful in two years time.

Mr. F. A. Cobb, M.P., asked whether it was known to what extent Research Enterprises, Ltd., carried out Government research policy in Canada, and was there a similar organisation in America?

The Canadian System

Dr. King replied that Research Enterprises, Ltd., carried out no fundamental research. Fundamental research was carried out very comprehensively by the National Research Council. There was nothing in this country corresponding to the N.R.C. in Canada, which to some extent combined the functions of the D.S.I.R., Medical Research Council, and M.A.P. Research Enterprises, Ltd., was a firm started by the Canadian Government, with the purpose of exploiting, for the war only, researches which had emerged in a scientific state from the National Research Council.

Dr. King understood that Research Enterprises, Ltd., would not continue after the war, and as far as he knew there was no corresponding body in this country at all. It was essentially a production organisation, but was able to take research which had gone through the early development stage at the National Research Council laboratories, and get it into production very quickly. For example, Canada had no optical glass industry and it was doubtful whether she could support one in peace time. Nevertheless, the basic work leading up to the formation of such an industry was done in the National Research Council, and very speedily in Research Enterprises, Ltd., prior to real production in time for the war.

In reply to a question concerning the finance of the Washington organisation, Dr. King said that the various units making up the Commonwealth Scientific Office were independent, just as the Dominions were within the British Empire. Each Dominion financed its own group. On the other hand, the common services were paid for on a basis of the amount of use which each got out of it. The office had never been prevented from doing anything through lack of money. Particularly in the last two years the Government had been extremely generous, and they had never put up a case for a scientist of a particular specialty to be sent out, which had been refused.

Asked whether, with the cessation of hostilities, American firms were more reluctant to supply information, Dr. King remarked that American manufacturers had never been keen to supply information. Large firms were reluctant to share information, not only with us but with other firms in the U.S. In the U.S. there was a very large number of small firms, some of which had been extremely vigorous, and these firms realised—and were supported by the U.S. Government in this—that unless they formed associations with one another and with firms abroad, they were unlikely to be able to afford sufficient research and development to compete successfully with big corporations. The small firms were very anxious to establish relations with corresponding small firms in this country. A great deal could be done in the future by encouraging such collaboration.

Information for Industry

Dr. J. Vargas Eyre said he was confident that a great deal of information came back to this country. Could Dr. King give some indication as to the channels it gets into, so that we might benefit by the information?

Dr. King replied that he was not in any way responsible for the functioning of the London department. American information went as directly as possible to the branches of the London Department which could actually use it. It was true that the information in general could not be made immediately available to industry. He was hopeful that a means would be found whereby scientific information, obtained under agreement by the Government, and paid for by the American Government, could eventually be made available to industry. Now that there was no longer a Minister of Production, as a temporary measure the President of the Board of Trade was responsible for the department in this country

Questioned as to whether inquiries would be welcomed from individual firms, Dr. King said that this was a matter for the Policy Committee, but personally he would not think it a very good idea, but if an arrangement were made whereby some Department here were willing to accept the inquiries and screen out irrelevant and sometimes useless requests, it might well be a useful function.

A CHEMIST'S BOOKSHELF

RAW MATERIALS FROM THE SEA. By E. Frankland Armstrong, D.Sc., F.R.S., and L. Mackenzie Miall, B.A. Leicester: Constructive Publications. Pp. 164. 15s.

Dr. E. F. Armstrong died on December 14 and this book by him and his nephew was published a few days later, although the manuscript was completed in September, 1943. No book has appeared on the important subject of the sea as a source of raw materials since Tressler's *Marine Products of Commerce* in 1923, a book which covered rather a wider field. Since then, man has discovered how to extract from the sea some of the inorganic substances which have been accumulating there throughout the ages, and the handling of vast quantities of dilute solutions has become technically possible.

The authors begin by tracing the history of the oceans, and describing the geo-biochemical changes which are known to occur, how slightly soluble substances brought down by rivers are deposited round the continents, how some ions are adsorbed and precipitated, while others seem not to have come from rivers at all but from submarine volcanoes. They tell us about the biochemistry of the oceans, and how the cycle and extent of life processes are determined by the mineral content, the light intensity, and the temperature and currents of the sea.

A chapter is devoted to oceanic chemicals, arranged alphabetically, and later chapters deal with the extraction of common salt, bromine, magnesium, and potassium on an industrial scale. One on iodine and the seaweed industry and another on making sea water drinkable make up the volume, apart from a useful appendix giving analytical methods for estimating the main constituents of sea water. The technology of extracting chemicals from inland seas, salt wells, and stratified deposits of salts is included in the text, and we have good descriptions of some of the processes of the Palestine Potash Company's works beside the Dead Sea and of several American companies' works in California, Utah, and New Mexico.

The general reader will be glad to learn how bromine and magnesium compounds are extracted from the sea by the Dow Chemical Co. in America, but will be disappointed that the more recent factories of the British Periclase Co. and Ocean Salts (Products), Ltd., could not be more fully described owing to official secrecy imposed during the war. For the same reason the British extraction of bromine from the sea is mentioned only in five lines, and many recent developments in the seaweed industry have had to be left out. Unevenness in a compilation of this kind is to be expected because American firms publish facts about their processes, chemical engineering, and works problems much more freely than British firms, quite apart from official secrecy edicts. However, the authors have succeeded in bringing together a great many facts from a scattered literature, and the book will be a valuable introduction for a wide public.

Heavy war duties did not allow the authors to remove many errors in punctuation, spelling, fact, and style. Facts are rather annoyingly repeated, even on the same page, and two examples of the pathetic fallacy may be found! Nevertheless, the subject of the book deserves to catch the public's imagination. Maritime countries like our own need not now rely on foreign supplies of magnesium compounds and bromine; in the future, potassium salts may be got from the sea. The fish-fattening experiments of Loch Sween may become more generally applied, and the seaweed industry will supply greater quantities and variety of fascinating chemicals. If this book stimulates an interest in the wealth of the sea it will have served a useful purpose. In this sense it is opportune, for we must take stock of the country's resources now and make plans to investigate and use to the full all which can be worked economically.

KINGZETT'S CHEMICAL ENCYCLOPAEDIA, revised and edited by Professor R. K. Strong; 7th ed. London: Baillière, Tindall & Cox. Pp. 1092. 45s.

"Kingzett" remains as much as ever an essential part of the industrial chemist's equipment, and we should be thankful that the price has not increased since the 6th edition appeared in 1940. The editor's preface reminds us that the present edition was produced under the severe handicaps of war time, yet certain extensive changes, as well as minor improvements, have been incorporated. A completely new article on "Penicillin" is now included; "Atabrin" and "Plasmochin" are dealt with; and "Sulfanilamide" receives much fuller treatment. The variants in spelling betray the American origin of the editor, but hardly detract from the value of the work. Mr. H. J. Bunker, of the Chemical Research Laboratory, Teddington, is given special credit for a completely new article on "Vitamins." It was probably a wise move to postpone until a subsequent edition any revision of the economic data regarding production and imports by countries.

The Iron Mines Co. of Venezuela, a subsidiary of the Bethlehem Steel Company, will be given all facilities, so that it may compete with concerns from other countries, in the exploitation of the huge iron ore deposits of the Imataca region of Eastern Venezuela. No smelting is envisaged in the country, as local coal is unsuitable.

Personal Notes

DR. ROLAND E. SLADE, Research Controller of Imperial Chemical Industries, Ltd., has retired from the service of the company. Born at Sandbach in 1886, and educated at Sandbach School and Manchester University, he became lecturer in Physical Chemistry, first at Liverpool and later at University College, London. Commissioned in 1914, he served in the Special Branch R.E. (Gas), was awarded the M.C. and demobilised, with the rank of Captain. He returned to be a director of the British Photographic Research Association—the first organisation of its kind to be started in Great Britain. In 1920, he was appointed Research Manager of the newly-formed Synthetic Ammonia and Nitrates, Ltd., at Billingham. He did pioneer work in planning the ammonia plant, later became managing director, and was responsible for the plant during the period of its greatest development (1927-1934). In 1931, he was made an honorary D.Sc. of Durham University.

Dr. Slade has been in control of I.C.I.'s research work since 1935. In August, 1945, his name appeared in the list of British scientists who had played a part in developing the atomic bomb. He has been actively interested in atomic disintegration for many years, and is one of the few men with first-hand knowledge of the subject who believe it will not be long before atomic energy is harnessed to production.

Dr. Slade has found time to serve on the Council of the Chemical Society and on the Royal Institute of Chemistry. He is also treasurer of the Faraday Society and secretary of the Chemical Council. Like Col. Pollitt, whose retirement from the board of I.C.I. was also announced recently, he is interested in farming. It was at Billingham that he began his agricultural experiments, which have resulted in important advances. If Col. Pollitt was one of the pioneers of the use of grass drying, Dr. Slade takes major credit for its technical development. To-day, grass drying is an established practice in British farming.

LIEUT.-COL. G. P. POLLITT, whose retirement from the Board of I.C.I. was briefly announced last week, was a Lancashire man. He was educated at Manchester University, at Bruges, and at Zurich, where he took his Ph.D. He started his career in the Chemical Department of Woolwich Arsenal in 1902. In 1903 he went as research chemist and manager to the high explosives department of the Kynoch works in Essex. In 1905 he joined the staff of Brunner Mond & Co., Ltd. Returning to industry after a distinguished war career, Col. Pollitt was elected to the board of Brunner Mond, and in 1920 was appointed first managing director and then chairman of the new enterprise, Synthetic Ammonia & Nitrates, Ltd., which Brunner Mond were just launching at Billingham.

Surrounding himself there with a brilliant team of chemists and engineers, Col. Pollitt and his men completed the construction of the first synthetic nitrogen plant in the British Empire and one of the largest in the world.

In 1926, Col. Pollitt joined the board of I.C.I. on the formation of the company, and he served as an executive director till 1934. He then relinquished the more active part of his duties to devote his energies to farming, and became a pioneer in the development of grass drying and in the manufacture of products from dried grass and other crops. When war broke out in 1939, Col. Pollitt at once resumed his executive duties at I.C.I., and joined the Special Weapons Department which was responsible for co-ordinating the research and production that led to the development of many new types of arms, including the P.I.A.T.

Retirement has recently withdrawn two well-known personalities from the I.C.I. active list. Dr. Roland Slade (right) **has for many years been a tower of strength in the research department. Lt.-Col. G. P. Pollitt** (left), **whose retirement was briefly announced last week, was the mainspring of the inspiration that founded the great works at Billingham.**

At present he is in Southern Rhodesia, where he has gone to examine the possibilities of putting into practice the theories regarding artificial drying of crops which he has long practised in England.

DR. C. H. FOOTT has resigned the directorship of Monsanto Chemicals, Ltd.

MR. REX CULLEN-WARD has been elected chairman of The Drug Houses of Australia, Ltd.

MR. A. B. BLUNSDEN has received the appointment of manager to the Lincolnshire Chemical Co., Ltd.

SIR DONALD BANKS and MR. T. EERDMANS have been appointed directors of Thomas De La Rue & Co., Ltd.

MR. W. E. PURNELL has been elected hon. sec. of the Australian Chemical Institute in succession to Dr. H. E. Dadswell.

MONSIEUR PAUL PASCAL, Professor of Mineral Chemistry at the Sorbonne and Professor of Chemistry at the Ecole Centrale, was last month elected a member of the Académie des Sciences, Paris.

MR. OSMAN JONES has resigned his position of chief chemist to C. & T. Harris (Calne), Ltd., and has been appointed scientific adviser to Lovell & Christmas, Ltd., London.

MR. F. B. WINDLE is now serving as chemical engineer on the chemistry division of the Technical and Scientific Register of the Ministry of Labour and National Service.

Owing to pressure of other business and the need of frequent visits abroad, MR. A. FALLER has found it necessary to retire from his position as a director of The British Drug Houses, Ltd.

MR. G. W. LACEY, C.B.E., B.Sc., A.R.I.C., general sales manager, responsible for the sales division of the British Aluminium Co., Ltd., has been appointed a director of the company. MR. E. A. LANGHAM, who has recently returned from India, has taken up his appointment as sales manager in the sales division, while MR. A. W. LANGHAM, who has been acting sales manager, has taken up his appointment as sales planning manager.

Obituary

MR. W. R. JAMIESON, chairman of Messrs. Ayrton Saunders & Co., Ltd., the Liverpool manufacturing chemists, died recently at his home at Preston.

SIR THOMAS ROBINSON, chairman and managing director of Hayes, Conyngham & Robinson, Ltd., and a director of the United Drug Company, Ltd., Nottingham, has died in Dublin.

NEW YEAR HONOURS

In addition to those names already announced the following have been awarded distinctions in the New Year Honours.

O.B.E.: MR. R. G. BASKETT, head of Chemical and Animal Nutrition Division and Senior Research Officer, Ministry of Agriculture, Northern Ireland; MR. W. L. BOON, Member, Fuel Efficiency Committee; MR. J. BRADLEY, Senior Scientific Officer, National Physical Laboratory, D.S.I.R.; MR. G. R. BROCKMAN, Chief Executive Officer, Petroleum Warfare Department; CAPT. F. J. E. CHINA, F.R.I.C., Member, Fuel Mixtures Committe, for services in Petroleum Warfare Dept.; DR. D. G. CHRISTOPHERSON, Senior Scientific Adviser, Research and Experiments Dept., Home Office; MR. E. R. DAVIES, Director of Research, Kodak, Ltd.; MR. C. A. DAVIS, lately managing director C. T. Brock & Co.; MR. T. HANDS, manager, British Thomson-Houston, Co.; DR. G. B. HARRISON, director of Research, Ilford, Ltd.; MR. W. H. NANKIVELL, Chief Textile Technologist, Courtaulds, Ltd.; MR. NORMAN NEVILLE, Director of the Food Machinery Industrial and Export Group; MR. F. H. ROLT, Principal Scientific Officer, National Physical Laboratories, D.S.I.R.; DR. J. H. SCHULMAN, Assistant Director of Research, Department of Colloid Science, University of Cambridge; DR. W. S. STILES, Senior Scientific Officer, National Physical Laboratories, D.S.I.R.; MR. J. R. H. WHISTON, Assistant Professor of Chemistry and Metallurgy, Military College of Science.

M.B.E.: MR. D. ANDERSON, Chemical Engineer, I.C.I.; MR. J. H. BAILEY, Works Manager, Negretti & Zambra, Ltd., MR. R. J. BOWN, Liaison Officer, I.C.I.; MR. A. BROOKES, Research Chemist, British Industrial Plastics; DR. A. R. C. COLLINS, Scientific Officer, Road Research Laboratory, D.S.I.R., MR. J. M. COOPER, lately Works Manager, I.C.I.; DR. R. GILMOUR, Chemical Engineer, Distillers Co., Ltd.; DR. W. E. SCOTT, lately Gas Identification Officer, Brighton; MR. H. SHEARD, Senior Scientific Officer, Building Research Station, D.S.I.R.

Atomic bomb research has been recognised by the following awards: O.B.E.: DR. O. R. FRISCH, Principal Scientific Officer, Directorate of Atom Bomb Research, D.S.I.R.; MR. J. F. JACKSON, Principal Scientific Officer, Directorate of Atom Bomb Research, D.S.I.R.; MR. C. F. KEARTON, Scientific Consultant on Atom Bomb Research, D.S.I.R.; DR. W. G. PENNEY, Principal Scientific Officer, Directorate of Atom Bomb Research, D.S.I.R.; MR. M. W. PERRIN, Assistant to Director of Atom Bomb Research, D.S.I.R. M.B.E.; MISS V. J. MAYNE, Personal Assistant to Director of Atom Bomb Research, D.S.I.R.

General News

From Week to Week

The Board of the Institute of Physics has elected nine new Fellows, 25 Associates, eight Subscribers and 75 Students.

The prohibition on the export of gypsum, felspar and ochre from Eire has been raised by the Minister for Industry and Commerce.

The M.A.P. has issued the following DTD specifications: Nitro-cellulose (No. 591); Isobutyl Acetate (No. 592), and Isobutyl Alcohol (No. 792).

Trading with the Enemy controls have been removed in respect of China by S. R. & O. 1946, No. 11, effective from January 9. A Treasury Order (S.R. & O. 1946, No. 17) has been made regulating the use of sterling at the disposal of residents in China.

The Manchester Joint Research Council, composed of representatives of Manchester University and the Manchester Chamber of commerce, has completed its first year. The idea, first conceived in Manchester, is likely to be copied elsewhere.

So many students want tuition at Salford Royal Technical College, that unless new premises can be obtained some may be turned away. The total figure has risen from 2500 in 1939 to 4000 to-day; and the Regent Institute, in which some teaching was formerly carried out, is no longer available—it was destroyed by German bombing.

Seventy tons of rose hips and 38 lb. of foxglove seed were gathered in Scotland in 1945. The Department of Health for Scotland, expressing its thanks to the collectors, predicted the probable modification of the Scottish medicinal plants collection scheme before next season, as a result of the end of the war.

Red squill may be imported on private account as from January 9. Applications for Import Licences should be made to the Import Licensing Department, Board of Trade, 189 Regent Street, London, W.1, in the usual way. Importers are reminded that red squill as a rat poison is subject to the provisions of the Ministry of Food Infestation Order, 1943.

The British Standards Institution, in collaboration with the manufacturers of screwing tackle, has recently prepared a schedule of dimensions relating to hexagon die nuts. This schedule gives the overall dimensions of 17 sizes of nut blanks and lists the particular screw threads associated with each size of blank. The schedule is published as Amendment No. 1 (P.D.401) to B.S. 1127, and copies are obtainable gratis on application, accompanied by a stamped addressed envelope, to the Institution, 28 Victoria Street, London, S.W.1.

Britain is to make available to Eire that country's pre-war imports of industrial explosives—160 tons per annum—according to information from official sources in Dublin. During the past few years Eire's yearly imports from Britain have been about 60 to 80 tons, owing to the shortage of supplies.

With the publication of reports on German chemical works by H.M. Stationery Office, the system whereby reports were released to the chemical industry through the Association of British Chemical Manufacturers has come to an end. No further appointments for consultation at the Association's offices, will be booked after January 31, 1946.

A series of lectures sponsored by the Fife Education Committee and the Workers' Education Association, had an encouraging send-off at Buckhaven last week, when Dr. Gibson Aitken spoke on "Science in Everyday Life." He contrasted scientific research on the Continent, which had been largely State-controlled and subsidised, with its British counterpart, but stated that the impetus of war research had brought us a new scale of values in scientific reckoning.

The Hydrocarbon Oils Regulations recently published by H.M. Stationery Office (S.R. & O. 1945, No. 1648, 2d.), summarise the regulations made by the Commissioners of Customs and Excise as amended by Section 8 of the Finance (No. 2) Act, 1945. They cover the duties of warehouse-keepers and refiners; receipts and deliveries; operations and use, including refining and control of gases; and accounts and returns, including documents required to be kept.

Wholesale prices in December fell by 0.2 per cent. from 169.1, as compared with the preceding month; the average prices of food and industrial materials declining by 0.2 and 0.1 per cent., respectively. While the index figures for coal and non-ferrous metals remained unchanged, there was an increase by 0.1 per cent. to 189.9 in the iron and steel group. Chemicals and oils declined by 1.3 per cent., from 146.3 to 144.3, due to changes in the price of petroleum products.

The delegation of the Central Industrial Committee of Belgium, which arrived in this country on January 14, for talks with the F.B.I., includes: M. L. Dehasse (coal), M. P. de Roubaix (chemicals), and M. P. Henrard (iron and steel). These first trade talks since the war between representatives of British and Belgian industry will give an opportunity to survey major economic problems facing both countries and will be followed by conferences on more specific issues between representatives of the particular industries concerned.

Speaking at a Scottish Convention meeting in Glasgow recently, on "The Economic Resources of Scotland," Mr. R. H. S. Robertson urged that fuller use should be made of these resources by applying the results of scientific research and better administration. "In the field of mineral resources," he said, "apart from coal oil-shale, and fireclay, I know of no firm in the country engaged on the exploitation of these resources which employs a chemist, a physicist, or a chemical engineer."

The Tin Metal Committee established by the Combined Raw Materials Board has made interim allocations of tin operative immediately to Denmark, France, the Netherlands, Norway, Canada, African and Indian Ocean Territories, India, South America, UNRRA, Sweden, and Switzerland. In general, tin metal tonnages concerned will be made available from British or Belgian sources of supply and, in the case of South America, from U.S.A. also. Semis will be obtained from any of these sources.

Foreign News

The U.S. Petroleum Industry War Council and Foreign Operations Committee have been liquidated.

Two Catalan industrialists are reported to have discovered an oil deposit near Alicante, about 150 metres from the shore.

In the Höchst plant of the I.G., about 5000 men, or about half the normal staff, are at present engaged in the production of chemicals and pharmaceuticals for both the occupation army and the civilian population.

According to the Polish Press Agency, glassworks in Poland produced 700,000 square metres of glass in November, 1945. This output is double the pre-war production figure for this commodity.

The Phosphate Export Association of America has been wound up after 25 years' existence. Henceforth the constituent members will conduct their own individual export business in phosphate rock.

Exports of cellulose from Sweden in 1945 amounted to 1,450,000 tons, of which half went to the United States. Great Britain, France, Brazil, Argentina, Spain, Portugal, Holland and Belgium shared the remainder.

Trinidad hopes to have a large-scale brick and tile plant in operation next month. The factory, which is at San Fernando, is now going through trial runs for the mass-production of building bricks, partition blocks and floor and roofing tiles.

During the German occupation, French production of iron ore rose substantially, but declined in 1944. The figures were: 1941, 10,570,450 tons; 1942, 12,757,620 tons; 1943, 16,879,160 tons; and 1944, 9,265,290 tons.

A proposal to levy an *ad valorem* cess on exports of Indian mica is reported to be engaging the attention of the Labour Department of the Indian Government. The object of the proposed cess is the establishment of a Mica Mines Welfare Fund, to finance welfare measures in the industry.

The creation of a Peruvian corporation for the production and refining of State-owned petroleum is being studied by a special commission which will propose a policy as regards national petroleum resources. The projected company would operate on a commercial basis.

Representatives of a British aluminium company have arrived at Ada, a port at the mouth of the Volta River on the Gold Coast. They have leased a large tract of land for erecting factories, warehouses, etc. The river will be dredged to allow ocean-going ships to proceed inland.

The East African Industrial Research Board is planning to introduce pottery making into another area in Kenya. Clay in the Baringo district is being examined, and if it proves suitable for pottery making it is hoped to start a small African pottery industry for the benefit of the local population.

Reports from the United States seem to indicate that the favoured "hormone weed killer" there is 2.4-dichlorophenoxyacetic acid, rather than 4-chloro-2-methylphenoxy-acetic acid—the Methoxone of I.C.I. Seven manufacturers in the U.S. are now stated to be turning out the product, especially for the control of noxious perennial weeds.

The construction of the largest plant in the U.S.A. for the manufacture of amino products has been decided on by the International Minerals and Chemical Corporation. The plant, at San José, California, will double the company's capacity and should be in full operation this summer. The chief product will be mono-sodium glutamate; other products are glutamic acid and betaine and their hydrochlorides, leucine, *iso*-leucine, and tyrosine.

Eli Lilly & Co. are building a plant for the production of streptomycin, the capacity of which has not been disclosed. The company has been producing streptomycin in small quantities in a pilot plant, and turned its output over to the U.S. Government. A small part of the present streptomycin production may soon be available for civilian use. Distribution would follow the pattern established for allocation of penicillin before it was released for unrestricted use. Merck & Co. have also announced that construction of large manufacturing facilities is being started for the production of streptomycin. The new plant is expected to go into production early in 1946. Total cost will be about $3,500,000.

In South Africa, a subsidiary fabricating company of the Canadian Aluminium Company has been formed to provide an outlet for Canadian aluminium. It will be known as the Aluminium Company of South Africa (Propy.), Ltd., Inc., and a factory site has been acquired at Pietermaritzburg. The principal product, in the initial stage, will be aluminium foil.

Two experts, who recently visited the United States, reported to the Kenya Pyrethrum Board that they have found no proof of the discovery of a perfect synthetic substitute for natural pyrethrum. Three U.S. firms were interested in the possibility of putting up plants in East Africa for the processing of pyrethrum, and are going to send their representatives, one of which is reported to have already arrived.

The Berbice Co., Ltd., a subsidiary of the American Cyanamid Corporation, is due to resume bauxite mining in British Guiana. It is hoped to ship 120,000 tons of high-grade ore to the United States per annum, to be used for chemical manufacture. Very soon one ship a week will be loading. In the past ten months, exports of bauxite from British Guiana have declined by 152,000 tons to 683,000 tons.

Because of the cessation of exports to Germany, ore production of the Luossavaara-Kirunavaara A/B., Sweden's foremost iron-ore producer, half of the capital of which is Government-owned, has declined to 403,000 tons in the year ended September, 1945, as compared with 3,670,000 tons in the previous year. Whereas a profit of 21,600,000 crowns was reported in 1943-44, the group made a loss of 10,900,000 crowns last year.

The question whether the young Brazilian aluminium industry will be able to survive post-war competition is being discussed among industrialists in the country. It has been estimated that the new plant which has been in operation since the beginning of 1945 would produce about 5000 to 6000 tons per annum, leaving an export surplus of about 4000 tons. However, capital interest and other charges have increased the already high cost of production to such an extent, that the metal cannot be sold at competitive prices. It is significant that imports of aluminium rose in the first six months of last year, indicating that foreign aluminium is preferred to the domestic product.

Forthcoming Events

January 22. Hull Chemical and Engineering Society. Regal Room, Regal Cinema, Ferensway, Hull, 7.30 p.m. Mr. T. G. Leggott: "Factory Planning, at Home and Abroad."

January 22. Society of Instrument Technology. London School of Tropical Medicine, Gower Street, London, W.C.1, 7 p.m. Mr. B. G. Higgins: "Electronic Controls for Resistance Welders."

January 22. Society of Chemical Industry (Agriculture Group). Royal College of Science, Exhibition Road, South Kensington, London, S.W.7, 2.30 p.m. Innovations in Plant Feeding Methods. Professor R. H. Stoughton: "Method for the Direct Nutrition of Plants," Dr. W. G. Templeman: "Sand Culture: Automatic Surface Application of Nutrients," and Mr. C. R. Thompson: "Correcting Deficiencies in Fruit Trees by Inserting Nutrient Tablets."

January 23. Institution of Factory Managers. Bonnington Hotel, Southampton Row, London, W.C.1, 6.30 p.m. Mr. A. Stevenson: "Selection Techniques."

January 24. Mineralogical Society. Rooms of the Geological Society, Burlington House, London, W.1, 5 p.m. Papers on minerals from Cornwall and Limerick, and on the structure of kaolinite.

January 23. Institute of Physics (Industrial Spectroscopic Group). Inaugural meeting. Royal Institution, Albemarle Street, London, W.1, 3 p.m. Lieut.-Commander J. Convey (Admiralty Laboratory, Sheffield): "The History and Present Status of Emission Spectroscopy as Applied in Industry." The meeting is open without formality.

January 24. Chemical Society (Manchester Section) and **Royal Institute of Chemistry** (Manchester Section). Chemistry Lecture Theatre, Manchester University, 6 p.m. Dr. W. A. Waters: "Some Recent Developments in the Chemistry of Free Radicals." (Tilden Lecture).

January 25. British Association of Chemists (St. Helens Section). Y.M.C.A. Buildings, 7.30 p.m. Mr. C. Jones: "Chemistry of Clays."

January 25. Institute of Fuel (Scottish Section). Royal Technical College, Glasgow, 5.45 p.m. Mr. J. A. Kilby and Mr. W. G. Cameron: "Waste Heat Boilers in the Iron and Steel Industry."

January 25 . Society of Public Analysts (Microchemical Group). Imperial College, London, S.W.7, 5 p.m. Miss I. H. Hadfield: "Chemical Microscopy in Metallurgical Analysis"; Dr. W. A. Kirkby: "Review of Methods of Micro-analysis of Gases."

January 25. British Association of Chemists. Room 104, Leicester Technical College, Leicester, 7 p.m. Mr. S. H. Wilkes (H.M. Senior Chemical Inspector of Factories): "Protection Against Industrial Poisons."

January 25. Society of Chemical Industry (Glasgow Section) and **Scientific Film**

Society, Royal Institute of Chemistry and Chemical Society. Examination Hall, Royal Technical College, Glasgow, 7 p.m. Film Programme: "Formalin."

January 26. Institution of Factory Managers. Bonnington Hotel, Southampton Row, London, W.C.1. 6.30 p.m. Annual general meeting.

January 29. British Association of Chemists. Moon Hotel, Spondon, Derby, 7 p.m. Film Show.

January 30. British Association of Chemists. Gas Industries House, 1 Grosvenor Place, London, S.W.1, 6.30 p.m. Mr. S. B. Heys: "English Banks at Your Service."

Commercial Intelligence

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

Mortgages and Charges

(Note.—The Companies Consolidation Act of 908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.)

W. EDWARDS & CO. (LONDON), LTD., scientific apparatus dealers. (M., 19/1/46.) December 21, charge and a debenture, to Barclays Bank Ltd., each securing all moneys due or to become due to the Bank; respectively charged on land at Salfords, Horley, and a general charge. *——. September 17, 1945.

New Companies Registered

Campbell Coverings, Ltd. (402,502).—Private company. Capital, £2000 in £1 shares. Manufacturing, analytical, organic, inorganic, research and industrial chemists, etc. Directors: A. T. Hart; A. H. Campbell. Registered office: 98/100 Lavender Hill, S.W.

Plastic Hangers, Ltd. (402,974).—Private company. Capital £2000 in £1 shares. Manufacturers of and dealers in plastic, modelling and moulding materials, rubber, gums, chemicals, etc. Directors are: J. H. Pruen, Mrs. M. O. Pruen. Registered office: 32 Berrow Road, Burnham-on-Sea, Somerset.

Maure Chemicals, Ltd. (402,841).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, foodstuffs, fertilisers, oils, colours, etc. Subscribers: R. E. Nuttall; H. M. Plaistowe. Registered office: 9 Arundel Street, W.C.2.

W. E. Powell & Co., Ltd. (402,493).—Private company. Capital, £5000 in £1 shares. Manufacturing chemists. Directors: R. V. Watts; A. A. White. Registered office: 3 Frith Road, Croydon.

Ultra Products & Plastic Development, Ltd. (403,046).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in plastics, chemicals, minerals, drugs, oils, isinglass, colours, glues, gums, pigments, paints, etc. Directors: K. F. Nutt, W. J. Taylor. Registered office: 237 Acton Lane, Acton Green, W.4.

Company News

The Electrolytic Zinc Co. of Australasia reports a net profit, for the year to June 30, 1945, of £324,491 (£292,574). A final ordinary dividend of 5 per cent. makes a total distribution of 9 per cent. (same).

Plastic Materials, Ltd. The nominal capital has been increased beyond the registered capital of £100, by the addition of £4900 in £1 ordinary shares.

The Midland Bank Limited reports a net profit for 1945 of £2,056,274 (£2,038,274). Carried forward £751,998 (£708,414). A final dividend of 8 per cent., making 16 per cent. (same) is being paid.

Chemical and Allied Stocks and Shares

BUSINESS in stock markets has been on a fair scale with British Funds maintaining their upward trend, but movements generally were small, a waiting attitude reflecting the knowledge that, apart from nationalisation developments, a Bill is expected for the creation of a National Investment Board. Contrasting with further profit-taking in South African gold shares, base metal mining issues were again higher on balance, tin shares participating on the latest news from Malaya. Home rails strengthened on expectations that the forthcoming dividends are likely to be maintained, and there was a better trend in colliery shares which attracted buyers, following their recent decline.

Imperial Chemical eased slightly to 40s. 4½d., but Turner & Newall at 81s. 6d. were better again on further consideration of the annual statement. British Oxygen remained in favour, rising further to 85s. 9d., and on higher dividend hopes, British Plaster Board moved up to 35s. 3d. United Molasses rose to 45s. 6d. on attention drawn to the company's diversified interests, but in other directions, General Refractories at 17s. 1½d. lost part of their recent rally.

B. Laporte remained around 83s. Greeff-

Chemicals Holdings 5s. shares were firm at 11s. 3d. with Monsanto Chemicals 5½ per cent. preference again 23s. and Burt Boulton ordinary 26s. Fisons eased to 52s. 6d. Steel shares remained under the influence of the increase in steel prices, Dorman Long being 25s. 9d., John Brown 28s., Guest Keen 43s. and United Steel 25s. 6d. Moreover, Tube Investments were favoured up to £5 13/16, and Hadfields improved to 31s. on the debenture scheme. Among collieries, Bolsover rallied moderately to 47s., Staveley were 44s. 6d. and Powell Duffryn 20s. 10½d. In other directions, Babcock & Wilcox firmed up to 60s., and Colvilles rose further to 25s. 1½d. Cotton textiles tended to ease, but in other directions, Courtaulds continued more active up to 57s. on the removal of restrictions on export of rayon piece goods.

Murex remained at 93s. 9d., but elsewhere there was a sharp rise to 95s. 7½d. in Metal Box shares. Gas Light & Coke at 20s. 10½d. were little changed, Associated Cement eased to 56s. 6d., while Goodlass Wall 10s. moved up to 25s. 4½d. Triplex Glass lost a few pence at 39s. 6d. Power Gas Corporation shares held firm at 43s. 9d. on the maintained 12½ per cent. dividend and the chairman's statement as to the company's "record" order book. United Glass Bottle kept at 77s. on the decision to redeem the outstanding 4½ per cent. debentures. Dunlop Rubber receded to 51s. 9d. following their recent rise, but Barry & Staines strengthened to 53s. 9d. and Nairn & Greenwich showed firmness at 82s. 6d. on the financial results. Paint shares kept firm, with British Paints higher at 47s., Pinchin Johnson 36s., and International Paint 125s.

Boots Drug have been at 56s. 9d., with British Drug Houses higher at 50s. Evans Medical Supplies 15s. and Vitamins shares at 8s. 3d. also more active on export trade prospects. W. J. Bush were 80s. and elsewhere, Beechams deferred were 21s. 3d., Timothy Whites 45s., and pending the interim dividend Sangers moved higher at 32s. De La Rue were £10⅜, with British Industrial Plastics 2s. shares 6s. 10½d., and Erinoid 5s. ordinary active up to 13s. 3d. Lawes Chemical 10s. shares were 13s. and a rise to 42s. 6d. was shown in Keith Blackman 10s. ordinary, while Sanitas 9 per cent. preference were 36s. 3d., and British Glues & Chemicals 4s. ordinary 13s. 6d. Oils rallied well, Shell being 81s. 10½d., Burmah Oil 79s. 4½d. and Canadian Eagle Oil 23s. 3d.

British Chemical Prices

THERE have been no outstanding features in the London general chemicals market during the past week, the undertone throughout remaining firm with perhaps a small expansion in the home trade demand. The volume of overseas inquiry continues to be fairly substantial with actual bookings restricted by the scarcity of supplies and the prior needs of the home market. In the acid section, acetic acid supplies are not yet able to cover the demand, while oxalic, tartaric and citric acids are in strong request. Offers of yellow prussiate of potash are promptly absorbed and permanganate of potash is in active demand as is the case with most of the potash and soda compounds. Elsewhere, arsenic, formaldehyde, and acetone are in good demand. Market values show little alteration, the undertone generally continuing firm. There has been no falling off in the demand for coal-tar products, and dealers have very little to offer for immediate delivery. Substantial export inquiry is in circulation. The introduction of maximum rates for naphthas should assist the producers to dispose of the lower gravity grades.

MANCHESTER.—From the point of view of inquiry the Manchester market for heavy chemical products has been fairly active during the past week. Home industrial users have been showing interest and a moderate volume of replacement buying has been reported, while shippers have been inquiring on export account in respect of a fairly wide range of materials. Home deliveries against contracts are on steady lines and include soda ash, caustic soda, bicarbonate and sulphide of soda, lump alum, the mineral acids and the ammonia and magnesia compounds. In fertilisers a steady trade is passing in superphosphates, sulphate of ammonia, slag and lime, with an awakening of interest in the compound manures.

GLASGOW.—In the Scottish heavy chemical trade business has now resumed its normal activities after the New Year holidays. Business during the past week showed a decided improvement. Prices remain firm but there have been some sharp advances for 1946 in numerous commodities. Export inquiries continue to improve.

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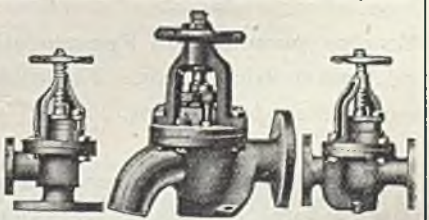

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