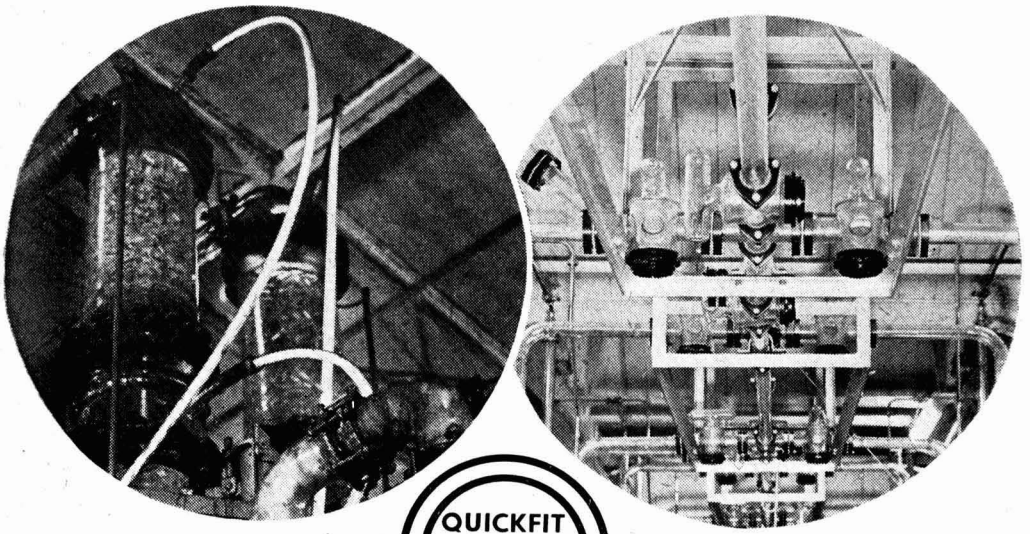
THE Chemical Age

VOL. LXX 8 MAY 1954 No. 1817



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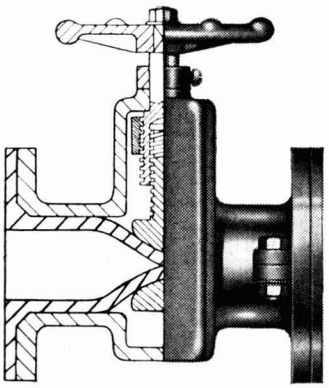

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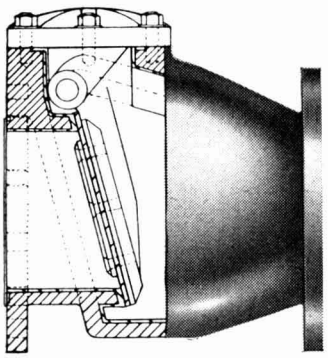

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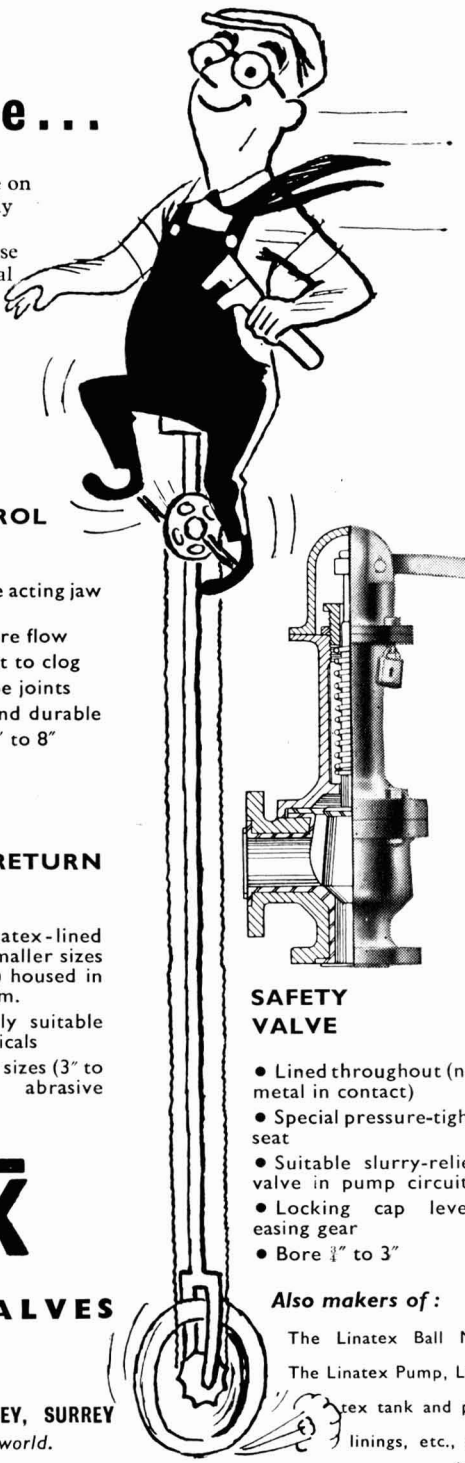

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Volume LXX
Number 1817

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : CENTRAL 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

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Trade & Tariffs

SO long as dollars remain the world's hardest currency, and so long as the United States remains so abundantly provided with most essential raw materials, some form of 'dollar-softening' process must be applied or world trade, and especially Western trade, will contract like diseased arteries round a doomed heart. Grants and loans of dollars cannot produce an enduring solution, whatever merits these devices had in the short-term and immediate post-war situation. Unlike Shakespeare's quality of mercy, they do not bless both giver and receiver; as injections to enliven world trade they have too many toxic side-effects. Trade that enables Western Europe to earn dollars is infinitely healthier. For the US manufacturer producing goods of the same kind that European countries want to sell to America, this is a difficult thesis to accept, particularly at a time when recession is affecting US home trade. We would be adolescently naive not to expect organised industry in the US to over-emphasise the case for no further lowering of tariffs.

Between the wars the tariff walls round US ports were among the highest in the world. Then tariff rates amounted to 50 per cent of the value of all goods imported by America. When one of the world's largest markets was so heavily protected, the onset of world trade paralysis and of tragically deep international depression in consequence is not difficult to explain. It is to the lasting credit of the Roosevelt administration that the liberalisation of US tariff rates was regarded as one uphill road leading out of the trough of depression and economic inertia. The process of tariff rate reduction was accelerated by the war; it is in no country's interest to restrict imports when raw materials and manufactured goods are desperately scarce and needed for immediate security. With most of the scarcities persisting during the immediate post-war period, it still remained the self-interested policy of the US to keep tariff rates at a much lower level than before the war. Any more tactful diagnosis would be unrealistic. Later in the post-war period the stockpiling demands of the Korean war and the abruptly renewed calls upon defence materials created once again conditions in which it would have been sheer folly for the US to discourage imports. Thus, the claim that today 60 per cent of the imports into the US are duty-free and the rate on the remaining 40 per cent is 12 per cent of their value is not remarkable. Some of this reduction in total weight of tariffs can be attributed to a change in outlook, but much of it must be regarded as a product of war, post-war, and cold war conditions.

There are two new factors in the present situation that make it logically impossible for the United States to compare the 1950s with the 1930s. Today her foreign policy is not isolationist and the dollar now has assumed much the same dominant world currency position that was formerly held by the pound. Without the ultimate loss of both these forms of leadership, the United States cannot adopt a policy of economic isolation or independence. It is clear enough that President Eisenhower recognises this for his recent message to Congress (April) virtually followed the tariff recommendations of the Randall Commission. 'Expanding trade is the only adequate solution . . . for our own economic growth we must have continuously expanding world markets.' He has called for selective tariff reductions and changes in the 'Buy American' Act. It is not irrelevant to point out that this

Act can operate as restrictively as any set of import duties, and so long as it still exists the argument that the United States has already greatly reduced its tariff rates is somewhat ingenuous. We should again be very naive, however, to suppose that these recommendations from the White House will not meet fierce opposition in Congress. It is far from certain that tariff reform will make further progress. It may be more realistic merely to hope that tariff rates will not be selectively raised.

The US chemical industry, especially the organic branch, is strongly opposed to further tariff reductions. To quote from a recent article in *Monsanto Magazine* (1954, **34,** 1): 'There is a maximum amount of each chemical product that can be consumed in this country in a year. For the most part, the American chemical industry can deliver every pound of every product that can be used. If foreign production is added to this, especially at lower prices, then there will be unemployment in the American chemical industry. With such unemployment will come a lessening in the contributions which the US chemical industry can make to both the peacetime economy and national defence. In a time of national peril, this could prove to be our Achilles' heel.' Looked at from an American angle, this is surely a tendentious argument. If chemical products can be delivered to US customers at lower prices than those at which American manufacturers can sell them, this is no disadvantage to the American consumers. Nor are the dollars paid to foreign countries lost. No one hoards dollars today. If Britain earns dollars by chemical sales to US, the dollars are spent again by Britain or the sterling area in buying other US goods. It is true that appreciable imports of chemicals by US buyers can lead to unemployment in the US chemical industry. This may be real unemployment or it may only be potential in the sense that US expansion in production is lessened. In view of the expansive nature of the US industry, the latter consequence is more probable than the former. But in the US economy as a whole employment may well be increased for the dollars that are earned might be spent upon US products which have required more labour to bring them into existence.

It is difficult to believe that the great chemical industry of the United States with all its technological enterprise and versatility can be seriously damaged by the maximum importation of 'non-dollar' chemicals which is at all likely. On the contrary, some branches should be fortified by the availability of cheaper intermediate materials, enabling the final products to be sold on the home market at more attractive prices. Certainly the argument of damage to the US chemical industry cannot be pressed to the point that its capacity and capability will be strategically weakened. Is it seriously contended that the Western world's chemical industry should be centred on the American continent because large industries in Europe will be closer to battle-front lines in the event of war? In his message to Congress the President discards this exaggerated theory and says 'we enhance our own military security by strengthening our friends abroad.'

It is argued that specific tariff rates, as opposed to *ad valorem* rates, are no longer significant because the dollar has depreciated in goods-value. A rate of a few cents per pound is much less protective in the 1950s than it was in the 1930s. It is true that the dollar, like every other currency, buys less than it did before the war, but this argument is incomplete so long as it ignores the substantially increased value of the dollar in terms of other currencies. The rate of approximately \$4.69 to £1 is now \$2.82. In any case our American friends cannot apply this argument in one direction and ignore it in other directions. The real increase in volume of US imports, especially when new and vital imports such as uranium ore are allowed for, is not striking. It is not nearly enough to bridge dollar gaps in everyday international trade. It is only an increase of about the same proportional size as the post-war increase in general production and consumption. The truth is that dollars can and should be made easier to earn, and in the long run it is in America's own interests that the dollar functions as the major target of world trade and not as a dole for the deficient.

Notes & Comments

Powdering Magnesium

A FEW months ago (see THE CHEMICAL AGE, 1953, **69**, 1217) early and enthusiastic developments towards the use of magnesium powder as a fuel for aero-engines were reported. Since then there has been an appreciable volume of criticism in the US technical press about the claims originally made, and there is little doubt that the 6:1 (approx.) power ratio claimed for magnesium compared with petroleum was a somewhat theoretical exaggeration. A less controversial reaction has come from the chemical engineering side. The practical possibility and safety of grinding magnesium to such a finely divided particle size has been questioned by more than one 'doubting Thomas.' However, a six micron standard, obtained by hammer milling high purity ingots, was claimed by the largest US producer of magnesium chips and powders. A fuller account of their powder-milling technique has recently been published (*Chemical Engineering*, 1954, **61**, [4], 122).

The General Process

THE general process for making powder, for such markets as synthetic chemistry, powder metallurgy, pyrotechnics, electroplating, and military uses, is triple-staged—machining or cutting ingots, hammer-milling, and final screening. In six years, with monthly output rising steadily to 100,000 lb. of powder, no serious case of burning has occurred. The plant has been planned for safety from the start. A number of relatively small and well-separated buildings are used. They are all well-ventiated and designed to avoid dust pockets. At the end of every shift all buildings and machines are air-swept with compressed air. All magnesium chips are magnetically iron-screened before entering mills so that the spark-producing risk from iron particles is eliminated. The employees are intensively trained in safety practice. Ingots are 'cut' by machines with some resemblance to lathes. Cutting is necessary as ingots cannot be directly milled; and it has been found that a 90-days aging process makes ingots much easier to cut. Ribbons like wood shavings are produced. The thickness of the ribbons determines the size of the final powder, thickness and particle diameter being directly related. These shavings are carried by an air-stream into a preliminary hammer-mill that acts as a disintegrator, breaking the ribbons down to $\frac{1}{4}$-inch strips. For some chemical purposes these short strips are marketable without further milling; for most purposes, however, high-speed grinding to powder is necessary. One, two, or three grindings with different hammers or screens may be needed according to the mesh size required. These operations are carried out without the use of an inert gas as atmosphere and without any other cooling than the air-stream through the mills. Screens of silk, stainless steel, or bronze are used for final grading as the powders produced have a fairly wide size distribution. Tedious screening difficulties on humid days have now been overcome by suspending batteries of infra-red lamps over the screen in damp weather.

Only One Hazard Remains

THE basic principle underlying safety is the elimination of any severe breaking-down operation. The pathway to smaller size is always gradually travelled. It is claimed that only one hazard has not been overcome, that of storms. When there is any thunder or lightning about, the whole plant shuts down.

Pattern for Polyethylenes

A RECENT paper (*J.A.C.S.*, 1954, **75**, 6110) puts forward new theories for the molecular mechanisms of ethylene polymerisation. The pattern is traced for new control over factors that decide the properties of the ultimate end-product. The principal advance is the recognition of the importance of branching at early points of chain formation. The end carbon atom of a chain may link itself to a hydrogen atom already held by

another carbon atom in the existent chain. A transient ring is formed with both carbon atoms sharing the same hydrogen atom. This state of 'short-circuit' ends with the detachment of the hydrogen atom from the chain, and at the empty site thus created a new long chain starts to form with the arrival of other ethylene molecules. It is postulated that physical properties of ethylene polymers are greatly influenced by the extent to which this short-chain branching occurs. Control over such conditions as temperature, pressure and reaction time is expected to determine the extent of the short-chain branching, and this in turn should decide such major properties as flexibility or stiffness. Largely theoretical at present, this new conception of polymer-forming mechanisms may prove not only a milestone of polyethylene plastics but it may also have extensions into the styrene, acrylic and vinyl fields. The practical validity of the theory will no doubt express itself in the appearance of improved polyethylene products with greater varieties in their physical characteristics. Indeed, we may well suspect that the paper would not have been published had there not already been solid progress along these lines.

Age & Management

IN a most able article in the series on management now appearing in *Chemistry & Industry* (1954, 470), Mr. J. Maddock, of Peter Spence & Sons Ltd., deals with training for management in medium-sized companies. He makes the point, well-known to all who have been able to work progressively in such firms, that 'the advantages do not lie altogether with the larger concern.' But perhaps the most important subject raised in the paper is the question of age and succession. Should retirement take place at 65 irrespective of fitness for work? Should earlier retirement take place when the individual's health or general fitness has become less adequate for key-responsibility? Mr. Maddock suggests that individuals must accept the need for succession as naturally as they accept the private need for family insurance, etc. All this would seem simple enough were it not that in so many cases men of outstanding ability cannot genuinely absorb the idea that their companies' affairs will and must, one day, be continued without their contributions. Arrangements made for their succession sometimes dispirit these men before it is in fact time for retirement or easing-up; sometimes, and often more dangerously, there is an inability to delegate executive responsibilities.

Inevitable Change

THE size and reality of this human problem can only be properly assessed by those who have been in close personal contact with an actual case-sample. A great deal of wasteful friction and needless misunderstanding are inevitable by-products. Often, when succession eventually takes place, it occurs in a far less happy atmosphere than it should, and the man who leaves begins an entirely new phase in his life with a dangerously sour feeling of ill reward and under-appreciation. The frequency of this difficult problem may in time be reduced by the new attitude which Britain must sooner or later adopt towards working ages. As the proportion of the older age-groups rises, retirement at 65 will become less conventional; but it is doubtful if this *general* change can be operated if continuing to work after 65 is not associated with reductions in responsibilities. If and when it becomes conventional for older men in most jobs to continue working with lessened burdens after 60 or 65, men at the top may similarly adjust their own ideas. This inevitable social change of the future, together with the steady rise in mortality figures for thrombosis, may bring about in practice what modern management theory can only hope to achieve much more slowly.

Uranium ore at Rum Jungle, in the Northern Territory of Australia, is to be mined by open-cut methods. The open-cut method has been recommended by the Consolidated Zinc Corporation, which is developing Rum Jungle on behalf of the Australian Atomic Energy Commission.

The Institution of Chemical Engineers

Membership Increase Reported at Annual Meeting

THE thirty-second corporate meeting of the Institution of Chemical Engineers was held in the May Fair Hotel, London, on 30 April.

The annual report of the Council for the year ended 31 December, 1953, was presented by Mr. F. E. Warner (joint hon. secretary with Professor M. B. Donald). It reported another successful and eventful year, which saw a substantial increase in membership, an excess of income over expenditure, developments in chemical engineering education, an increase in the numbers of meetings held and of papers published, and a general expansion of effort and interest in chemical engineering. Mr. Warner said that during the year the membership had increased by 137 to 2,928, and it had now increased beyond the 3,000 mark.

He drew attention to the sub-section in the report on vocational guidance, which stated that about 2,000 copies of an illustrated brochure entitled 'Careers in Chemical Engineering' were distributed to school boys, parents, school masters, education officers and others. The brochure, for which there is a steady demand, was well received. In November about 200 public and grammar school boys and masters attended a meeting of the Institution in London to see a chemical engineering film and to hear something of opportunities in the profession. Its success had encouraged the Institution to look into the possibilities of further such meetings in other parts of the country, and they were in process of being arranged.

Survey of Training Facilities

On training facilities, the report stated that at the request of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association a survey of chemical engineering training facilities in Great Britain was undertaken, and was in progress at the end of the year.

Chemical Engineering Higher National Certificate Schemes had been approved in content at seven centres in England and Wales. Development was necessarily slow (Mr. Warner said), and the Institution relied a great deal on its members in industry to see that incentive was given in the localities to encourage the appropriate part-time training scheme which would form the basis for the Higher National Certificate courses. Rules governing the award of those Certificates in Chemical Engineering in Scotland had been published, and a Joint Committee of the Scottish Education Department and the Institution had been set up to administer the scheme for Scotland.

Medal Awards

The Osborne Reynolds Medal for 1953 was awarded to Mr. E. F. Mactaggart in recognition of his many services to the Institution, and especially as hon. business manager for the *Transactions*.

The Moulton Medal for 1953 was awarded for the paper 'Liquid-Liquid Extraction, Part VIII: the Extraction of Uranyl Nitrate in a Wetted Wall Column,' by Mr. R. Murdoch and Dr. H. R. C. Pratt.

The Hinchley Medal was awarded, on the recommendation of the Engineering Board of the Imperial College of Science and Technology, to Mr. Harry Brody, who took the highest place in the Final (Eng.) (Chem. Eng.) Examination in 1953.

The committee set up under the chairmanship of Prof. F. H. Garner, O.B.E., to advise the Council on policy with regard to the Report of the Committee on Chemical Engineering Research was instrumental in the formation of a joint committee with the Department of Scientific and Industrial Research to consider the correlation and distribution in suitable form of information on crushing and grinding in accordance with recommendations contained in the Report.

Mr. Stanley Robson, who was retiring after two years as president, announced the election of honorary officers for the ensuing year as follows:—

President: Sir Harold Hartley.

Vice-Presidents: Prof. F. H. Garner, Mr. Julian M. Leonard, Dr. N. E. Rambush and Dr. B. Segal.

Joint Hon. Secretaries: Prof. M. B. Donald and Mr. F. E. Warner.

Hon. Treasurer: Mr. P. A. Greene.

A ballot for the election of Ordinary

Members of Council resulted in the election of Dr. E. H. T. Hoblyn, Mr. K. B. Ross and Mr. R. W. Rutherford.

Dr. H. W. Ashton was declared elected as an Associate Member of Council.

Following the corporate meeting, Mr. Stanley Robson delivered his presidential address entitled 'Progress and Objectives.' Mr. Robson surveyed chemical engineering progress in Britain, giving special attention to the development of training facilities, the penetration of the chemical engineer into a wide range of industries and the division of membership by occupation such as administration, design, research and development. He showed that slightly more than half the members, excluding students, was employed in the chemical and allied trades, including mineral oil refining, and that fourteen per cent were employed in chemical plant manufacture. The distribution by occupation followed a similar pattern to that in the USA.

Mr. Robson then considered a number of the objects of the Institution, the progress made towards their attainment and the most urgent problems facing the Institution.

A vote of thanks to the president was proposed by Dr. B. Segal, chairman of the South African Branch.

Speeches at Annual Dinner

The annual dinner was held in the evening at the May Fair Hotel. Sir John Cockcroft, K.C.B., C.B.E., LL.D., M.A., M.Sc. Tech., Ph.D., D.Sc., Sc.D., F.R.S. (Director of the Atomic Energy Research Establishment, Harwell) proposed the toast of the Institution.

Chemical engineering in this country, he said, was relatively new to the older primary technologies of the civil, mechanical and electrical engineers. Nevertheless, after the initial doubts as to whether an offspring of the chemists and mechanicals could possibly be wanted or could be legitimate, the profession was rapidly establishing itself as our fourth primary technology. That was shown by the membership of the Institution, now over 3,000, and by the foundation or approaching foundation of no less than four University Chairs in that field during the last year. It was interesting to note, however, that doubts about the origin of the profession were still held in some academic quarters, since one of those Chairs was to be a Chair of Chemical Technology, and another was associated with industrial chemistry. Nevertheless, the student numbers grew and, he was told, there should soon be an annual enrolment for first degree courses of 200, and 50 or so for higher degrees and appreciable numbers in technical colleges.

Judging by the difficulties experienced in obtaining qualified graduates, however, the numbers being trained were still too few, for it would appear that the estimates of requirements made five years ago by the Hankey Committee were too conservative.

Enormous Expansion in USA

If we looked to the United States we saw first the enormous expansion of the chemical engineering industry; we saw an Institution with a membership of 13,000, and we found that the number of graduate students annually was 4,000—about 20 times our numbers.

In this country the Government, through the Ministry of Supply and the Department of Atomic Energy, had become a substantial user of chemical engineering, and the Ministry of Supply had established a 'practice school' at the Bridgwater R.O.F. and had also founded vacation consultantships and studentships at R.O.F's and research establishments. Benefit had been derived from those activities at Harwell, where there was a very flourishing Chemical Engineering Division which included nine associate members and eight student members of the Institution. Sir John said he had no doubt, having seen them at work over the last seven years, of the important role they played between the chemist, who usually did the pioneering test tube work, and the engineer who designed and built the plants. He believed that scientific design focusing itself around the pilot plant could save enormous sums in final plant construction and operating costs. He had once heard a US estimate that plants built without a pilot plant often cost three times as much as those based on adequate pilot plant experience.

He had also seen much new technological development based on processes such as solvent extraction, ion exchange separation, and fluidised bed techniques, and he realised what importance those playgrounds of the research chemical engineer held for the future.

Again, he was glad that the Institution was taking the initiative in diverting more of

our schoolboys at their critical age into technology, and its publication 'Careers in Chemical Engineering,' combined with its successful schoolboys' meeting in London, had show how to go about that problem, which was vexing all the technologists. He was quite sure there was plenty of undeveloped talent available among the young if only their imagination could be captured during the formative years.

Coupling with the toast the name of the president, Sir John said he had come to know Mr. Robson through his son, who had worked with him at Malvern on the development of radar during the war, and at Chalk River, in Canada, at the end of the war and since. The high qualities of that 'chip off the old block' were an indication to him, before he had met the President, of his own qualities.

Mr. Robson, in his response, said the Institution was proud to have Sir John Cockcroft as its principal guest, and it was interesting to appreciate the application of chemical engineering techniques in the building up of a vast new industry.

He understood that there was a fundamental doctrine in atomic engineering, known as the doctrine of the immutable day. That particular day had been an immutable day for him, for he was wearing the Institution's presidential chain of office for the last time. That had led him to reflect at the annual meeting on how much progress had been made. Chemical engineers had achieved their own indisputable place; they were members of no mean industry and profession. He could base the claim to respectability on an infallible sign—the ladies had managed to invade the profession.

In conclusion he said the members of the Institution were very cognisant of Sir John's great work, and wished him good fortune for many years to come.

Future in his Hands

Mr. P. K. Standring, proposing 'Our Guests,' commented that the president, the council and the members must have some quite special kind of skill, because always at the Institution's annual dinner the guests were just those people whom the members would most particularly have wanted to see.

In welcoming Sir John Cockcroft and paying tribute to his work as Director of the Atomic Energy Research Establishment, Mr. Standring said one had the sobering thought that perhaps our future existence was in his hands. By a curious coincidence, he supposed the same thing might be said of Sir William Ogg (president of the Society of Chemical Industry) in a rather different way, because of his life's work in connection with agriculture; as Director of the Rothamsted Experimental station he was making a contribution to an industry on which, one imagined, the teeming multitudes inhabiting this island must depend in the future even more than in the past.

It was appropriate, since the Institution's members and guests were dining in the wonderful city of Westminster, that the Rt. Worshipful the Mayor and his lady should be present, and Mr. Standring offered them a very hearty welcome, as he did also to the Masters of the London Companies, and the presidents and other representatives of the kindred societies.

And finally, in welcoming the ladies, he said he could think of a multitude of reasons why it was right that they should be present at the annual dinner; one of those reasons was that they provided a wonderful incentive to brevity in speech-making.

Importance of Institution

Sir William Ogg, M.A., LL.D., F.R.S.E. (president of the Society of Chemical Industry), in the course of his response, emphasised the importance of the Institution, covering as it did a tremendous range of interests, spreading out in all directions. The profession might not be as old as that of agriculture, but its work extended back a long way, not in its present form, but in one form or another. He would expect that there was a chemical engineer in the garden of Eden looking after the compost heap—not preparing it, for chemical engineers didn't work themselves! They merely advised other people how to do it. He had come to that conclusion when he was a shift chemist in the middle ages! No doubt today, as then, when things got into a mess it was always the chemical engineers upon whom we relied. However, his function was not to inquire into their virtues and vices and private lives. He and his fellow guests were present to enjoy the Institution's hospitality and good company—or perhaps he should put it the other way round, for good fellowship was the essence of hospitality, and the guests had enjoyed that in full measure.

Mr. Robson then invested his successor, Sir Harold Hartley, with the insignia of the

presidency, a duty which, he said, it was an honour to perform. Sir Harold's distinguished career and his very delightful personality and friendliness had indeed made him not only well known, but extremely well respected. Recalling Sir Harold's previous period of office, Mr. Robson said it was somewhat unusual for a president to hand over the insignia of office to another president from whom he had received it at the beginning of his own presidency. It was a very great thing that he had been able to persuade Sir Harold to resume that office, in which he had served for a year, after which, for reasons of national importance, he was not then able to carry on for a second year. Mr. Robson added that he had lost no time, and the Council had lost no time, in ensuring that Sir Harold completed his full period of office.

Sir Harold said that two years ago, when he had transferred the chain of office to Mr. Robson, he had not dreamt that he would again find it around his own neck, with all the responsibilities that it implied. But he did appreciate immensely Mr. Robson's kindness in asking him to preside over the Institution for another year. The members knew how he felt about the future of chemical engineering and the future of the Institution; and he knew that he could count on their support and their forbearance. He would do his best, and he appreciated that he would have Dr. Brennan at his right hand.

His first duty as president was to thank Mr. Robson for all he had done for the Institution during his two years of office. It had been a great thing for the Institution to have had as its president during that period someone who brought with him the great prestige of a fine chemical engineer, and one who had had a wide experience in its councils. Under his guidance it had made very steady progress, as could be seen, for example, in its *Transactions* and its By-Laws. He had also carried the flag to Australia, where his visit was a great encouragement to chemical engineering. The members had very much enjoyed the wisdom and charm with which he had presided over their activities, and they were most grateful to him; he had done great service to the Institution.

Exports of refined petroleum products from the UK during the first quarter of this year earned a record total of just over £21,500,000.

Starch Output Grows

Centenary of Wet Milling Process

THE centenary of the discovery by John Polson of a process round which the British starch industry has been built is being celebrated this year by Brown & Polson Ltd., Royal Starch Works, Paisley.

When, in 1840, John Polson and William Brown went into partnership to produce starch from sago for stiffening muslins produced by their respective textile firms, they found that sago was not a completely satisfactory source material. This led John Polson to experiment with maize, which, in addition to having a high starch content, was cheap and abundant. The oily maize germ, however, could not be separated by dry milling and it was realised that the oil would contaminate the starch if not extracted at an early stage.

John Polson solved this problem by discovering and patenting the wet milling process, in which the grain is softened and torn without being crushed, thus loosening the germ so that it rises to the surface in a separator and is skimmed off. It immediately became possible to use maize as a source material on a large scale.

Rise in Production

By 1953 the production of starch and starch derivatives by the British starch industry rose to 279,000,000 lb. Although the process used today is fundamentally the same, modern techniques have so speeded up the processing time that the complete process, which took three weeks 100 years ago, is now completed in 30 minutes. From being a textile stiffener and a food in the form of cornflour as it was 100 years ago, starch is now used in about 400 forms and about 80 industries. British consumption is 300,000 tons a year.

In the past ten years Brown & Polson Ltd. have spent £250,000 on modernising the plant at the Royal Starch Works, which is mainly concerned with food products. Their St. Mirrens Works (formerly William McKean Ltd.), where industrial starch is produced, and their Glenfield Works (formerly William Wotherspoon Ltd.), where starch is used as a raw material for additives for paper and textile manufacture, and for core sands for foundries, are working to capacity.

Chemical & Dyestuffs Traders

Key Industry Duty Attacked at Annual Meeting

IN presenting his report at the thirty-first annual general meeting of the British Chemical and Dyestuffs Traders' Association, the chairman, Brigadier C. Norton Stafford, C.B.E., T.D., expressed regret that the recent Budget had revealed that it was proposed to continue Key Industry Duty for a further five years. While the Association supported measures which were deemed necessary in the national interest, Brigadier Norton Stafford said that it was opposed to unnecessary or excessive restrictions on trade, and for this reason it contended that Key Industry Duty had outlived its usefulness.

The great progress which the chemical industry had made under this form of protection had fulfilled the intention of the Safeguarding of Industries Act of 1921. The industry today was efficient and occupied a leading role in world chemical production, technical initiative and progress. Any duty which was prohibitive must hinder the flow of trade and deny to consumers the availability of a wider range of raw materials at competitive prices.

It was the view of the Association, he said, that any measure of protection which industry might feel justified in seeking should be subject to the procedure provided in the Import Duties Act of 1932, with each case being decided on its merits. This course, if adopted, would give all interested parties a reasonable opportunity of being heard before a decision to impose or vary an import duty was reached. The Association regarded a rate of 33⅓ per cent import duty as excessive.

Open Market Needed

These views, continued Brigadier Stafford, had been submitted to the Board of Trade in November last and they were consistent with the frequently stated belief that Britain's commercial greatness depended in no small part on her ability to create an open market where buyers and sellers could meet in an expanding world trade. A nation became great by the industry of its people and the ability of its citizens to create a prosperous trade with other countries.

Another trade restriction which had continued in operation far in excess of the period envisaged when it was first introduced was the Dyestuffs Import Licensing System. This system eliminated competition and had been the subject of much discussion owing to the procedure which must be followed by an applicant seeking to import a foreign dyestuff. Statements had recently been published which were said to express the consumers' point of view, advocating the continuance of this prohibitory measure, and at the same time pointing out that the UK dyestuffs industry was virile and supplied 90 per cent of the dyestuffs used in this country.

Not in Consumers' Best Interests

The only conclusion to arrive at from these claims was that there was no need for excessive protection. A prohibitory measure which resulted in a monopoly was not in the best interests of consumers, and invited the attention of the Monopolies and Restrictive Practices Commission. It was hoped that the time was not far distant when the restriction by licence could be removed.

The indiscriminate use of clauses on bills of lading, and the need for some revision of the London Lighterage Clause, were other subjects which had received attention during the year.

Another matter to which the attention of members had been directed concerned the use of printed reservations on contracts, and more especially on acknowledgements of contracts, and the need for careful scrutiny of such reservations.

The easing of licensing restrictions and the lessening of government control in the commodity markets had restored to merchants some of the initiative and freedom, without which the United Kingdom could never regain its position in world trade. There were, however, still many Statutory Orders and Regulations, made under powers delegated to a Minister, relating to trade which affected the activities of merchants and which required the close attention of trade organisations, since it was only by a collective approach that a trade or industry could be effective in safeguarding its vital interests. It might be observed in passing

that the importance of the representative trade association had developed side by side with the growth of delegated legislation.

Export trade was a considerable part of a merchant's business, and merchants did not need to be exhorted to extend their trade in overseas markets. That was the business they sought, and in earlier and more prosperous times, free from currency and quota restrictions, the merchant was undoubtedly successful in developing export trade.

It was inevitable that competition in world markets would become more intense, but by enterprise and resource the merchant would again make a substantial contribution to the prosperity of the country in overseas trade. To achieve this there was need for a greater measure of co-operation from home producers in the matter of supplies, and a clearer understanding of the function of the merchant.

Brigadier Norton Stafford referred to the past year as another period of useful activity by the Association on behalf of chemical traders and distributors, and said that he was pleased to record that cordial relations had continued with Her Majesty's Ministries and that the degree of co-operation attained with the Government Departments had been most helpful.

Helpful Individual Service

The Association, he said, had continued to render to members that helpful individual service which was a part of the function of the organisation. Bulletins issued during the year had contained information of importance to chemical merchants as a whole, or to a section of the trade in particular.

Following a vote of thanks to all the officers of the Association, and after the report had been approved, election of officers took place as follows:—

President: Mr. G. S. Bache.

Vice-President: Mr. C. W. Lovegrove.

Chairman: Brigadier C. Norton Stafford, C.B.E., T.D.

Vice-Chairman: Mr. C. F. V. Blagden.

Hon. Treasurer: Mr. Ian D. Orr, A.M.I.M.M.

Executive Council: Mr. C. Fountain (Jensen, Lawson & Co. Ltd.), Mr. H. Gilliat (E. G. Jepson & Co. Ltd.), and Mr. D. E. Flaherty (Guest Industrials Ltd.).

Hon. Auditor: Mr. R. Heap, F.C.R.A.

The annual luncheon of the Association was held at the Savoy Hotel on the same day with the chairman, Brigadier C. Norton Stafford, presiding. The toast 'The Association' was proposed by the Rt. Hon. Ian Macleod, M.P., Minister of Health, and the response was made by Mr. G. S. Bache, president of the Association. The health of the guests was proposed by Brigadier Norton Stafford and the response was by Mr. C. F Merriam, M.C., president of the British Plastics Federation.

Mr. Macleod said that he thought it was the duty of any government to create confidence in overseas markets, particularly in the pound sterling, and to make it possible for business men to keep a fair share of the returns on their investments. If the Government provided a suitable atmosphere for industry it could expect that industry would, in return, use all its energy and ingenuity to build up overseas trade.

Somewhat Disappointed

Replying, Mr. Bache said that at the annual luncheon last year he had said that all industry had suffered a good deal from business recession during 1952, but had expressed the belief that they were beginning a slow but steady recovery. His optimism had been justified by developments during 1953. He had been somewhat disappointed by the recent Budget, but realised the need for caution in view of the American trade recession. He had been told, however, that conditions were now improving in the United States and he felt that many of the existing restrictions on trade could now go. The Empire had been built up on private enterprise and he would like to see a return to free trade. He urged members to try not to be so insular and to try sometimes to converse in the language of the customer.

Revised Atomic Weights

DELIBERATIONS of the 17th Conference of the International Union of Pure and Applied Chemistry, held in Stockholm from 29 July to 4 August last year, have just been published. Important recommendations on nomenclature and symbols are given, and ten changes in atomic weights are proposed as follows: carbon, 12.011; gold, 197.0; iridium, 192.2; manganese, 54.94; ruthenium, 101.1; sodium, 22.991; tantalum, 180.95; terbium, 158.93; thorium, 232.05; thulium, 168.94.

Power in Chemical Industry

ON Friday 23 April, the Graduates' and Students' Section of the Institution of Chemical Engineers held a symposium at Battersea Polytechnic on 'Fuel and Power in the Chemical Industry.' We print here extracts from four of the papers presented at the meeting.

Steam Generation for Chemical Plant

MR. R. H. PADDON-ROW (Foster Wheeler Ltd.)

IN deciding on the type of plant to be installed, there are five major decisions to be made:—

1. Is the steam to be used entirely for process requirements?
2. Will it be economical to generate power before utilising the steam for process requirements?
3. What type of fuel should be used?
4. Should the units be housed or designed for outdoor operation?
5. What steam pressure and temperature should be adopted?

The decision between (1) and (2) will depend on economical considerations and will be partly decided by the balance between process steam and electrical power requirements. The cheapest arrangement when the electrical power demand is always equal to or less than process steam requirements will be a back pressure turbine driving an electrical generator and exhausting to process. Power is exported during periods of low electrical consumption.

Refinery gas and/or fuel oil firing enables units to be designed for a low initial cost compared with coal firing and, in addition, maintenance should be considerably lower due to the cleaner fuel and the absence of any coal or ash handling equipment. Coal fired units vary considerably, depending on the type of firing equipment used, such as travelling-grate stokers, spreader stokers, retort stokers and pulverised fuel. It is usually uneconomical to use pulverised fuel firing, because of the greater capital expenditure, for boilers below about 200,000 lb. per hr. evaporation. Travelling-grate stoker fired boilers of 250,000 lb. per hr. evaporation are operating successfully and units of approximately this size are also being fired by retort and spreader type stokers.

Outdoor units are becoming more popular in this country and can be operated successfully without undue trouble. The extra cost of a unit designed for outdoor operation will be in the region of 2-5 per cent, depending on the type of boiler, but this will be offset generally by the saving in building cost. The steam pressure and temperature will depend in general on process requirements, power generation and the maintenance capabilities of the works in question.

Rating & Availability

These two design features are entirely interdependent. Everyone knows the meaning of availability, but the term 'rating' is a little vague and may be defined more clearly in relation to the various parts of the boiler to which it is applied:—

(a) *Furnace Rating.* This is usually given as the heat liberation in B.Th.U.'s per hr. per cu. ft. of furnace volume and may be based on the G.C.V. or Nett C.V. of the fuel and does not include any heat from the air supply. It is a rather misleading figure if used to convey an idea of furnace temperature and thus the possible maintenance or slagging troubles, but it has the use of giving an indication of the average time the combustible particles remain in the combustion chamber. For units above about 40,000 lb. per hr. evaporation, an approximate guide, based on the assumption that it is required to operate for long periods (i.e. about 6,000 hours per year) at the maximum continuous load, is to limit the heat liberation in furnace to the following figures:—

(1) Gas and/or oil fired units—30,000-35,000 B.Th.U. per hr. per cu. ft. of furnace volume.

(2) Stoker fired units — 20,000-25,000 B.Th.U. per hr. per cu. ft. of furnace volume.

(3) Pulverised fuel fired units—16,000-20,000 B.Th.U. per hr. per cu. ft. of furnace volume.

The above figures are based on the G.C.V. of the fuel and it is understood that during short peak periods the upper limts may be considerably exceeded. In general, the figures may be increased for smaller boilers and decreased for larger units, but this

depends largely on the amount of water cooling provided in the combustion chamber.

For large units having fully water cooled combustion chambers it is usual to give a figure of heat liberation per sq. ft. of furnace envelope. This is a good indication of furnace temperature and it is quite usual to limit this figure to approximately 85,000 B.Th.U. per hr. per sq. ft. for pulverised fuel units.

(b) *Rating of Firing Equipment.* This is very variable and, particularly with coal fired units, depends on the type of fuel provided. For oil, gas, and P.F. firing the liberation of heat per burner depends to a great extent on the draught loss across the register and also on the flame clearances. The ratings of travelling grate stokers vary between such wide limits as 33-43 lb. of fuel per hr. per sq. ft. of effective grate area. Sometimes the rating is specified as B.Th.U. per hr. per sq. ft. of effective grate area and a reasonable range on this basis would be 340,000-440,000, while spreader stokers approach 600,000 B.Th.U. per hr. per sq. ft. of grate area, due to the fact that a large proportion of the fuel is burnt in suspension.

(c) *Heat Absorption Rating.* This is usually given as lb. of steam per sq. ft. of boiler and water wall heating surface per hr. and must be used with understanding. If there is very little or no heating surface in the furnace, then a high figure for this rating would indicate closely pitched tubes which may give rise to low availability under adverse fuel conditions.

(d) *Superheater.* If a superheater is fitted to the boiler then it is necessary to promote good steam and gas distribution to limit the metal temperatures of the tubes. With high temperature steam particular attention should be given to obtaining high rates of steam mass flow through the elements and metal temperatures of the tubes should be calculated. For metal temperatures above 850° F., it is advisable to use low chrome/molybdenum alloy steel.

Necessity for Pure Steam

When a superheater is fitted it is very necessary to ensure that the steam from the boiler drum is very pure and it is usual to specify that the total dissolved solids in the steam should not exceed 1 ppm. This figure should be specified for all pressures, but in order to allow the wetness fraction to increase with increasing steam pressure, it is usual to reduce the allowable quantity of total dissolved solids in the boiler water.

The reason for doing this is the greater difficulty in separating steam and water at the high pressures where their densities are nearing equality. The fitting of efficient water separating and steam drying equipment becomes very necessary and there are several designs which give excellent results.

(e) *Availability.* This is a very important feature and designs should be carefully studied from this point of view.

In gas and oil firing, unless vanadium bearing oil is used, the main causes of fouling of the gas side surfaces are bad combustion and the lowering of the gas leaving temperature to below the acid dewpoint. The latter is a serious problem when high sulphur fuels are employed as the dewpoint temperature rises approximately 30° F for each 1 per cent increase in sulphur content.

Air Heaters

Air heaters can be a source of severe trouble unless designed correctly, with metal temperatures above the dew point, and fitted with air re-circulation and by-pass arrangements Air re-circulation maintains the boiler efficiency, but is only practicable over a fairly narrow range whereas air by-passing can cover the widest range, but means that some efficiency must be sacrificed.

Economisers with low feed water inlet temperatures can also be a source of trouble and means should be provided for either re-circulating water from the outlet to the inlet or heating the feed water to a safe figure.

Vanadium bearing oils can cause fouling, mostly in the 1,500° F temperature belt, and also produce severe attack of high alloy steels.

In coal firing, in addition to high sulphur troubles, very severe slagging can take place in the furnace, superheater and boiler sections. This fouling can be caused by high chlorine or high phosphorus contents in the coals and it is also possible to experience severe tube wastage due to sulphate attack. This is a very vexing problem and is still being investigated, but the general features which minimise the effects are:—(1) Low furnace exit temperatures coupled with low rising velocities; (2) low velocities through the furnace slag screen; (3) low fuel bed temperatures; and (4) widely pitched slag screen and superheater tubes.

The arrangement of boiler passes should

be such as to enable the maximum amount of ash to be trapped in order to reduce the dust collector load, or, if one is not fitted, to reduce the quantity of grit handled by the I.D. fan.

Construction

Provision must be made for easy access to the various boiler parts and sufficient cleaning means, such as sootblowers and water washing equipment, should be provided.

Cost

A balance must be struck between cost and all the desirable features mentioned. A general principle is to buy the most easily rated boiler than can be afforded.

Other Points

An extremely important point which must be closely investigated and settled is the feed water supply and water treatment. The advice of feed water treatment experts should always be sought at an early stage so that water supplies can be analysed and the correct equipment put forward.

With pressure above 650 psi. the presence of silica can cause trouble and at 1,000 psi. there is every possibility of serious deposition of silica in process heat exchangers and/or turbines. There are two main methods employed to overcome this which should be studied carefully. One way is to demineralise the water, thus providing feed of very high purity, and the other is to reduce the silica content to a reasonable figure by the use of a hot lime soda process using dolomitic lime and then employing a boiler utilising the dual circulation principle.

The dual circulation boiler is operated in exactly the same manner as a conventional boiler and presents no difficulties as the additional features are built into the unit and, once set, require no adjustment. Briefly, the principle employed divides the boiler water system into two circuits, the primary embracing the highly heated furnace tubes, and the secondary the lowly heated boiler convection tubes. All the steam taken from the boiler is generated in the furnace section, while that generated in the boiler convection surface is condensed by the feed water.

A continuous blow-down, equivalent to the sum of the unit blow-down and the steam generated in the secondary section, is maintained from the primary to the secondary section and this controls the solids concentration in the primary section at a very low figure. For equal unit blow-down rates the dual circulation boiler will produce steam having a silica content approximately 1/5th of that produced by a conventional boiler, but this figure is really dependent on the percentage blow-down from the unit. Several dual circulation units are operating very successfully in the USA, although, up to the moment, none is operating in this country.

Chemical Engineering Aspects of Gas Manufacture

MR. J. J. PRIESTLEY (W. C. Holmes & Co. Ltd.)

THE gas and coking industries not only provide alternative fuels for the chemical industry but also several important raw materials, sulphur and ferrocyanides. Coal carbonisation in ovens or retorts presents a difficult problem in heat transfer because of the low conductivity of the carbonising charge. Flue temperatures have been increased to the maximum possible with existing refractories to increase the temperature differential to speed up the process.

A recent significant advance has been the use of carrier gas recycling, an old technique with a new application, described by Nicklin and Redman, and also by Gaskill; which has increased coal throughputs of existing plants by 70 per cent, promoting heat transfer by increased gas turbulence. In the field of coal gasification the new technique of oxygen gasification under pressure, and possible catalysis to increase methane production, involves considerable chemical engineering techniques.

The purification of crude gas includes the unit processes of heat transfer, gas absorption with and without chemical reaction, adsorption, mechanical separations and catalysis. The cooling of gas is a special problem involving simultaneous heat transfer and mass transfer of water vapour. Electrical precipitation of tar is widely used. Selective absorption is used for the removal of ammonia, benzole, toluole, carbon disulphide, naphthalene and water vapour, multistage washing generally being adopted for these extraction processes.

Hydrogen sulphide is usually removed by solid beds of iron oxide, though liquid processes have been developed. Adsorption by active carbon is frequently used as an alter-

native method of benzole extraction. Catalytic processes have been developed for organic sulphur removal. Finally the treatment of the liquid effluents from gas works and coke ovens involves the processes of distillation, solvent extraction, evaporation and oxidation.

Energy Aspects of Evaporation

MR. B. N. REAVELL (Kestner Evaporating & Engineering Co. Ltd.)

THE sources of energy most readily available are coal and oil. Usually these sources of energy must be converted to other forms to facilitate the conveyance of heat in a controllable manner and at a suitable temperature level. For this purpose steam is the medium most generally used as it can be generated and conveyed by pipe line simply and cheaply and its temperature can be controlled to an exact degree over a wide range.

Coal may be converted to gas and the gas burnt in the evaporating plant to provide the required heat. This is more convenient than burning the coal directly as gas may be stored, conveyed by pipeline, controlled by simple means, and the heat is available over a wide temperature range. Electrical energy is another convenient source of heat in evaporation plants and it has the advantage that it can be readily produced from any source of energy, coal or oil, including water power. The adoption of electricity for industrial evaporation plants, is, however, limited by the relatively high cost of operation and lack of generating capacity.

Electromagnetic energy in the form of infra-red radiation, high frequency and low frequency induction systems is being used to a small extent for specialised evaporation problems and there appear to be promising developments in the utilisation of this form of energy. Fluid media other than steam or water are being increasingly used to convey heat generated by combustion of coal, oil or gas and to apply the heat in evaporators.

The convenience of steam for evaporation work needs no detailed description. The fact that it can be used for heating almost any process plant allied to the evaporator is another advantage.

The 'thermal compactness' of steam is worth consideration. For example, if by virtue of the chemical composition of the liquor to be evaporated we must limit the maximum temperature of the heating medium to 150° (Centigrade) and in a given evaporator 1,000,000 B.Th.U.'s per hour are required at an inlet temperature of 150°, this will be supplied by passing into and condensing in the evaporator 1,100 lb. or 700 cu. ft. of steam per hr. at 54 psi. The pipe and valves conveying and controlling the steam may be $2\frac{1}{2}$ in. bore or less for a pressure drop of about $\frac{1}{2}$ lb. per 100 ft. of piping.

To effect similar conditions in an evaporator using direct products of combustion from coal or oil we should have to pass as much as 4,500 lb. or 800,000 cu. ft. per hr. of hot gases at 150° into the evaporator assuming an effective temperature drop of 50°, and the duct to convey these gases would need to be at least 24 in. diameter for a pressure drop of $\frac{1}{2}$ lb. per 100 ft. of duct. This is perhaps an elaborate way of saying that the effective heating capacity of 1 lb. steam at 54 psi. or 150° is about 37 times that of 1 lb. of combustion gases at 150°.

Since the cost of an evaporator for a given duty is to a considerable extent dependent on its overall size and effective heating surface, the thermal compactness of steam and its ability to transfer a great deal of heat over a small surface area is a great advantage. However, the temperature level at which steam can be employed usefully is limited to about 195° or 200 psi. at the top range and 80° or 16 in. Hg vacuum at the bottom range.

Media Other than Steam

When an evaporation plant is required to work outside this range of temperatures a heating medium other than steam must be employed. High B.P. fluids such as mineral oils, or mixtures of organic liquids, are generally used for temperatures up to about 300° and for still higher temperatures these liquids are boiled and the vapours used at temperatures as high as 400°. The source of energy used to heat the fluids may be exactly the same as used for raising steam so that apart from providing a higher temperature level no advantages prevail over the use of steam. None of these fluids, however, has such a high latent heat as steam and the heat transfer under condensing conditions is less because of this and because of viscosity and lower thermal conductivity. For this reason the surface of evaporators using such fluid heating media must be greater than for steam—in some cases as much as doubled.

High Vacuum Evaporation

To meet the requirements of very low temperature, high vacuum evaporation, a new technique of energy utilisation has been developed in the past few years. In this system the calandria or heating section and condenser or cooling sections of the evaporator plant are linked together in a closed system incorporating a gas compressor and expansion valve. Ammonia gas fills the system and when mechanical energy is applied to the compressor the hot compressed gas serves as the medium for supplying heat to the calandria and after losing latent heat and condensing in the calandria, the liquid ammonia is cooled in passing through the expansion valve and flows on to the condenser. Here the ammonia evaporates, heat is gained, and the gas recycled to the compressor.

Since the latent heat of evaporation is retained in the system the only energy supplied is that required to operate the compressor. This energy is much below the equivalent of the latent heat required for evaporation, and plant of this type can easily be made to equal quadruple or even quintuple effect evaporators so far as energy requirements are concerned.

Electrical Energy

Electrical energy may be converted to heat energy very readily by a simple resistance circuit. The resistance may be formed either by the liquid to be evaporated or by resistance elements immersed in the liquid. As in the case of steam, electrical energy has the advantage of thermal compactness—a resistance element liberating energy in the form of heat at the rate of 1,000,000 B.Th.U.s per hr. can conveniently be housed in a space 4 ft. 6 in. diameter by 12 in. deep. Temperature control is simple and the temperature level that can be conveniently operated may be from 150° to 1,000°. However, it is not practical to obtain very low working temperatures as this involves high resistance elements and low voltage with attendant high plant cost.

A new method of applying electrical energy to the heating of evaporating pans has recently been introduced, known as low frequency induction heating. In this system the vessel or pan containing the liquid to be heated is made to form the secondary circuit of a transformer. The primary winding, comprising a copper coil wound externally to the vessel, is supplied with 50 cycle AC current at normal grid supply voltage. Low voltage current induced in the secondary circuit generates heat. This system is particularly well suited to heating and evaporating liquids at temperatures above the convenient range of steam temperature, say, 600° and downwards. The efficiency of such a system is quite good, as much as 85 per cent of the electrical energy put in being employed usefully in heating the contents of the pan.

Other Energy Sources

Utilisation of solar energy for evaporation purposes has not been developed to any extent, but it is still used in the production of salt in tropical and sub-tropical countries. Solar radiation is not a 'thermally compact' source of heat and with average bright sun conditions falling on an area of 270 sq. ft. would enable mechanical energy to be developed at the rate of 1 kW, which is equivalent to 5 per cent efficiency.

The possibilities of using atomic energy as a primary source of heat are attractive and it would appear that no change in existing technique of applying heat to effect evaporation would be required. Such forms of energy would then be available for use in evaporation plant of known design.

The choice of the type of evaporator most suitable to a particular process may often be governed more by consideration of the energy requirements of allied equipment than by the evaporator section alone. It is only by taking the overall energy requirements into account that we can decide the best sources and forms of energy for a given problem.

Use of Electricity in Electrochemical Industry

MR. R. S. CLEGG (British Aluminium Co.)

THE particular electrochemical process described is the production of aluminium. Aluminium is about lowest among the common metals in the scale of electrochemical equivalents and cheap electric power is therefore a pre-requisite for its production. In this country, at any rate, it does not seem that power derived from coal could be used economically in competition with hydro-electric power.

The British Aluminium Company's largest factory at Fort William has a total generation capacity of 72,000 kW, of which 60,000

kW is normally available. The 12 generating units produce DC power at 300 volts and 20,000 amps each. Aluminium cell voltages are approximately 5, so that normally 60 cells are connected in series in a given circuit. Hitherto cells of 40,000 amp. capacity have been operated but larger ones are now being used.

In cell operation the overall reaction is the reduction of alumina to aluminium at the cathode and the oxidation of the carbon anode to CO_2 and CO. The main source of cathode current inefficiency is metal 'fog' and there is a relationship between current efficiency and the CO/CO_2 ratio of the anode gases.

The limitations of a 40,000 amp. prebaked anode type of furnace—unavoidable heat losses from the top of the furnace and the costs of shaping and baking the anodes—have been overcome by the continuous anode first patented in Norway by Soderberg in 1927. In this anode, the heat otherwise lost from the top of the furnace is used to bake the mixture of ground coke and pitch from which the anodes are made. The expected savings in the cell operating voltage and anode production costs have both been realised.

The overall power efficiency of the aluminium cell operating at 85 per cent current efficiency and at 4.9 volts is approximately 30 per cent. The more obvious method of reducing heat losses by increased thermal insulation of the cell is of very limited application since, with small inter-polar distances, anode and cathode products back-react with consequent reduced current efficiency.

'This Unhappy Dispute'

Letters to Shareholders of Bowmans Chemicals, Ltd.

SHAREHOLDERS of Bowmans Chemicals Ltd. (whose annual meeting was reported in THE CHEMICAL AGE last week, p. 996) have received circular letters from the secretary, Mr. W. H. Bellamy, referring to letters sent to them by Mr. W. G. Black and to the requisitioning by Mr. Black and others of an extraordinary general meeting on 3 June for the purpose of removing from office three of the directors of the company.

The letter from the secretary to the ordinary shareholders describes the requisitioning of the extraordinary meeting as 'an irresponsible action which can only damage the company and through it the interests of the general body of shareholders' and continues: 'Nothing has happened in the last twelve months to justify this attack upon the board. On the contrary, the company's affairs have undergone a striking improvement, which was recognised at the annual general meeting by the fact that the motion for the adoption of the directors' report and the accounts for the year ended 31 October, 1953, was carried on a poll at that meeting by a majority of some five to one.'

The secretary's letter to the preference shareholders points out that as arrears of dividend on the preference shares were paid on 1 April the preference shareholders are not entitled to attend and vote at the extraordinary meeting. However, the board considered that as the matter was one of vital concern to the preference shareholders they should have an opportunity of meeting to discuss the matter and record their opinion. The board had therefore decided to hold a separate meeting of the preference shareholders immediately before the extraordinary meeting. The letter goes on '. . . it is hoped that the opposition will be as willing as the board are to accept the verdict of the preference shareholders' meeting combined with that of the extraordinary general meeting as being final, so that this unhappy and long drawn out dispute which is so damaging to the interests of the company may be finally brought to an end.'

Lactic Acid Price Increases

In consequence of the increased cost of raw materials, fuel, wages and freight charges, Bowmans Chemicals Ltd. have announced that they have found it necessary to increase their prices for dark lactic acid (tanners' grade), the new prices for which are now as follows—

	5-ton lots	1-ton lots	Cask-lots
Dark lactic acid—			
44 per cent by weight ..	£68	£70	£73
75 per cent by weight ..	£116	£119	£124

all net per ton, ex-works, packed in casks charged extra at 50s. each and returnable carriage paid. As all deliveries are now in casks, the concessionary allowance of £2 per ton to customers who took delivery in drums no longer applies.

Monsanto Chemicals, Ltd.

Chairman's Annual Review Shows Record Sales & Profits

A MARKED improvement in both turnover and profit by Monsanto Chemicals Ltd. during 1953 is commented upon by the chairman, Mr. Edward A. O'Neal, Jnr., in the course of a statement issued in connection with the annual meeting which is to be held in London on 8 June.

Sales increased by 9 per cent to reach the record total of £10,852,854, states Mr. O'Neal, while direct exports, which amounted to 40 per cent of total sales, were also a record at £4,320,000. A downward trend in the selling prices of several major groups of products had been more than offset by increased sales volume, by the consequent higher and more efficient levels of operation at the factories and by some lower raw material costs. As a result, the net profit amounted to £670,860, an increase of 128 per cent over 1952.

Inventories had been held conservatively in line with trading requirements and at the end of the year stood at £2,022,792. Development and engineering efforts had been extended on various projects deemed essential to the continuous and orderly development of the company's plans for expansion both at home and abroad.

More Efficient Production

With the improved volume of turnover, both the company's factories were able to operate at more efficient production levels, with the exception of the pharmaceuticals and rubber chemicals group, where demand fell considerably short of capacity. Exports again played an important part in the company's activities, increasing by £300,000 above the previous year. Nevertheless, increasing competition was experienced in all the overseas markets—not only from similar exporters but from new local producers in various markets to which the company had regularly sold goods in recent years.

The research laboratories at Fulmer, Buckinghamshire, were now fully established and were providing a valuable service, both to the company's customers and to the sales division, in the development of new uses and applications for the company's products, especially in the rubber, textile, plastics, detergents, oil additive and agricultural chemical fields.

At the end of the year, Mr. O'Neal continues, the company's employees totalled 3,435, compared with 3,318 at the end of 1952. Wage rates had been increased by 25.4 per cent over the past three years and a further advance became effective on 1 January last. The increases made high productivity a most compelling objective. The trade unions were co-operating with the company and good progress was being made with the joint effort in that direction.

Increasing Capital Investment

The company had continued to assign experienced staff to the task of ensuring that production techniques and equipment were kept efficient and up to date, and substantial capital had regularly been made available to back up their expert recommendations. The average capital investment per employee had increased steadily year by year and today, on the average, approximately £2,700 capital had to be found to provide a job for each additional employee engaged.

Looking to the future, Mr. O'Neal states that although keen competition both at home and abroad seems more likely to intensify than decline, the company has set higher sales targets as a guide for commercial and production planning. Additional supplies of certain products would become available during this year from new plants now under construction.

The company would, through its own research, continue to seek new products and processes.

Papers Wanted

Section XVIII of the 27th International Congress of Industrial Chemistry in Brussels next September will be concerned with ceramics, bricks, tiles and refractories. Anyone who would care to submit a paper on refractory materials at the conference is invited to communicate with Mr. G. R. Rigby, British Ceramic Research Association, Queen's Road, Penkhull, Stoke-on-Trent, who will gladly give further particulars to those who are interested.

OCCA London Section

Mr. R. F. G. Holness Re-elected Chairman at AGM

THE annual general meeting of the London Section of OCCA was held at the Criterion Restaurant, Piccadilly Circus, London, on Tuesday, 27 April. Mr. R. F. G. Holness presided, as chairman of the Section for the past year, and during the meeting he was re-elected to that office.

The adoption of the annual report was proposed by Dr. S. R. W. Martin. Speaking of this year's Technical Trade Exhibition, he said it was very much to the credit, not only of the Section, but of OCCA as a whole, and to all who had had anything to do with its organisation. Thanks were due to the officers and committee for the magnificent work that had been done.

Mr. E. D. Eddowes, seconding the adoption of the report, said he believed the Section's membership was 41 per cent of the total throughout the country.

Hon. Treasurer Recovering

In connection with the financial report, reference was made to the illness of the Hon. Treasurer of the Section, Mr. H. A. Newnham, who had been in hospital. The Chairman was able to announce that he was now back home, making excellent progress.

Mr. R. N. Wheeler, proposing the adoption of the financial statement, paid tribute to the work of Mr. Newnham and of Mr. A. H. Soane (Hon. Auditor). The statement was a tribute to the excellent way in which the committee, under the chairmanship of Mr. Holness, had managed the Section's affairs during the past year.

The Honorary Officers were re-elected as follows:—*Hon. Secretary*: Mr. H. C. Worsdall; *Hon. Treasurer*: Mr. H. A. Newnham; *Hon. Publications Secretary*: Mr. J. A. L. Hawkey; *Hon. Auditor*: Mr. A. H. Soane.

The re-election of the Chairman was proposed by Mr. L. O. Kekwick (Past President of the Association and Past Chairman of the London Section), who paid tribute to Mr. Holness as a man of outstanding personality and honesty of purpose in all that he did. Those remarks were endorsed by Mr. W. V. Lee, in seconding, who also thanked him on behalf of all for his work and offered him best wishes for his second term of office.

Mr. Holness, in his response, said he had served on the committee for a number of years, but he had little thought that to be translated to the chair of the Section would be such a stimulating experience; it was one of those things which had to be experienced to be believed. The committee members were pillars of strength in their own individual ways, and he expressed his personal thanks to them.

As the result of a ballot, the following were declared elected to fill three vacancies on the Committee: Mr. A. T. S. Rudram, Dr. S. R. W. Martin and Mr. H. A. Idle.

The meeting ended with a vote of thanks, proposed by Dr. L. A. Jordan (Past President), to the chairman and committee, and to the retiring members of the committee.

Following the annual meeting, the members enjoyed a talk by Mr. L. C. Nickolls, M.Sc., D.I.C., A.R.C.S., F.R.I.C., Director of the Metropolitan Police Laboratory, New Scotland Yard, on 'Some Experiences of a Scientist in Criminal Investigation.'

US Arsenic in 1953

Production of white arsenic in the United States in 1953 decreased 31 per cent from the 15,700 short tons produced in 1952 and totalled 10,900 tons, according to the Bureau of Mines, US Department of the Interior. Producers' stocks at the end of the year amounted to 10,800 tons, a 4 per cent decrease from the figure of 11,300 tons reported on 31 December, 1952. Imports of white arsenic were reported as 4,700 tons, 4 per cent over the 4,500 tons imported during the preceding year. Mexico supplied 93 per cent of the total. Imports of metallic arsenic more than doubled the 30 tons imported in 1952, and totalled 70 tons.

'Fluon' Polytetrafluoroethylene

In an article with this title, published on 24 April (p. 929), the statement that 'the working temperature range of components made from 'Fluon' is remarkably wide—from 80° to 250°' should, of course, have read 'from −80° to 250°.' We apologise to our readers and to the I.C.I. Plastics Division for this unfortunate misprint.

Electrochemical Research in India

Survey of Progress Made During 1953

WHILE electrochemistry has been taught and practised in India for a long time, it is only during the last few years that organised research in electrochemical fields has been planned and conducted systematically. The starting of the India section of the Electrochemical Society of America in 1950 enabled workers in the field to come together and discuss problems of common interest and an impetus to initiate research in diverse facets of the subject.

Landmark Reached

The year 1953 may well be said to be the landmark in the organisation of electrochemistry in India, because a Central Electrochemical Research Institute was set up by the Council of Scientific and Industrial Research of the Government of India at Karaikkudi in South India. The Institute has major divisions dealing with electrochemistry, electrometallurgy, electrodeposition, electrolytic cells and research utilisation and has initiated both fundamental and applied research.[1]

The salient features of electrochemical research conducted in the country during the year under review are concerned with the production of high purity inorganic chemicals, electrolytic oxidation and reduction of organic chemicals, electrodeposition of metals and alloys from non-conventional baths, and certain theoretical concepts.

In the industrial electrolytic field a detailed study has been made by Chakrabarti and Banerji[2] of the factors influencing the production of high purity electrolytic manganese dioxide, in the flowing electrolytic system using a three compartment cell between stainless steel cathodes and lead-antimony anode. The current efficiency was found to increase with rise in temperature and fall in current density passing through a maximum at a concentration of about 200 g. per l. of manganous sulphate. The concentration of sulphuric acid does not materially influence the current efficiency at higher temperatures.

The product comprises 90 per cent manganese dioxide with minute traces of lead and lower oxides of manganese and 10 per cent moisture. A mechanism has been proposed to explain the oxidation process assuming the discharged hydroxyl ion at the anode to be the oxidising agent. It is claimed that 1 lb. of manganese dioxide is obtainable from every kWh of electrical energy consumed. A patent has been sought for this process.

In a study[3] of the physical and chemical properties of cuprous oxide prepared under a variety of conditions by electrolysing a slightly alkaline solution of sodium chloride between copper electrodes, Hira Lal has found that, besides cuprous oxide, both cupric oxide and free copper were obtained. The formation of free copper was attributed probably to the cathodic reduction of the positively charged cuprous oxide micelles. The proportion of cupric hydroxide in the product was influenced by the temperature of electrolysis, the current density and concentration of the electrolyte. X-ray powder photographs indicated that the colour of the product varied with the crystallite size of cuprous oxide and also showed the presence of cupric hydroxide but not of cuprous hydroxide.

Direct Production of Solid Salts

A method for obtaining solid ammonium persulphate directly from the electrolytic cell, using a platinum anode and a graphite cathode, has been worked out by Jatkar and Sesadri.[4] The current efficiency falls off gradually with the progress of electrolysis but is much less than what is obtained with persulphuric acid. The method is based on the solubility of the salts in the ternary system $(NH_4)_2SO_4$-$(NH_4)_2S_2O_8$-H_2O. Electrolysis of 4N sulphuric acid-ammonium sulphate (saturated) results in the continuous production of solid ammonium persulphate of 80-85 per cent purity. One recrystallisation of the crude product gives crystals of 99.84 per cent purity.

Patel and Rao[5-7] have studied in detail the electrochemical preparation of sodium hydrosulphite using a mercury cathode. A patent has been granted for the process. They have employed a catholyte containing 20-30 per cent sodium bisulphite together with a high concentration of sodium chloride, maintained a low *p*H, a temperature of 50°

during electrolysis with a current density of 2-3 amp. per sq. dm. at the cathode. They have used other metallic cathodes such as iron, lead, nickel and zinc, and have offered an explanation for the hydrogen over-voltage of the cathode and its efficiency in the electrolytic reduction of bisulphite to hydrosulphite. The solubilities of the product in water, in aqueous sodium chloride and in aqueous alcohol in different strengths and at different temperatures have been determined.

Organic Reactions

In the realm of organic reactions, benzaldehyde has been obtained by De and Maller[8] by the electrolytic oxidation of toluene in an undivided cell consisting of lead electrodes and using 60 per cent sulphuric acid with mixed oxygen carriers. A high current density of 6.8 amp. per sq. dm., a temperature of 60-70° and use of manganous and ceric sulphates are essential for the process. Benzaldehyde is isolated as its sodium bisulphite compound.

Salicylaldehyde has been prepared by the electrolytic reduction of salicylic acid[8a]. Fatty acid amines have been prepared[9] by the electroreduction of the corresponding long chain nitriles employing a copper cathode in the presence of Raney's nickel in ammoniacal alcoholic medium. The method is claimed to be more economical and convenient than the more complicated high pressure hydrogenation process.

The polyelectrolyte nature of sodium alginate has been studied by Das Gupta and co-workers[10], with reference to viscosity of its solution in different concentrations and in presence of electrolytes and the conductivity of its solutions. The physicochemical properties of polyglucosamine hydrochloride solutions have been elucidated[11]. The behaviour of poly-electrolytes has been explained by the folding chain theory of Fuoss. Hira Lal[12] has presented the specific and partial specific volume data for potassium laurate and lauryl sulphonic acid at 25° and 0.2° and has formulated an empirical equation relating the specific volumes with the osmotic coefficients of colloidal electrolytes.

In the field of electrodeposition, a number of researches has been reported. Vaid and Ramachar[13] have investigated the possibilities of using pyrophosphate complexes of tin and copper for electrodeposition of tin-copper alloys. It has been shown that baths using copper pyrophosphate, stannous pyrophosphate, sodium hydrogen phosphate and disodium hydrogen phosphate can be evolved and details of concentration of the various constituents, current densities, temperature and compositions of the alloy deposits are given. Alloy deposits varying widely in the percentages of tin and copper can be obtained under different conditions.

Ramachar and Shivaraman[14] have given the conditions for the electrodeposition of copper on steel by using a complex copper monoethanolamine solution. The solution does not deposit copper on steel by immersion and is comparable to the cyanide bath in giving smoothness, brightness and adherence of deposit. The incorporation of Rochelle salt considerably improves the performance of the bath and optimum conditions have been discussed for obtaining satisfactory deposits. Copper has also been deposited from a diethanolamine solution by the same workers[15].

Ramachar and Sadagoplachari[16] have worked out a process for the deposition of silver from a complex iodide bath, comparable to the cyanide bath, and the optimum plating conditions and the effect of certain addition agents are discussed. Modi and Tendolkar[17] have studied the electrodeposition of copper powder from an acid copper sulphate bath and the effect of additions of glucose, glycerine, glue, gelatine and sodium naphthalene β-sulphonate on the powder characteristics. Addition of glucose and glycerine has no effect on the grain size of the deposit whereas sodium naphthalene β-sulphonic acid reduces the grain size and its apparent density; glue and gelatine give very fine powders of high apparent density.

Use of Fluoborate Baths

The electrodeposition of brass[18] from a non-cyanide bath containing cupric tartrate and sodium zincate has been found to be dependent on the concentrations of the two substances in the electrolyte and independent of the current density beyond a critical value.

The use of fluoborate baths in electroplating work has received considerable attention. Anantharaman and Balachandra[19] have arrived at the optimum conditions for electroplating cadmium from its fluoborate solution by a systematic study of all variables on its plating characteristics. The new bath is non-poisonous, stable, easily

[continued on page 1060

Short-Stoppers

Importance in the Production of Polymers

SHORT-STOPPING has of recent years been introduced into emulsion polymerisation practice. Short-stoppers enable the chemist to obtain an optimum conversion of monomer to polymer, whereby the production of intractable polymers, both difficult to process and shape, is prevented. This ultimate conversion to an insoluble polymer is thought to be due to the formation of cross-links and possibly accounts for the 'setting-up' phenomenon which takes place during the storage of polymer before the removal of monomer, or the hard and inelastic products which are produced during blow-down operations. To eliminate the possibility of cross-linking, it is often necessary to stop the polymerisation before this stage is reached. Common short-stoppers in use today include hydroquinone, tetramethyl thiuram disulphide, sodium sulphide and the dinitrobenzenes.

Short-stopping agents may function in a number of ways. In the case of sulphur-containing short-stoppers, decomposition to elementary sulphur probably features in the mechanism, sulphur, like oxygen, being known to possess inhibiting properties. On the other hand phenolic derivatives like hydroquinone owe part of their short-stopping characteristics to their rôle in the formation of quinones. Such compounds as the dinitrobenzenes owe their inhibiting properties to the part they play in termination reactions, where they are thought to form end-products having stable free radical configurations.

Quinone Formation

Stopping agents which form quinones on oxidation function as inhibitors in two ways: they may react with catalyst and so prevent the formation of active centres; or, through the resulting quinone, may be capable of reacting with an active chain and so featuring in a chain termination process. In the case of the dinitrobenzenes, it is believed that the growing polymer exhibits a preference for the inhibitor rather than the catalyst. The quantities of short-stoppers used are usually in the range of 0.01-3 parts per 100 parts of polymer.

The desirable characteristics of a short-stopper, apart from the necessary inhibiting characteristics, should include (i) a low toxicity, (ii) non-staining characteristics, and (iii) low contamination qualities. Hydroquinone, although an effective short-stopper, is toxic, and being water soluble, creates the additional problem of disposal after the completion of a process. Sodium sulphide is again an excellent short-stopper, but its serious disadvantages involve corrosion and the contamination of end-products with objectionable odours.

Contamination of Reactants

Some inhibitors, while having non-staining and non-corrosive properties, invariably contaminate the reactants. In this category is placed phenolethanolamine. This short-stopper has however been superseded by such disubstituted derivatives as the phenyl or β-naphthyl diethanolamines (USP. 2,556,651). In the short-stopping of low temperature polymerisations hydroquinone and 2,4-dinitrochlorobenzene have been replaced by organic sulphur derivatives such as tetramethylthiuram disulphide and xanthogen disulphide, etc., the short-stopping of such polymerisations being difficult between 50 to 80 per cent conversion (USP. 2,662,876).

In testing the efficiency of various short-stoppers, it is usual to add the inhibitor to the charge at about 50 per cent conversion, and then to continue the polymerisation for (say) another 15 hours, after which period the increase in conversion is noted. Kluchesky and Wakefield have illustrated the comparative efficiencies of various short-stoppers (*Ind. and Eng. Chem.*, 1949, **41**, 1768) and have shown that the best results have been obtained using aryl hydroxy derivatives such as hydroquinone, naphthaquinone, α- and β-naphthol, *p*-phenyl phenol, catechol and pyrogallol, while the least satisfactory results have been recorded with such arylamine derivatives as N,N'-diphenylethylene diamine, *p*-chloro-*o*-anisidine and di-(β-hydroxyethyl)-aniline respectively. In this category may also be placed the phenylhydrazones of furfural and salicyl aldehyde. The conversion increase in all cases varies with the amount of inhibitor added; below

some conversion figures are shown for categories of short-stoppers.

Substance	Parts/100 parts of Monomer	Conversion Increase (per cent)
(*a*) *Phenolic Short-Stoppers*		
Hydroquinone	0.01	0.5
α-Naphthol	0.01	0.5
β-Naphthol	0.3	1.0
p-Phenyl phenol	0.2	0.0
Catechol	0.2	0.0
Pyrogallol	0.2	0.0
(*b*) *Aromatic Amines*		
α-Naphthylamine	0.3	0.5
β-Naphthylamine	0.3	0.5
Aniline	0.2	0.0
(*c*) *Alkyl phenols*		
p-tert. Butyl catechol	0.3	1.0
Di-*tert.* butyl quinol	0.2	3.5
Di-*tert.* butyl catechol	0.2	1.5
Di-butyl catechol	0.2	1.5

Stopping agents which do not form quinones appear to be somewhat less effective than those compounds which form quinones on oxidation. It is evident, however, that short-stoppers which do not oxidise to quinonoid derivatives are important when non-staining is essential. Compounds of interest in this field are the alkali dialkyldithiocarbamates and the tetraalkyl thiuram disulphides. Data relating to short-stoppers which do not form quinones are tabulated below.

Substance	Parts/100 parts of Monomer	Conversion Increase (per cent)
Sodium diethyldithiocarbamate	0.3	6.0
Mercaptobenzthiazole	0.5	3.0
bis-(Dimethyldithiocarbamyl) disulphide	0.2	2.0
m-Dinitrobenzene	0.2	7.5
2, 4-Dinitrochlorobenzene	0.3	4.5
Sodium sulphide	0.2	0.0

Naphthols, although highly efficient as polymerisation inhibitors, have inactive derivatives, particularly when substitution is made in an adjacent position to the hydroxyl. It would appear that the resulting steric effects of adjacent alkyls prevent the facile oxidation to the quinonoid form, and in particular to the *ortho* form. Thus α-octyl and α-butyl-β-naphthol are ineffective as short-stoppers. In the formation of an *o*-quinonoid system from a phenol, the mechanism may be conceivably based on a keto-enol equilibrium, as a result of which the resulting α-methylene may be oxidised to the appropriate hydroperoxide, loss of the elements of water yielding the quinone. While in the simpler alkyl radicals such an oxidation may be permitted, due to the methyl acting as a donor, the mechanism would appear unlikely for the more bulky alkyl radicals.

In other fields, the 2 and 3-vinyl pyridines have been used in vinyl chloride ploymerisations, where in order to prevent the formation of polymers having inferior heat and light stability such short-stoppers have been utilised to advantage (USP. 2,616,882). In 'oil phase' vinyl chloride polymerisation processes, cinnamaldehyde, acrolein, and citral have found applications. In blow-down operations after the completion of butadiene-styrene or butadiene-acrylonitrile polymerisations, 2,4-dinitrophenylthiocyanate has proved particularly useful (USP. 2,547,194). Recent applications also involve the use of cyclomono-olefines and α-alkylstyrenes.

Air Pollution Control

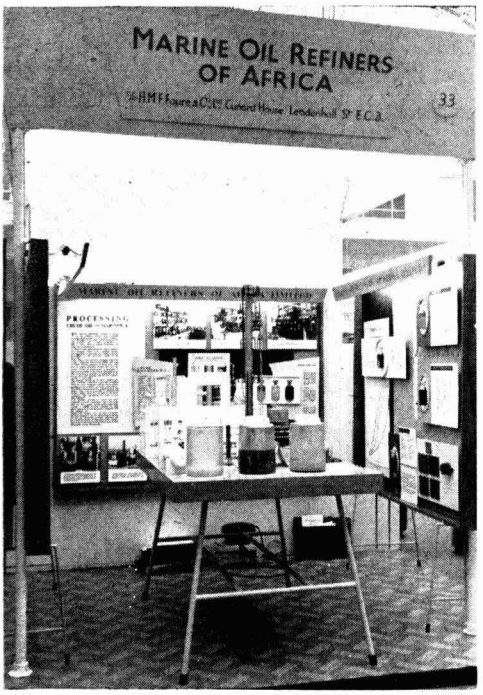
SPEAKING at a meeting of the Institution of Mechanical Engineers in London on 23 April, Mr. F. S. Mallette, executive secretary of the Committee on Air Pollution Controls of the American Society of Mechanical Engineers, described the contributions made by the chemical industry toward cleaner air for United States cities. Mr. Mallette's trip and lectures were made under the James Clayton bequest, which was instituted in England for the advancement of knowledge in any field relating to mechanical engineering.

The effluent from air-blown sulphuric acid concentrators, Mr. Mallette told his audience, contains acid mist and sulphur dioxide. 'Attempts were made,' he said, 'to control the acid mist with low-pressure sprays, bag filters, and an acid fume furnace, but the only successful method found was a high pressure water fog system. In a pilot model, mist removal efficiencies as high as 95 per cent were achieved at a spray pressure of 500 lb. and a water rate of six gallons per minute.'

A plant scale model, Mr. Mallette said, increased efficiency even over the pilot model. The value of sulphuric acid recovered and heat saving amounted to about $55,000 per unit per year. The net operating cost was about $5,000, or two cents per ton of acid concentrated for the process concerned.

The rubber industry faces not only air pollution problems, Mr. Mallette said, but also odour problems, which occur mainly during the drying operations of both synthetic and reclaimed rubber. A new method to cope with this problem is catalytic oxidation.

The OCCA Exhibition



Some of the attractive stands at the Sixth Technical Trade Exhibition of the Oil & Colour Chemists' Association, held at the Royal Horticultural Hall, 21-23 April

B.C. Iron Ore Development

In order to determine the possibility of developing a big iron ore industry in British Columbia, extensive explorations are to be undertaken by Canadian Collieries (Dunsmuir) and US Steel Corporation, according to a report from Vancouver.

New Uranium Find

Described as the richest uranium strike in the Northern Territory of Australia since the Rum Jungle discovery, a new strike has been made by gold prospectors just south of Adelaide River, about 70 miles from Darwin.

Nickel Production

Supply for Civilian Uses 'Inadequate'

ABOUT two-thirds of the free world's supply of nickel in 1953 went to the US and half the remainder—or approximately 17 per cent of the whole—went to Canada and the UK.

So stated Dr. John F. Thompson, chairman of the International Nickel Co. of Canada Ltd., when speaking at the company's recent annual meeting. In the US since 1 November, when Government controls on the civilian use of nickel were revoked, said Dr. Thompson, nickel deliveries had been made first to meet defence production requirements and stockpile contracts with the Government. The supply remaining for civilian purposes after providing for these heavy and abnormal demands had been found to be inadequate. As a consequence, the period of restriction of peace-time ' uses for nickel was being prolonged to the detriment of civilian markets.

Dr. Thompson noted that Inco's nickel producing capacity at the end of 1953 was at an annual rate in excess of 275,000,000 lb., compared with about 250,000,000 lb. at the close of 1952. Considerable new nickel production capacity would be established during the next few years and might well prove to be temporarily in excess of market demand. He expressed the hope that 'other producers and those newly coming into the field will feel, as we do, that production carries with it the responsibility for developing and expanding the market for nickel.'

Noting the expanding nickel production and the fact that nickel is in world-wide competition with other steel alloying elements and with a wide variety of other materials, Dr. Thompson said it was important that, so far as possible, the price basis remain stable over some period of time, resisting pressures in either direction. The company's price for nickel has continued unchanged since January, 1953.

At the company's Clydach (Wales) refinery, a new improved wet treatment process is used to treat residues in place of the historic Orford process. This, Dr. Thompson observed, represents the final passage in the life of the Orford nickel-copper separation process, dating back more than 60 years, on which the Canadian nickel industry was founded.

(See also THE CHEMICAL AGE, 1954, **70**, 179).

Electrochemical Research in India

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controlled and, while being slightly inferior to the cadmium cyanide bath in its throwing power and resistivity, is vastly superior in all other respects.

In a similar study for electroplating zinc using the fluoborate bath, the two authors[20] have given bath details and optimum conditions. It has been found that the fluoborate bath for zinc is comparable to the conventional cyanide bath and superior to the sulphate bath. Fegredo and Balachandra[21] found that the best plates of cobalt were obtained from a still solution containing 116-154 g. per litre of cobalt fluoborate and 15 g. per litre of boric acid at 45-50°, at a *p*H 3.5 and cathodic current density of 50-60 amp. per sq. ft.

The theories underlying the mechanism of the working of addition agents in electrodeposition have been discussed by Gokhale[22]. The colloidal theory, reducing effect and the complex ion theory have been examined in relation to many common addition agents employed in electrodeposition. A critical and exhaustive review has been made of the electrolytic production of manganese[23].

In two symposia on 'Electrolytic Alkali Chlorine' and 'Metallurgy in Electroprocess Industries,' organised by the India Section of the Electrochemical Society, a number of original papers[24] on different problems in the industries were presented and discussed.

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South African Newsletter

FROM OUR OWN CORRESPONDENT

SIR Ernest Oppenheimer, chairman of African Explosives and Chemical Industries Ltd., announces in the annual report that at the Klipspruit cyanide factory an extension is being made to synthesise methane from coal producer gas. This will increase production and eliminate fluctuations in the supply of methane gas from the Johannesburg sewage disposal works. The plant for the production of chlorine, caustic soda, and associated products at Umbogintwini is taking shape, and production is to begin in 1955. Since the close of the year the company has offered a loan of £250,000 to Rand Carbide Ltd., and been granted an option to convert the loan into shares at 25s. each until 31 December, 1956. There has recently been an improvement in the export position of carbide, and arrangements have been made to supply the carbide for certain industrial developments which are to reach the production stage in 1955.

* * *

The value of base minerals sold by mines in the Union reached record figures in 1953, according to the latest statistics of the Department of Mines. Taking a few of the leading minerals, coal heads the list with sales valued at £16,464,000, compared with £14,639,000 in 1952, and £13,559,000 in 1951. More coal mines are being opened up and the increase in the domestic price of coal has also largely accounted for the increase in value. Chrome ore sales last year touched their highest with a figure of £2,661,000, as against £1,716,000 in 1952 and £1,586,000 in 1951. Manganese ore has developed into a big business with record sales last year totalling £4,371,000, that comparing with £3,796,000 in 1952 and £3,175,000 in 1951. Under the heading of 'other minerals' the names of the minerals are not disclosed, but it is known they include platinum and antimony. These realised a total of £21,588,000 last year. In the previous year they were valued at £21,236,000 and in 1951 the value was £15,468,000. Probably the higher sales and price of platinum are the main factors accounting for the increase.

* * *

Two large South African companies are developing iron ore deposits in the Sabi River area of Southern Rhodesia. One is the Messina (Transvaal) Development Co. Ltd., which recently applied for an extension of the area over which it holds an exclusive prospecting reservation. The reef in which this company is interested is to the west of the Ngesi River in the Buhwa hills. The other company is the Sabi Mining and Exploration Co. Ltd., a subsidiary of the Anglo-Transvaal Consolidated Investment Co. Ltd. This company holds an exclusive prospecting reservation over 99 square miles between the Chiridzi and Makwasini Rivers.

* * *

Plans to construct a new electrolytic copper refinery at Ndola were announced on 22 March by Roan Antelope Copper Mines, Ltd. The refinery, which will require about £3,000,000 of capital, will have an initial capacity of between 55,000 and 60,000 long tons of electrolytic copper a year, and will draw its power from the Rhodesia-Congo Border Power Corporation Ltd. An official announcement said that production was expected to begin in 1958. The Roan Antelope Copper Mines would enter into a long-term contract to supply the refinery with up to 60,000 long tons of blister copper a year for refining into electrolytic shape. The design of the refinery would provide for the possibility of expansion to 110,000 long tons of electrolytic copper. The refinery would be owned by a new company, to be called the Ndola Copper Refineries Ltd., and in which the Roan Antelope Copper Mines Ltd., would take up all the ordinary share capital. The rest of the capital would probably be in the form of loan capital, which would be offered to outside parties. The Ndola Municipal Council has agreed to make certain facilities available to the new refinery, and has undertaken to provide all the housing required.

More Cement in Italy

Cement production in Italy totalled 8,033,206 tons in 1953, an increase of nearly 20 per cent over the 1952 total. The largest expansion occurred in Southern Italy as a result of the industrialisation and recovery programme.

DIE CHEMISCHE ANALYSE IN DER STAHLINDUSTRIE. By Robert Weihrich. 4th edition (Edited by Professor A. Winkel, Bonn). Ferdinand Enke Verlag, Stuttgart. 1954. Pp. 223, 30 illustrations and 13 Tables. DM. 32 (full cloth).

It is noted with regret that the death of the author, Robert Weihrich, of this fourth, recast and expanded edition, occurred in July, 1950. Progress through the press was supervised by Professor A. Winkel.

The compass of this edition remains essentially the same as the last although the analyses of some rare components of steel have been shortened or omitted. Physical chemical methods of analysis which were scattered throughout the book in the earlier editions have been collected together in special sections. Limits of the book do not permit inclusion of emission spectrum analysis, but on page 206 the author has indicated the technical references worthy of consultation for this important method of steel analysis. For the arrangement of the material in the book, obviously a difficult task in a book of this nature, a cipher system has been chosen. The first number gives the general analytical process (e.g. potentiometry is number 4), the second number the general conditions of the process under consideration and the third number, throughout the book, that particular metal or material being analysed. Thus, for example, while section 3 considers gravimetric and volumetric processes, 3.2 is the analysis of steel for individual components, gravimetrically or volumetrically, and 3.2.1 is the determination of carbon in steel. The presentation of material is quite satisfactory

In the first chapter the sampling of steel, cast iron, pig iron, steel clippings, iron alloys (e.g. brittle Fe-Mn, Fe-Si and hard Fe-Zr) and powder alloys, is amply considered. In the iron and steel industry frequently it is important to carry out a rough qualitative investigation. Such a preliminary testing not only simplifies the quantitative investigation but can narrow or even make it superfluous. Tables are given for qualitative steel testing under the headings of (1) Spark test for elements W, Mo, Mn, Cr and Ni, (2) Eggertz's solution test—the appearance of a (1:1) nitric acid solution of the steel, (3) Magnetic test, and (4) Spot testing on the surface of the steel—one drop of (1:4) nitric acid is dropped on the clean surface of the steel and allowed to remain for one minute; the colour of the drop and the solubility of the steel is examined.

Accuracy and the length of the operation are the two factors of importance in the choice of a method for the determination of a substance in steel analysis. Modern physical-chemical methods (colorimetry, potentiometry, etc.) shorten the length of the analysis but do not displace the older methods completely. Section 3 gives a detailed account of methods for the gravimetric or volumetric determination of each constituent likely to be present in the steel. This is quite well done because each constituent is introduced by indicating the amounts normally used in steel production, and, where possible, a qualitative test for the constituent is included. In this section also the analysis of iron alloys, alloy metals, ores, zunder and clinker is carefully described. In the following sections the potentiometric determination of Cr, Ni, Mo, V, Cu, and As in steel, the use of the polarograph in steel analysis, the colorimetric determination of C, Mn, Si, Cr, Ni, W, Mo, V, Cu, Co, Ti, Al and the microchemical analysis of steels, are discussed.

'Kolorimetrischen' in the table of contents page viii has in error been printed 'Kalorimetrischen' (calorimetric). This book is clearly written and well-produced with a literature reference (p. 211-214) of 42 books. It is to be hoped, therefore, that it will be translated before long since much valuable material is here brought together and given in detail. The book can be strongly recommended.—R. J. MAGEE.

HOME

KID Exemptions

The Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty, for the period 1 May to 18 August: monomethylcyclohexanol and di-(monomethylcyclohexyl) *ortho*phthalate. This order is the Safeguarding of Industries (Exemption) (No. 4) Order, 1954, and is published as Statutory Instruments 1954, No. 529. Copies may be obtained (price 2d. net by post) from HM Stationery Office, Kingsway, London, W.C.2, and branches, or through any bookseller.

Non-Flammable Substances

In our leading article on 17 April, reference was made on page 874 to a range of 'non-toxic, non-corrosive, odourless and inflammable substances from $CHFCl_2$ to CF_3CH_2 Cl whose boiling points differ by 180°.' These compounds are, of course, non-flammable and the word 'inflammable' was a printer's error.

Octane Gas in Scotland

Plans for the expansion of the octane gas industry at Grangemouth have been approved by Grangemouth Dean of Guild Court. These involve a new plant for bottling liquid gas, thus increasing the refinery capacity from 7,000 tons to 16,000 tons a year. The plant, a store, a pumphouse and weighbridge are included in the proposed expansion, which will cost £30,000.

Terylene Hose—But Not for Feet

British high-pressure hose made of Terylene is to be used to fight forest fires in Canada. The British Columbia Forestry Commission, who have ordered a quantity of this new hose from George Angus & Co., of Newcastle-on-Tyne, wanted hose which would withstand twice the normal working pressures and which could be used efficiently over great distances—distances sometimes of over a mile from the source of water. The specifications for the hose were that it should have a working pressure of 600 psi. and a burst strength of 1,000 psi. Terylene was selected as the fibre most able to meet these severe requirements economically.

New Bronze Foundry

A new bronze foundry is in course of construction at the Sutton-in-Ashfield works of Sheepbridge Steel Castings Ltd. for the production of intricate casting in difficult non-ferrous alloys such as high tensile manganese bronze, nickel bronze and aluminium bronze.

More at Work

The latest available employment statistics for Great Britain, published in the Ministry of Labour Gazette for April, show that the total number employed in the chemical and allied trades at the end of February was 501,800, as compared with 500,000 the previous month. The largest number of these were in the chemical and dye industries—214,100, an increase of 1,000 over the end of January.

London Office

To cope with increasing orders from the London and Southern Counties area, F. Haworth (A.R.C.) Ltd., chemical engineers, Irwell Chemical Works, Ramsbottom, Manchester, have opened a London office at 40 Buckingham Palace Road, S.W.1 (Tel.: Tate Gallery 3861).

Increasing Employment at Wilton

Work for another 900 men is to be found at the Wilton (North Yorkshire) plant of Imperial Chemical Industries Ltd. when the first unit of a new Terylene plant comes into operation later this year. It was announced some time ago that the Terylene plant is to be duplicated and work on this project has commenced.

Alternative Employment

Answering a question in the House of Commons recently, regarding the availability of alternative employment for workers at the I.C.I. plant at Roslin, Midlothian, which is due to be closed shortly, Mr. H. A. Watkinson, Parliamentary Secretary to the Ministry of Labour & National Service, stated that all the 61 workers concerned were being offered employment at other I.C.I. factories. For those who were unable to accept the offer, the normal machinery of the employment exchange would be at their service.

• OVERSEAS •

Fertilisers from Israel

By the end of 1954, Fertilisers and Chemicals Ltd., Israel, are to export $1,500,000 worth of products. The exports, mainly potassium sulphate and dicalcium phosphate, will be sent to Scandinavian countries, Turkey and the United Kingdom.

Exporting Mercury Salts from India

The Government of India has decided that with the exception of oxides and sulphides of mercury, the exports of which are banned, exports of mercurous chloride and other mercury salts and compounds should be allowed in the same way as mercuric chloride and should be licensed freely for export on shipping bills against registered sales.

New Pigment Factory

Standard Ultramarine Co. of Canada, Toronto, are to build a new factory shortly in the Rexdale industrial area there. On a four-acre site, it will cost about $500,000. Modern process equipment with special automatic devices will produce a complete line of organic red and yellow pigments and blue toners for use in paint, printing ink, rubber and plastics.

US Sulphuric Acid

Production of by-product sulphuric acid (produced from the sulphur content of sulphide ore) at USA copper and zinc plants in 1953 was 868,000 short tons (basis, 100 per cent), compared with 867,000 short tons in 1952 and the largest output since 1944, according to the Bureau of Mines, US Department of the Interior. The increased output of acid at copper plants slightly more than offset the drop at zinc plants.

Canadian Uncertainty

Speaking at the recent annual conference of the Society of the Plastics Industry (Canada), Mr. R. B. McPherson, of Canadian Industries Ltd., said the scope and extent of the present decline in Canada's economy indicated that more than the usual seasonal curtailments were at work. Record imports were due to the inability of the Canadian manufacturer to meet foreign competition in his own market because of the relatively high cost structure in Canadian industry.

Iron Works for Sale

The New Zealand Government does not intend to develop the Onekaka iron and steel works as a State enterprise, and is advertising its sale.

Americans in Holland

A well-known American concern, the Fairchild Camera and Instrument Company, is planning to set up a Dutch subsidiary plant for the making of plastics.

PVC Production in Austria

Austria possesses at present only one factory making PVC at Hallein, Salzburg, with an annual production capacity of 1,200 tons. Two-fifths of the production is exported in raw condition, mainly to West Germany, Belgium, Great Britain, Sweden and the USA. About 1,000 to 1,500 tons annually is needed in Austria.

Fish Meal for Human Consumption ?

A Hague chemist has succeeded in preparing a fish meal suitable for human consumption, for which it is claimed that it retains all the good properties of fresh sea fish. Hitherto, such meals have been usable only for fodder. The inventor suggests that the new meal may prove of great value for the food supply of underdeveloped countries, notably on account of its outstanding keeping qualities. It retains at least 70 per cent of the albumen present in fish, but has been purged of the oily taste so noticeable in fat sea fish.

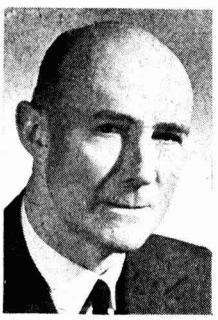
Uncertain Future for Casein

The whole position of the lactic casein industry in New Zealand appears to be in the 'melting pot,' according to an official of the New Zealand Dairy Products Marketing Commission. He said that casein production so far this season amounted to about 5,000 tons compared with nearly 6,000 tons for the same period of the previous season. Market values were likely to depreciate in the future as a result of the entry of the United States into the world market. The whole position depended on what quantities of lactic casein were to be produced in other countries, and what portion of this production would be set aside for export. But it was 'reasonably certain' that there would be a decline in market values, he asserted.

PERSONAL

MR. G. A. S. NAIRN, chairman of Lever Brothers, Port Sunlight, Ltd., is to retire on 30 September next on reaching the age of 65. He will be succeeded by MR. F. S. WALKER, who began his business life with Lever Brothers at Port Sunlight and since 1944 has been the commercial manager of the United Kingdom Soap Executive of Unilever Ltd. in London.

New appointments have been announced on the board of W. J. Bush & Co. Ltd. MR. E. L. BUSH (right) relinquishes his appointment as managing director to become chairman. A son of the late Mr. J. M. Bush and a grandson of the founder of the company, Mr. Bush joined the company in 1922 and was appointed a director in 1935. MR. C. F. BUSH (left), son of the late Mr. Ferdinand Bush and also a grandson of the founder, was appointed joint general manager in 1931 and a director in 1942. He becomes joint managing director with Mr. A. J. McIntyre (centre), who joined the company in 1919, was company secretary from 1933 to 1941, and became a director in 1942.

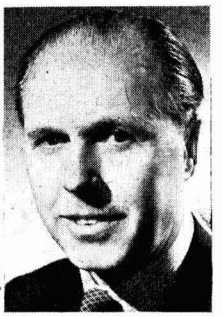


DR. E. S. HEDGES, the Tin Research Institute director of research, has left London for a month's tour of the USA, where he will introduce to chemical manufacturers the recent discoveries made by the Tin Research Institute regarding the fungicidal and insecticidal properties of certain organotin compounds.

MR. W. D. WILSON, who has been appointed to the board of Newman Industries Ltd., joined the company in 1935 as works manager. Previously he was with Crompton Parkinson Ltd. for 12 years and with Bruce Peebles & Co. Ltd. for six years. He will continue in his present executive capacity as general manager of the company's Grantham works.

MR. V. HODGSON has been appointed general manager of Cyprus Sulphur & Copper Co. Ltd., in succession to MR. L. R. JACKSON, who has retired.

MR. G. F. GREAVES, of Joseph Crosfield & Sons Ltd., who is on a Far East business tour, has given up chairmanship of the Warrington and St. Helens district committee of the Regional Board for Industry, and MR. A. C. H. CAIRNS, chemical sales director of Joseph Crosfield & Sons has joined the committee.



Two legacies of £1,000, left to Robert Gordon's College, Aberdeen, by MR. WILLIAM F. HAY, who died in 1944, have become payable on the death of his wife. Mr. Hay was a co-opted member of the chemistry and pharmacy committee of the college for 34 years. One legacy was in appreciation of the great benefit conferred by the college on his father and the other was in gratitude for the education and training which he himself received at the college.

MR. GEORGE VERNON TATE, chairman of Tate & Lyle Ltd. for 16 years, has accepted the office of president of the company, formerly held by the late Lord Lyle of Westbourne. Mr. Tate, who also becomes president of Silvertown Services Ltd., is succeeded as chairman of the three companies by MR. IAN D. LYLE.

Newly-elected Foreign Members of the Royal Society are: KARL VON FRISCH (Munich), distinguished for his work on the physiology of the chemical and visual sense organs of animals, especially insects and

fish; OTTO LOEWI (New York), distinguished as being the first to demonstrate the transmission of the effects of nerve impulses by the release of chemical transmitters; and KARL MANNE GEORG SIEGBAHN (Stockholm), distinguished for his work on the accurate measurement of X-ray wavelengths, both by crystal and diffraction grating methods.

MR. HENRY S. WINGATE, a director of the International Nickel Co. of Canada and hitherto one of its vice-presidents, has been elected president of the company in succession to DR. PAUL D. MERCIA, who has retired from that post on reaching retirement age. Mr. Wingate has also been elected to the executive committee of the company and president of its USA subsidiary, the International Nickel Co. Inc. MR. F. M. A. NOBLET, hitherto assistant treasurer, who has been appointed hon. treasurer of the company and of its USA subsidiary, succeeds MR. WILLIAM J. HUTCHINSON on the latter's retirement. Both Dr. Mercia and Mr. Hutchinson are continuing as directors and members of the executive committee.

MR. M. M. HALLETT has been appointed director of research to three Sheepbridge Group companies—Sheepbridge Stokes Ltd., Sheepbridge Equipment Ltd. and Sheepbridge Steel Castings Ltd.

Appointments to senior executive posts in the organisation of Industrial Cellulose Research Ltd., wood pulp research centre maintained by Canadian International Paper Co., have been announced. MR. DOUGLAS E. READ, associated with CIP since 1929 and manager of the building board mills at Gatineau since 1948, is named general manager of the research concern; M. RENE DOSNE, manager of rayon research since 1946, has been appointed director of rayon research and development; and MR. EDWARD J. HOWARD promoted from manager to the post of director of cellulose research and pulp development.

MR. J. J. MACFARLAND has been promoted to the newly created post of assistant to the general manager of the Plastics Division of Celanese Corporation of America. Mr. MacFarland joined the company in 1947, and a short time later was made manager of the product development department of the Chemical Division.

MR. J. EARLY HARDESTY has been appointed assistant comptroller of Mathieson Chemical Corporation at Baltimore, it was recently announced by MR. THOMAS S. NICHOLS, the president. Mr. Hardesty joined the company on 1 March. Mr. Hardesty was associated with Davison Chemical Corporation, Baltimore, for twenty years and for the past four years has served as treasurer of that company.

Obituary

The death took place on 17 April of MR. SAMUEL ERNEST MELLING, M.Sc., F.R.I.C., at his home in Lytham, aged 77. Public Analyst of Wigan for over 50 years, he was also public analyst to Cheshire, Oldham, Rochdale, Ashton-under-Lyne and Accrington.

The death took place recently of COLONEL L. J. HUDLESTON, senior lecturer in the Department of Chemistry, University College of Wales, Aberystwyth, aged 62. He was appointed to the college staff from London University in 1920.

MR. PHILLIP T. WARD, a director of Thos. W. Ward Ltd., has died at the early age of 35 following a long illness. The son of Mr. Ashley S. Ward, president of the company, Mr. Phillip Ward was educated at Charterhouse. He began his career with Thos. W. Ward Ltd. in 1937 and was appointed a full director in 1948.

MR. ROBERT W. SHARWOOD, a director and vice-president of Canadian Industries Ltd., died in Montreal on 20 April. He was 48, and had been ill since January. Born in Johannesburg, South Africa, in 1906, he was educated in England at Rugby and Oxford. In 1934, Mr. Sharwood joined Canadian Industries Ltd. as special assistant to the treasurer, and three years later was appointed assistant treasurer of the company. He became treasurer in 1939 at the age of 33. was appointed vice-president in 1943 and elected a director and member of the executive committee in 1949. In the recent announcement of the proposed plan for dividing Canadian Industries Ltd., Mr. Sharwood was named as a director and vice-president of Canadian Industries (1954) Ltd., the new company in which Imperial Chemical Industries Ltd. is to be the principal shareholder.

Publications & Announcements

A BI-MONTHLY 'Tretol Maintenance News' is now available post free from Tretol Ltd., 12 North End Road, London, N.W.11. The publication, which deals with problems of factory maintenance in a light and fairly non-technical fashion, is primarily intended for circulation among works and maintenance engineers. Subjects discussed in the Spring issue include corrosion prevention, decoration of factory walls, dust-proofing of floors and painting asbestos cement.

* * *

CRODA LTD., of Snaith, Goole, Yorks., announce that after several years of research it is now possible for them to offer 'Crodura' Wax on a commercial scale. 'Crodura' is a new high-melting-point wax, with properties indicating its use as a direct replacement or extender for other far more expensive waxes, or as a stabiliser in the emulsion-type wax polishes.

* * *

A NEW catalogue of products has recently been issued by Leicester, Lovell & Co. Ltd., of North Baddesley, Southampton. The catalogue, entitled 'A Guide to Resins and Glues for Industry,' covers the company's range of synthetic resins, synthetic resin glues and casein glues for an extremely wide variety of industrial and trade applications. These include a variety of wood gluing applications, metal to wood gluing, bottle labelling, bookbinding, cork bonding, paper gluing, tube winding, etc. There is also an interesting section on products of comparatively recent development for applications such as the bonding of non-porous surfaces, potting of electronic assemblies and surface coatings. The whole range of applications is conveniently indexed at the beginning of the booklet. Copies are obtainable on request to the company.

* * *

THE Foster Instrument Co. Ltd., of Letchworth, Herts, has issued its Thermo-electric Pyrometer catalogue No. 112, which supersedes Catalogue No. 103 and all previous issues. This company has specialised for more than 42 years on instruments for temperature measurement and control, and claims consequently to be in an unrivalled position to advise on problems in this particular field. Many of their equipments are specially designed to suit particular applications, too numerous and varied to be included in the catalogue. The company offers to recommend most suitable types of equipment for temperature measurement and control.

* * *

A NEW range of flameproof switchgear has been developed by The General Electric Co. Ltd. for use in chemical works, gas works, oil refineries, collieries, grain elevators, paint and spraying plants and similar situations. It can also be employed out of doors and for any application requiring an exceptionally robust installation. The equipment can be used for building two- and three-phase 4-wire flameproof medium voltage distribution switch fuse boards which will take currents up to 100 amp. at 660 volts. The individual switch fuse units may also be used alone, if required. The new range includes double pole and triple pole (with neutral) switches, fuse chambers and busbar chambers, terminal boxes, conduit adaptors, cable sealing boxes and cable box reverse entry chambers, together with such accessories as support brackets and cover plates for blanking off busbar chambers. Units are completely interchangeable.

* * *

LUSTREX Toughened-1 (abbreviated to T-1) is the first of a new series of toughened polystyrene moulding powders announced by Monsanto Chemicals Ltd., Victoria Station House, S.W.1. The properties of this material have been carefully balanced so as to give a product of outstanding toughness—and Lustrex T-1 is tough enough to permit nails to be driven through it, it is claimed. It has a much higher elongation and deflection at break than general purpose and 'medium impact' polystyrene, and flat mouldings can usually be bent almost double before fracture occurs. The impact strength also is considerably increased and it is said that Lustrex T-1 is three or four times more resistant to breakage than is general purpose polystyrene. These properties have not been obtained at the expense of mouldability; on the contrary, Lustrex T-1 moulds at lower temperatures and pressures than general purpose material. It has a good gloss and appearance while its base or natural colour is such that an unusually wide range of colours can be made.

Law & Company News

Commercial Intelligence

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

Mortgages & Charges

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

ACALOR (1948) LTD., Crawley, chemical engineers. 22 March, debenture, to Royal Bank of Scotland securing all moneys due or to become due to the bank; general charge. *——. 28 November, 1952.

Increases of Capital

The following increases of capital have been announced:—NORTHERN PHARMACEUTICALS LTD., from £100 to £15,000; POLYCHEMICAL DEVELOPMENTS LTD., from £100 to £105.

Changes of Name

The following changes of name have been announced:—HERBERT A. WALFORD (HOLDINGS) LTD., to TABLEAU HOLDINGS LTD., on 11 March; KAYLENE LTD., to KAYLENE (CHEMICALS) LTD., on 1 March.

New Registrations

Carlton Laboratories (Southern) Ltd.
Private company. (532,555.) Capital £100. Manufacturing chemists, wholesalers, retailers, importers and exporters of and dealers in chemicals, gases, disinfectants, fertilisers, insecticides, etc. Directors: Herbert F. Hart and Laurence E. R. Greene. Reg. office: 46 Preston Street, Brighton.

Sun Lab Equipment Co. Ltd.
Private company. (532,643.) Capital £500. Constructional and general engineers, manufacturers of chemical machinery, etc. Directors: Geo. T. Stokes, Wm. T. Holland, Kathleen M. Mew and Albert H. Nicholls. Reg. office: 338 Streatham High Road, London, S.W.16.

F. Murley Ltd.
Private company. (532,420.) Capital £2,000. Wholesale or retail consulting, analytical, manufacturing, pharmaceutical and general chemists. Directors: Fred Murley and Irene C. Murley. Reg. office: 96/98 Holdenhurst Road, Bournemouth.

Tacol Ltd.
Private company (registered in Edinburgh). Capital £2,000. Advisers, consultants and contractors to the oil, engineering, chemical, building and allied industries, etc. First director: Chas. J. Wright. Reg. office: 1 Church Street, Coatbridge.

Dawsons Ammonia Distillers Ltd.
Private company. (532,438.) Capital £15,000. Object: To acquire the business of ammonia distiller carried on by Percy Dawson at Ashton March, Preston. Directors: Percy Dawson, Wm. A. Dawson and Mrs. Irene McGlashan. Solicitors: E. Naphthen & Co., Preston.

Pash Chemicals & Basic Materials Ltd.
Private company. (532,110). Capital, £3,000. Manufacturers and merchants of chemicals, basic materials, or any derivatives therefrom, etc. Directors: Zelman D. Pash and Mlavina Pash. Reg. office: 7/8 Idol Lane, London, E.C.3.

Change of Address

Mallinson & Eckersley Ltd. have moved from Salford to 23 Blantyre Street, Chester Road, Manchester, 15 (Tel. Deansgate 5867-8-9; Telegrams, Pitchpine, Manchester).

Company News

Babcock & Wilcox
The directors of Babcock & Wilcox Ltd. are recommending a final dividend of 7 per cent, less tax, on the £7,524,398 ordinary stock of the company. With the interim of 7½ per cent paid on the £5,016,265 ordinary stock existing before the 50 per cent scrip issue, the distribution for the year 1953 is equivalent to the 18 per cent, including 3 per cent bonus, paid on the smaller capital for 1952. Group profit, excluding that of two foreign subsidiaries, was £4,149,618, compared with £4,605,018 for the previous year.

British Alkaloids Ltd.
For the year ended 31 March, British Alkaloids Ltd. is paying a final dividend of 2.1d. per 1s. share, making a total of 3.6d. per share, or 30 per cent. This is the same

as the previous year. Subject to final audit, the profit, after all charges, including taxation, amounted to £20,637 (£21,539). UK tax charged was £27,800 (£30,800).

Cooper, McDougall & Robertson Ltd.

Group profits of Cooper, McDougall & Robertson Ltd. for 1953, before tax, have dropped by £116,688 to £212,757 in comparison with the previous year. The ordinary dividend is 5 per cent, which is half of what it was for 1952. The profit includes income from associated companies amounting to £70,939 (£64,131); profits less losses on sale of fixed assets, £8,317 (£37,410); net exchange loss, £24,384 (gain, £2,167); and depreciation, £93,095 (£132,411). Net profit of the parent company is given as £55,978 (£109,273).

Dunlop Rubber Co. Ltd.

To meet expanding production needs, the Dunlop Rubber Co. Ltd. has acquired for £750,000 the entire share capital of Brynmawr Rubber Ltd. from Enfield Cables Ltd. The main factory at Brynmawr, in the Welsh Development Area, was a new idea in factories, specially designed and built for this industry, with a total floor space of more than 250,000 sq. ft. The factories at Brynmawr and Cwmavon will provide the Dunlop Rubber Company with additional space for the manufacture of products other than tyres, and, for the time being, existing production will be continued.

National Drug & Chemical Co. Ltd.

Mr. G. E. Griffiths, new president of National Drug & Chemical Co. Ltd., told shareholders at the annual meeting that recent reductions in Federal excise taxes would lower the margin of gross profit on realisation of inventories affected. Sales volume of the company in the first quarter of this year, he reported, was maintained at approximately the same rate as last year, but operating costs still showed a rising trend, mainly due to increases in salaries and wages. 'Strenuous efforts' would be required, he said, to maintain earnings this year at the level of 1953 and hold the pace set in the past eight years. In 1953, net profit showed a gain amounting to $503,399 or $1.42 a share (1952, $1.16).

The Telegraph Construction & Maintenance Co. Ltd.

In a statement issued with the annual report of the Telegraph Construction & Maintenance Co. Ltd. for the year ended 31 December last, the chairman, Lord Colgrain, says that the company's affairs continue to progress satisfactorily. Production was good and turnover was higher by 8 per cent over the previous year, but because of keener competition the gross profit was slightly lower. Despite this and the 'heavy burden of taxation,' however, net profit was £220,972, compared with £194,017. The directors recommend a final dividend of 3¾ per cent, making a total of 7½ per cent for the year, and a cash bonus of 1 per cent. Referring to the transfer of the Plastics Division to Farnborough, Kent, Lord Colgrain says this has been completed with the minimum dislocation of production, which is now again in full swing.

Unilever Ltd. and Unilever N.V.

The Boards of Unilever Ltd. and Unilever N.V. are recommending final ordinary dividends in respect of the year 1953 (payable on 14 June), at the rates forecast when the interim dividends were announced in November, 1953, namely: Unilever Ltd.: 9¼ per cent actual (1s. 11.4d. per £1 of stock) less tax, making 15¼ per cent for the year ended 31 December, 1953 (1952—13½ per cent); Unilever N.V.: 8¾ per cent actual (Fl.87.5 per share of Fl.1,000) making 14 per cent for the year. The total dividends are equivalent in value under the terms of the equalisation agreement between the two companies. Trading conditions in general have been favourable and results satisfactory. The value of turnover at £1,310,121,000 is the largest so far achieved. After charging depreciation of £15,154,000 (1952, £16,825,000, including the addition to reserve for replacement of fixed assets), the combined trading profit on the groups' operations throughout the world was £61,652,000 (£38,921,000). Taxation for the year amounted to £33,860,000 (£22,180,000) and the consolidated net profit was £25,824,000 (£21,056,000).

Mathieson Chemical Corporation

Earnings of Mathieson Chemical Corporation, Baltimore, USA, for the three months to 31 March were $4,753,819, or 83 cents per share on the 5,480,773 shares outstanding on that date. This compares with earnings of $4,668,645, or 82 cents per share for the same period in 1953. Sales for the three-month period were $65,556,997, compared with $60,515,173 in 1953, a gain of 8.3 per cent.

Export Licensing Changes

CHANGES in export licensing control are made by a Board of Trade Order which came into force on 3 May.

Principal changes are as follows:—

(1) Licences are not now required, except for exports to China, Hong Kong, Macao and Tibet, for certain essential oils, certain waxes, spent oxide, certain metals and alloys in various forms, agar, calcium silicide, tars other than crude coal tars, certain manufactures of platinum, natural rubber and rubber latex and certain dyestuffs.

(2) Lead thiocyanate, specified ferro alloys, specified manufactures and semi-manufactures of platinum and platinum alloys and certain wire and strip of copper of copper alloys, may now be exported without licence to any of the destinations specified in Part II of the Third Schedule, excluding Hong Kong.

(3) The value limit of *bona fide* gift parcels has been increased from £10 to £25.

Also from 3 May, the Open General Licence of the 5 October, 1953, relating to dyestuffs and certain organic products for dyestuffs manufacture has been revoked.

Next Week's Events

WEDNESDAY 12 MAY

Society of Chemical Industry

London: 11 Chandos Place, W.1, 6.30 p.m. Meeting for young members of Food Group. Dr. J. R. Pollock: 'Experimental Malting'; P. D. S. Wood: 'Urea Inclusion Compounds and Their Use in Fat Chemistry'; J. D. Felmingham: 'The Chemist in the Food Can-making Industry'; P. O. Dennis and H. F. Shipp: 'A Laboratory Climbing Film Evaporator'; L. Coton: 'A Continuous All-glass Still'; Miss J. V. Benoliel: 'Kjeldahl Destruction Without a Fume Chamber.'

THURSDAY 13 MAY

Royal Institute of Chemistry

Frant, near Tunbridge Wells: Wellcome Veterinary Research Station, 2 p.m. Members' visit.

Society of Chemical Industry

Chorleywood, Herts.: Memorial Hall, 6.30 p.m. J. B. M. Coppock: 'Science & the Baker' (preceded at 2 p.m. by limited visit to Baking Industries Research Station).

Royal Society

London: Burlington House, Piccadilly, 4.30 p.m. Sir Ian Heilbron: 'The Work of the Brewing Industry Research Association.'

Institute of Metal Finishing

Manchester: Engineers' Club, Albert Square, 7.30 p.m. Joint meeting with Institution of Engineering Inspection. T. P. Hoar: 'Corrosion in Theory & Practice.'

FRIDAY 14 MAY

Society of Chemical Industry

Seascale, Cumberland: County School, 7.45 p.m. Joint meeting of Liverpool Section with RIC. J. W. Broadhurst: 'Instrumentation in a Chemical Factory: *p*H Measurement & Control.'

Market Reports

LONDON.—Active trading conditions have continued in most sections of the industrial chemicals market and deliveries against contracts are being called for to the full extent of commitments. Enquiries for new business are coming from consumers over a wider field. Export trade remains good. Prices, for the most part, are unchanged, and the undertone of the market is steady. Interest in the coal tar products market is sustained, particularly for the light distillates. Creosote oil is in good demand for export, and rather more overseas enquiry is reported for cresylic acid.

MANCHESTER.—Prices on the Manchester chemical market during the past week have maintained a steady front in virtually all sections. Consumers in the textile bleaching, dyeing and finishing trades are reported to be taking reasonably good deliveries under contracts and in the aggregate substantial quantities of the alkalies and other products are being absorbed by other leading industrial outlets. Sellers are handling a fair number of fresh inquiries in both the home and export sections of the trade. In the tar products market quieter conditions are reported in pitch but most other lines are meeting with a steady demand at generally firm prices.

GLASGOW.—It has been an extremely busy week for chemicals generally, mainly due to the take up of orders placed some time ago for forward delivery, and in some cases manufacturers have been hard put to meet demands. The position, more or less, all round is extremely healthy and prices have not shown any undue variation from the last period.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order*, 1952.

APPLICATIONS are invited from **CHEMISTS** for a progressive position in a large industrial Research Laboratory in the South of England, to study problems connected with the manufacture and use of detergents. Applicants should have a good degree or equivalent experience, preferably in the detergent and textile fields. The initial salary will be commensurate with qualifications and experience. The Company operates a Pension Scheme. Apply **BOX No. C.A. 3312, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS; PATENT EXAMINER AND PATENT OFFICER CLASSES. The Civil Service Commissioners invite applications for pensionable appointments. Applications may be accepted up to December 31, 1954, but early application is advised as an earlier closing date may eventually be announced. Interview Boards will sit at frequent intervals. The Scientific posts cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small; individual vacancies exist at present for candidates who have specialised in Palaeobotany, Foraminifera, Malacology and Lichenology. The Patent posts are in the Patent Office (Board of Trade), and Ministry of Supply.

Candidates must have obtained a University Degree with First or Second Class Honours in an appropriate scientific subject (including Engineering) or in Mathematics, or an equivalent qualification; or for Scientific posts, possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer and Patent posts taking their degrees in 1954 may apply before the result of their degree examination is known.

AGE LIMITS.—Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For Scientific Officers and Patent Classes, between 21 and 28 during 1954 (up to 31 for permanent members of the Experimental Officer Class).

SALARY.—(London) Senior Scientific Officers: (men), £975-£1,150; (women), £845-£1,025. Scientific Officers: (men), £470-£855; (women) £470-£750. Patent Examiner and Patent Officer Classes (men), £440-£760, (rates under review). Women's rates somewhat lower. Somewhat lower rates in the provinces.

Further particulars from the **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1** quoting No. S.53/54 for Senior Scientific Officers and S.52/54 S. 128/54 for the other posts.
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Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 8 May, 1954. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.