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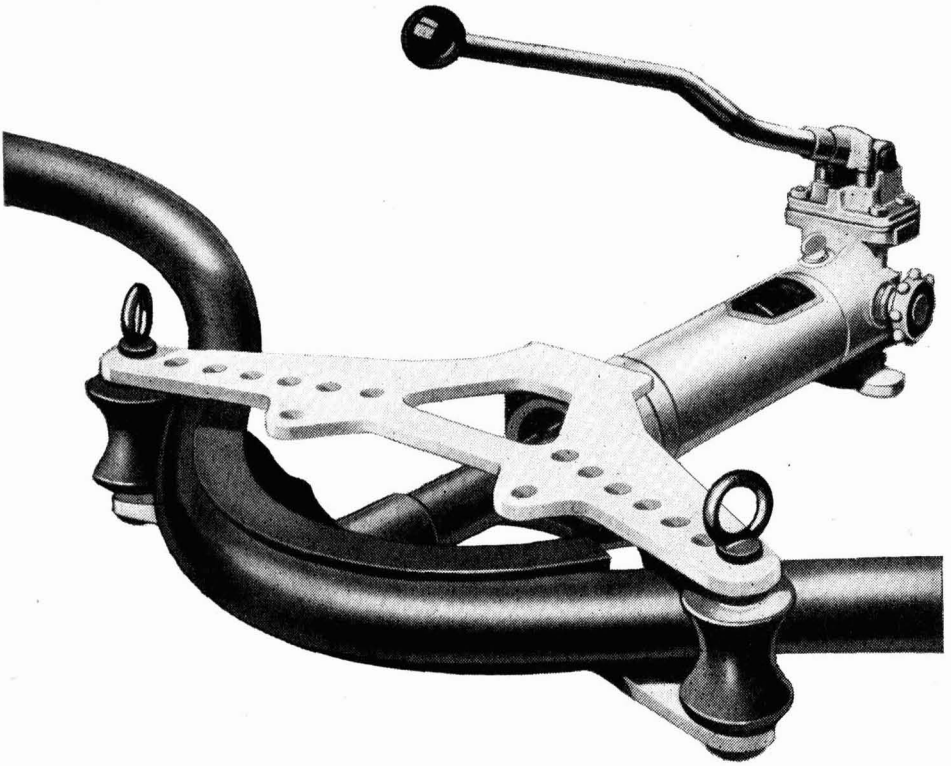

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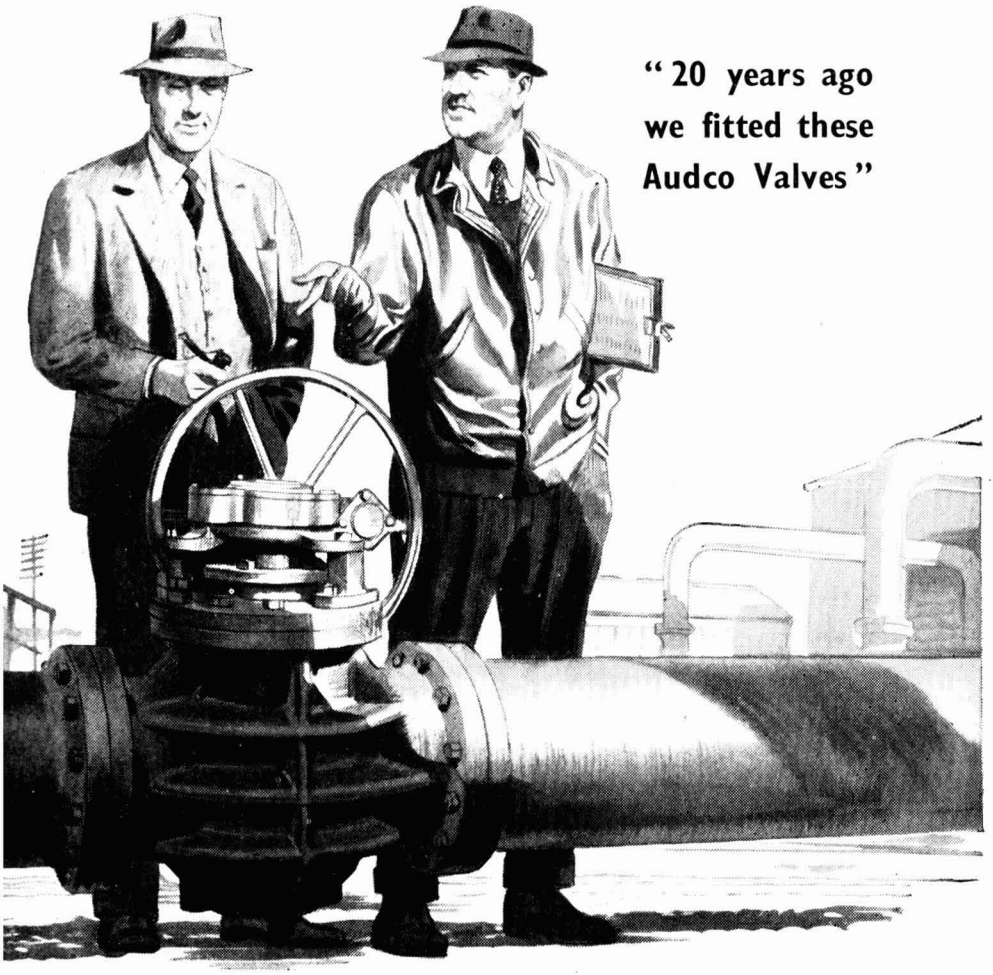

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The Chemical Age

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Progress in Chemotherapy

'NEW drugs for old diseases' might well be the slogan of post-war chemotherapy, and by no means all the progress is attributable to the antibiotics. In the centenary year of Ehrlich's birth there are many more new synthetic drugs in promising development stages than at any other time. It would be foolish to expect all of them ultimately to succeed; but it is a certainty that some of them will improve man's prospects of conquering or withstanding ill-health. It is in recent years, as Professor J. W. Cook observed in his Chemical Council lecture, that the partnership between chemistry and medicine has become so rich and fruitful.

Much of the research work by which new drugs are established is carried out by the producing industry. This undoubtedly reflects the speculative nature of chemotherapeutic research. However much guidance towards molecular pattern may have been deduced from past experience and plausible theory, a trial-and-error stage of testing inevitably confronts every new synthetic drug. Its behaviour *in vivo* may not correspond with earlier laboratory indications of behaviour. Troublesome side-effects may limit the extent to which it can be used for achieving the target-effect. Clinical test results in hospitals may not produce the benefits that seemed predictable from tests with animals. Even when a new drug appears to have passed all these stage-by-stage screening tests with outstanding success, its long-term establishment is still an uncertainty. Ineffectiveness may gradually develop because a few initially resistant organisms invading the body are left to breed without competition an ultimately resistant and occupying population.

With so many factors conducive to failure and unable to be predicted in the earlier stages of development, it is not extravagant to describe chemotherapeutic research as a precarious combination of science and chance. So long as the rewards for success are attractive enough, private enterprise will remain best fitted for undertaking these highly speculative risks. From a broad front of research, a limited number of successes will emerge, and the profits derived from these will help to carry the losses on those that fell by the wayside. It is certainly possible in theory for the entire chemotherapeutic research effort of a country to be state-funded and state-organised, but all experience goes to show that state departments rarely indulge with success in ventures that involve taking chances. Moreover, profits already being derived from well-established drugs and medicines can be made to serve the cause of creating new ones. Thus, profits made from simple indigestion or constipation remedies can be put to good use in research for drugs to cure or relieve blood pressure, tuberculosis, etc. A competitive industry must adopt such a policy, not altruistically and from public zeal, but for its own health and longevity. No business in this rapidly changing branch of chemical manufacture can wisely rest content with its existing products. The more appropriate role of the state is the role of censorship, to approve or disapprove the introduction of new drugs into medical treatment, to conduct or sponsor independent tests when there appears to be some doubt about the side-effects or long-term effects of an otherwise promising drug. When medicine has itself been nationalised, with the costs of treatment for almost every member of the population falling upon the state, it would seem disastrous for state departments to have full control of research,

development, and censorship. Who, then, would be the pace-maker of progress?

An American survey (see *Chemical Week*, 1954, **74**, [9], 47-50) revealed that out of some 2,000 new 'ethical specialities' aimed at the medical profession in the period 1948-1952, only 54 had established themselves as attractively profitable products, and only about 100—including the previous 54—could be classified as selling well enough to do more than 'break even' with costs. Admittedly, no pharmaceutical industry is more fiercely competitive than that of the US and we might not be unduly wrong in assuming that a number of the failures among the 2,000 new products had been over-inspired by the force of competition. A new drug, without allowing for this tentative factor, has a 1 in 20 chance of becoming a worthwhile product to make and sell; but even when a medical drug industry invests in research more cautiously, the chance must still be between 15 to 1 and 18 to 1. This might at first thought seem an argument for private enterprise to be less enterprising and to conduct much less research, but the fact that 2,000 new products sought a place in the medical treatment market in only five years shows that no existing product can count upon a lasting future. To the established pharmaceutical company research is as much a weapon of defence and stability as it is a means of expansion.

These are theoretical arguments. As with drugs themselves, the test of theory is practice; the fact that so many new and promising synthetic drugs are being tested or actually entering medical treatment today is proof that private enterprise and competition can adequately stimulate progress. A remodelled sulphanilamide, first developed for treating congestive heart failure, is effectively checking the eye disease glaucoma. This disease is caused by fluid outflow restriction inside the eye, which sets up internal pressure. The new sulphanilamide 'Diamox,' taken orally, increases fluid outflow and relieves the pressure; so far it appears to possess no toxicity or side-effects. Hitherto, glaucoma has only been controllable by operative treatment or by the frequent applications of drops. Another long-known disease, shaking palsy or Parkinson's disease, for which atropine has been a most limited relieving drug owing to its toxicity, can now be given much safer relief from at least two new synthetic drugs, 'Artane' and 'Parsidol.' 'Artane' has half the antispasmodic effect of atropine, but its side-effect hazards are far less severe; the margin between effective and dangerous dosage rates is much greater.

So far with cancer chemical research has revealed causative influences rather than produced potential chemotherapeutic remedies. But recently a promising drug, 6-mercaptopurine, and an even more hopeful antibiotic substance, azaserine, have given indications of tumour growth inhibition. Furthermore, there is evidence that the drug and the antibiotic together are synergistic. Out of a number of substances tested as inhibitors of tumour growth in mice, crude filtrates of *Streptomyces* culture were found to exhibit this property. The active constituent, azaserine, was isolated, its molecular structure unravelled, and it has already been synthesised. Some cancer-inhibiting activity has been displayed by other antibiotic substances, but animal tests with azaserine have so far shown greater activity allied with lesser toxicity. It must be some time yet before the stage of clinical tests is reached; if their results favour development, industry has solved in advance the problems of synthesis.

An 'artificial' antibiotic, one that has not so far been isolated in nature, but produced only by the artificial culture of a mould organism from Venezuela and by synthesis, chloramphenicol, is now widely used for treating whooping-cough, typhoid fever, and a range of respiratory ailments. It is being synthesised on a commercial scale, and is the first antibiotic substance for which this can be claimed. Amoebic infections seem likely to be countered by 8-quinolinóls, and CDQ (or 5-chloro-7-diethylaminomethyl-8-quinolinol) has given particularly effective and non-toxic results with rats and dogs.

Chemotherapeutic progress is being actively pursued and mankind has never had better hopes for defence against disease.

Notes & Comments

By Any Other Name

A CANADIAN correspondent to *Chemistry and Industry* (1954, 519) has just suggested that the name 'chromatography' should be discarded since by origin it means either colour writing or the study of colour. In its place he puts forward an entirely new word 'synthetolikmisis,' a philological derivation from the Greek words for 'compound' or 'combination' and the verb 'to winnow.' We cannot help feeling that most people, let alone most chemists, will prefer to continue using an incorrect word that is already familiarly established, reasonably easily pronounceable and spellable, than to adopt an awkward and ugly child of more legitimate parentage. In any case, the general acceptance of chromatrography as a scientific word has come about as a short-cut version of the longer and more accurate two-word descriptions, 'chromatographic analysis' or 'chromatographic separation,' and if chromatography can correctly mean the study of colour there is nothing so very seriously erroneous about these fuller terms of nomenclature. Language, technical or otherwise is a living thing and it is entirely appropriate that two-word names, when they incur more and more frequent use, should be replaced by single-word names that can carry the same load within their context of use. When the word chromatography is used today in scientific papers or articles, is there any reader for whom the matter is intended who does not know what is meant, or who is likely to be confused by the other and more entomologically correct meanings? That, surely, is the crucial test. Why should we invent a new word when we are making an old and far more pleasant one serve the essential purpose?

Re Reactors

A HEADLINE that recently raised our eyebrows was 'Reactors by Mail-Order' in one of last month's issues of *Chemical & Engineering News*. For a moment we visualised American housewives casually press-buttoning atomic energy units in the kitchens while stacking dirty plates in the automatic dish-washer. However, we soon learnt that the ACS weekly had been indulging in tabloid technique, and for some time ahead it will still remain improbable for reactors to be despatched on trial, with a money-back-guarantee, or on receipt of the first instalment. All that is likely to be sent through the post is a manufacturer's catalogue of reactors. However, if reactors have reached the catalogue stage, it *is* something. This particular US company has listed three models. None of them is designed for generating electric power, a negative statement we accepted with some relief for it would have been rather too confusing if private enterprise had started to offer in 1954 what top-level state scientists tell us we cannot expect until round about 1964! These reactors will produce high-flux sources of neutrons for research involving irradiation. The three kinds are a 'water boiler' type with the fissionable material in aqueous solution inside the core, a 'pool' type operating under water with a core of uranium and aluminium alloy, and a graphite cored reactor.

The Norwegian Way

NEVERTHELESS, the news about reactors that has most impressed us is from Norway. Norway has constructed and paid for a uranium reactor, and yet there are rather more than two people living in London for every person who lives in Norway. Most of the money for Norway's reactor has come from her weekly football pools which are run as a State monopoly. So this is another kind of 'pool' reactor, and one that might well serve as a prototype for other countries in Europe! Norway's football pools pay tax free prizes but their profits are approximately divided in a 2 : 1 ratio for developing national science and sports. So it has taken five years for the Norwegian Atomic Institute to build a uranium reactor and with relatively small appropriations of taxpayers' money.

European Sales Conference

SINCE the war Albright & Wilson Ltd. have made it regular practice to bring overseas representatives to sales conferences as part of their intensive export sales programme. At the last conference, delegates were invited from the company's world-wide chain of agencies, but excluding Europe—as it has been found that the specialised selling needed in the European market can more easily be discussed at a separate conference. A European Sales Conference, therefore, is to be held 16-20 May at which delegates representing 15 firms in 12 European countries will be present.

Following short talks by various members of the London sales staff and reports by agents from Austria, Belgium, Denmark, Finland, France, Holland and Italy on 17 May, a dinner will be held at the Hyde Park Hotel, London, and delegates will visit a London theatre. On the following day a visit will be made to the firm's new Portishead works and on 19 May the party will inspect the Oldbury Works and then attend the Memorial Theatre at Stratford. On the final day of the conference reports will be given from agents in Norway, Portugal, Spain, Sweden and Switzerland.

Heat Transfer Course

ARRANGEMENTS have been made for a vacation course in Heat Transfer to be held at Loughborough College from 19-31 July. As was the case in 1952 and 1953, the course will be mainly of a practical nature.

To obtain the maximum benefit from the course, a student should have some knowledge of heat transfer, but it is expected that there will be some wishing to attend whose knowledge of the theory and practice of heat transfer is either in need of revision or is largely non-existent. For these, the first few days of the course will largely be spent in the lecture room.

Thereafter the course will take the general form of morning lectures on a special topic or aspect of heat transfer, followed for the remainder of the day by carrying out experiments on such pilot-scale apparatus as heat exchangers, jacketed pan coolers, heaters, drying and humidification plant, etc.

The inclusive fee for the course is 20 guineas and the number of students attending will have to be limited to 30. Further information is obtainable from Dr. R. F. Phillips, Department of Chemical Engineering, Loughborough College of Technology, Loughborough, Leicestershire.

During the joint meeting of the Societe Francaise de Metallurgie and the Institute of Metals, an Anglo-French party visited the new Crawley Works of The A.P.V. Company Ltd. and the adajcent Stainless Steel and Aluminium Foundries of A.P.V.-Paramount Ltd. Prior to the tour of the works the party was welcomed, at a lunch, by Dr. Richard Seligman, the chairman of A.P.V.

New Ethylene Dibromide Plant

Lined with 170 Tons of Rubber

GREAT advances have been made by the rubber industry in recent years in lining chemical plant with corrosion-resistant rubbers. These advances relate not only to the technical qualities of the linings and the skill with which they are applied, but also to the greatly enlarged scale on which they are employed.

One of the most notable projects carried out recently in this field has been the contract completed by the General Rubber Goods Division of the Dunlop Rubber Company Ltd., Manchester, for the Associated Ethyl Company Ltd., in connection with the large new plant recently set up on Merseyside for the manufacture of tetra-ethyl lead.

As is well known, tetra-ethyl lead is the best anti-knock additive available for use in petrol, both for aviation and motor fuels. Tetra-ethyl lead was first used for this purpose about 30 years ago and manufacturing capacity throughout the free world today is probably in excess of 650,000,000 lb. a year, of which the greater part is in the United States of America. In Great Britain production has now been brought up to an annual level of about 80,000,000 lb.

Tetra-ethyl lead is mixed with ethylene dibromide for use in aviation spirit and with ethylene dichloride and ethylene dibromide for use in motor fuel. The function of the ethylene derivatives is to act as scouring agents by combining with the lead compounds which would otherwise form solid deposits in the engines.

Demand Greatly Increased

The use of ethylene dibromide in the improved fuels has led to a greatly increased demand for bromine, an element previously in limited supply. This new demand has been met by the large-scale production of bromine from sea water and it is in this connection that recent developments in the production of tetra-ethyl lead in the United Kingdom resulted in an exceptionally large project for the rubber lining of a chemical plant.

This new bromine plant has been constructed on the northern coast of the Isle of Anglesey, because deep-sea water brought in from the Atlantic by the Gulf Stream is available there and this water contains a higher proportion of bromine than does the surface water. The construction of the plant at Amlwch was a very considerable undertaking, and involved the application of something like 170 tons of compounded rubber. The total cost of this lining work ran well into six figures.

Bromine Liberation

The new plant has been constructed to take sea water from Bull Bay by means of a tunnel driven through the rock, whence it passes to a reservoir and is then pumped into four large distribution tanks. From these the water passes to concrete cells, which are filled with contact rings. In this process the sea water is acidified and then treated with gaseous chlorine, whereby bromine is liberated and removed by counter-currents of air through the cells. Treatment with sulphur dioxide causes the formation of fine mists of hydrobromic and sulphuric acids, which are filtered out of the air currents and the resulting liquor treated for the liberation of the bromine itself.

The provision for acidifying the sea-water and for handling the various acid mists, etc., obviously necessitated very thorough protection of the concrete, steel and other materials of construction and this was achieved throughout the plant by means of rubber and ebonite linings and coverings. The cells of the concrete blowing-out tower were lined with unvulcanised rubber sheet, afterwards cured *in situ* by hot air, the lining having to withstand also the cutting action of the contact rings.

In a rather similar manner the four sea-water distributing tanks, each about 44 ft. long and 12 ft. wide, were lined internally with soft vulcanised rubber and the work then proceeded to the lining of the five acid storage tanks, each 15 ft. high and 20 ft. in diameter, with low-temperature curing ebonite, this material being subsequently vulcanised by boiling water.

The absorbing vessel into which the acid-laden mists pass from the cells was lined internally with two layers of material, the

under one being a self-vulcanising compound, with a covering layer of vulcanised sheet. The girders inside this vessel were previously lined externally with ebonite. The surface covered in this operation totalled more than 35,000 sq. ft. and used 30 tons of rubber materials.

A Venturi duct having an internal surface area of approximately 7,000 sq. ft. connected the absorber to the blowing-out tower, and this structure was lined with low temperature curing ebonite, which was vulcanised by the passage of steam at atmospheric pressure. In this operation it was necessary to correlate the fabrication, welding, shot-blasting and progressive movement of the elaborate scaffolding, and the vulcanisation process was again carried out with careful control of temperatures.

In addition to these main rubber lining projects, a large amount of rubber went into miscellaneous items, such as rubber-lined and ebonite pipes, valves, large bore ducting, jointing materials, etc. The total area of rubber lining work was approximately 250,000 sq. ft. The project was initiated in discussions between Dunlop and The Associated Ethyl Company Ltd. during the year 1951 and was completed on schedule in 1953. The ethylene-dibromide produced by the plant is now being transported to the new tetra-ethyl lead plant on Merseyside.

'Corrosion in Action'

Mond Nickel Film Shown

AN excellent educational film entitled 'Corrosion in Action' has been produced under the auspices of The International Nickel Co. Inc., the American associates of The Mond Nickel Co. Ltd., and on Friday, 8 May, trade and technical journalists attended a private showing in London. The film, which is completely instructional and makes no attempt to sell any firm's products, is in colour and has been given a British commentary. In three parts, it runs for approximately one hour.

The film deals first with the economic importance of corrosion, showing examples of the various forms of attack. A historical survey leads to a diagrammatic explanation of electro-chemical corrosion. The film points to the role of oxygen as a promoter of cathodic reactions and shows how corrosion may be controlled by various means.

The arrangement of metals in their electromotive series introduces a discussion of galvanic action in terms of potentials, current density and area effects. This is shown clearly in a series of laboratory tests utilising colour-changing reagents which detect the existence of anodic and cathodic corrosion products.

Passivity and protective films are demonstrated by a series of bench experiments, indicating how important the film can be in some instances. Local shielding and the damage resulting from it is followed by a section comparing the mechanism of corrosion of various materials. The film ends with illustrations of the measures that can be taken to minimise corrosion and the many practical and economic advantages which result when materials are chosen with full knowledge of the many factors involved in the study of individual corrosion problems.

D.C.L. Group Moving

DURING the last fortnight in May, most of the divisions and subsidiary companies in the D.C.L. Industrial Group will move from their present London offices to new accommodation in Devonshire House, W.1. The new address: Devonshire House, Mayfair Place, Piccadilly, London, W.1; and the new telephone number: MAYfair 8867 will be common to the London offices of:

British Geon Ltd.
British Industrial Solvents
British Petroleum Chemicals Ltd.
British Resin Products Ltd.
The Carbon Dioxide Company
Commercial Solvents (G.B.) Ltd.
D.C.L. Engineering Division (Southern Office)
D.C.L. Industrial Alcohol Division
D.C.L. Transport Department
D.C.L. Industrial Group Publicity Dept.
D.C.L. Yeast & Malt Extract Dept.
The Distillers Company (Biochemicals) Limited
F. A. Hughes & Company Ltd.
Honeywill & Stein Ltd.
The Methylating Company Ltd.

Associated with these changes, Magnesium Elektron Ltd. will move to Distillers House, 20-21 St. James's Square, S.W.1. (Tel. WHItehall 1040.)

The telegraphic addresses of the various units remain unchanged.

DSIR Plan Chemical Engineering Research

Announcement in CRL Annual Report

IN 'Chemistry Research 1953,' published last Friday, the Chemistry Research Board announces that it has agreed that chemical engineering research should be added to the programme of the Chemical Research Laboratory. The Board says that work on this subject will at first be on a modest scale. Later, more staff and buildings will be required if full value is to be obtained from the new development.

The extraordinary variety of problems which come the way of the Laboratory is shown in the first part of the Director's report. Advice on protecting pipelines from corrosion has been given to authorities in Kuwait, the Fenlands (a sewerage network) and the Derwent Valley (an aqueduct). Others who have consulted the CRL on underground corrosion include British Railways, South African and East African railways, various cable manufacturing firms and the British Electricity Authority.

Just as much variety exists on the atmospheric corrosion field. The CRL has assisted in overcoming the corrosion of a large steel chimney stack, improving the life of sparking plugs, protecting internal parts of church organs, and combating corrosion of steel exposed to acetic acid and steam in a vinegar plant. Many of the inquiries received have concerned corrosion in packing or storage; for example, the corrosion of condensed milk containers exported from Holland to Malaya, soup tins imported here from the West Indies and chromium-plated sterilisers for export to Borneo.

Industrial Firms Aided

Some 20 industrial firms have been helped by the Radiochemical Group in analysis and concentration of metals. The Microbiology Group have assisted on problems caused by the action of sulphate-reducing bacteria, including the deterioration of petrol storage tanks in Israel and Norway and the use of disused gravel pits as refuse-tipping centres.

Because of the recent discovery that tannates stop the activity of sulphate-reducing bacteria, commercially available tannins and their oxidation products have been examined to select materials for tests in clay soils. Mild oxidation increases their effect on the bacteria. Some tannins, particularly those made from mangrove, are promising. These tannins are of no use in the tanning of leather because they darken the material and they are therefore available in large quantities. Arrangements have been made for field tests of them with the co-operation of the Metropolitan Water Board.

'Filiform' Corrosion

There has been a revival of interest in the 'filiform' type of corrosion caused by contaminating particles. Corrosion of this sort produces unsightly trails over a metal surface. Tests with particles of salts and other substances have shown that most contaminants accelerate corrosion as the humidity increases. Ammonium chloride, however, is an exception. The rate of attack with this falls off at high humidities. The accelerated test developed at the Laboratory has reproduced in a striking manner forms of corrosion on mild steel specimens that are met with in practice and is likely to be of great practical importance in combating the attack.

Corrosion-inhibitive pastes based on bentonite with sodium nitrite have proved successful in unheated conditions. The pastes have one particular advantage. When they are applied to slightly rusted steel, further corrosion is prevented. If pastes of the usual oil and grease type are being used, all rust must be removed first. This tiresome job can now be avoided.

During the year an intensive search has been carried on for new sources of selenium, a highly important element in industry. It has been discovered that in the new flashing-roasting plant now coming into use for the manufacture of sulphuric acid, a good deal of the selenium originally present in the pyrites is concentrated in the sludge left when the sulphur dioxide is washed with dilute sulphuric acid. It can readily be recovered from it. Concentrations of selenium up to 12 per cent of the dried sludge have been obtained in this way. The selenium is in elemental form. It seems that an im-

'Chemistry Research, 1953,' published by HMSO for DSIR, price 2s. 6d. (65 cents USA) by post 2s. 8d.

portant contribution to our supplies could be made by processing the sludge. (See THE CHEMICAL AGE, 1953, **69**, 755; 804.)

Geochemical methods of prospecting have become more and more important in the last few years. They call for the analysis of large numbers of soil samples for a variety of metals. High accuracy is not needed but an easy and quick system is essential. The CRL has developed a useful technique for this work, using paper strip chromatography. It takes less than thirty minutes to complete and extracts from ten samples of soil can be treated at the same time. So far the technique can be used in the search for niobium, tantalum, copper, cobalt, uranium and lead. Its possibilities with other metals are being studied.

A great deal of interest has been shown by industry in the use of infra-red spectrometry for analysing mixtures of organic compounds. A large number of samples have been analysed and circuit-diagrams and lay-out plans of the equipment have been supplied to interested organisations.

Semi-Permeable Membranes

Work has continued on the applications and fundamental characteristics of semi-permeable membranes and on the ion-exchange and related properties of cross-linked polymers. Production from polyvinyl alcohol of membranes of graded permeability which can be reproduced is an important step forward in the development of these membranes. This has attracted much attention from industrial and other research workers. Many of them have been working at the laboratory for short periods to make a closer study of the new techniques. These novel membranes are of particular value in the characterisation of polymers of low molecular weight. By their use the range of dependable osmometric measurements has been extended to overlap satisfactorily with older techniques.

Basic studies on the properties of cross-linked polymers have contributed greatly to practical success. In the laboratory the results have been applied to the separation and concentration of metals, and they are also being used in industry, notably in the recovery of gold from cyanide solutions. A series of resins has been prepared containing complex-forming residues and exhibiting highly selective behaviour. One of these is particularly promising in the removal from water of traces as small as 1 ppm. of copper.

A survey carried out by the Microbiology Department on raw materials for the production of sulphur by microbiological action showed that sewage sludge is at present the only possible source of carbon that it would be economical to use. The CRL is carrying on its investigations as far as a laboratory large-scale experiment so that data may be available on which pilot plant operations could be based.

The laboratory has continued to supply samples of standard materials to industrial and academic establishments in all parts of the world. The materials, listed in the appendices, include cultures of industrial bacteria, pure organic compounds and pure metals.

Trade with Brazil

THE Export Credits Guarantee Department (the Government department providing insurance against the major risks of exporting) announces that it is resuming a limited cover on exports to Brazil. It suspended the issue of all fresh cover for Brazil in May, 1952, at a time when its gross liabilities in that market totalled some £32,000,000.

Cover on resumption will be limited to 80 per cent of the credit granted (as against the normal 90 per cent for most risks); the waiting period before loss is ascertained will be 12 months (as against the normal six months); there will be no cover for goods not of UK origin; exchange sale notes must be produced covering all payments due, and the department will require prior proof of compliance with import licensing and exchange formalities before it comes on risk for any transaction. The existing scheme for cover on shipments of spare parts (the only form of cover currently available) will continue to operate.

Selling Arrangement Extended

The selling arrangement which Melanoid Ltd. have had with the Belfast Ropework Co. Ltd. for more than 25 years, covering the sale of Tectal cordage preservatives at UK ports, has been extended to the whole of the UK. Inquiries and orders for Tectal can be sent either to the Belfast Ropework Co. Ltd., Belfast, N. Ireland, or to Melanoid Ltd., Station Street, Dudley Port, Tipton, Staffs.

New Division for NPL

Annual Report Reveals Automatic Control to be Studied

APPROVAL of a proposal for a new research division at NPL is mentioned in the Laboratory's report for 1953, published last Friday. The new division will be concerned with automatic control of experimental, industrial and administrative operations, and the development of techniques for data processing and computation. It will incorporate the present Electronics Division and the Control Mechanisms section of the Metrology Division.

Although NPL does little research of a specifically chemical nature, much of it has a direct application to chemistry.

For instance, the basic measurements of the dielectric constants of pure liquids have now been completed. The difficulties with benzene, the most widely-used standard, were found to be almost entirely due to water in solution, which could be removed only after months of treatment with drying agents. Cyclohexane was found to be free from this difficulty and is therefore suggested as a better standard. Liquids of higher dielectric constant gave considerable difficulty on account of ionic conduction and chemical instability when stored. A technique was, however, developed which gave satisfactory values for dichloroethane and nitrobenzene, and it is believed that these liquids will serve as standards.

Dielectric Losses in Silicones

Further work has been carried out on the dielectric losses in representative dielectrics, and earlier work on silicone liquids has been extended to silicone greases and rubbers. These materials are not pure silicones and at low frequencies they show a power loss considerably greater than that of the pure liquids, the loss apparently arising largely from ionic conduction. At very high frequencies, however, the characteristic absorption ascribed to the silicon-oxygen linkage usually dominates the properties.

Some ketone polymers prepared at the CRL have also been investigated. They were on the whole very similar to the phenolic thermoplastics in dielectric properties, showing strong dipolar absorption at temperatures just above the softening point, which is about 100°. The properties were, however, greatly influenced by impurities such as cause discoloration of the resin on long exposure to light.

The method for determining the colour of fluorescent pigments has been fully worked out, and applied to a selection of commercial fluorescent inks and optical bleaches. The work in collaboration with the Medical Research Council on the spectral absorption of biological stains and stained specimens has continued.

A new metallurgy building has been opened to house the X-ray, Ceramics and Radioactive Tracer sections of the Metallurgy Division. (THE CHEMICAL AGE, 1954, **70**, 881.) This has made more space available in the foundry for vacuum-melting furnaces. Work has been carried out on the effects of carbon, nitrogen and phosphorus on the physical properties of iron.

Impurities in Titanium

The causes of the difficulty of removing calcium and magnesium oxides from titanium reduced directly from titanium dioxide have been investigated, and metal of much improved purity has been produced. Reductions of titanium dioxide with mixtures of alkaline earth, metal chlorides and alkali metals have been examined. They appear to be possible according to thermochemical calculations, but in practice have not yielded metal of satisfactory purity.

An investigation of magnesium alloys with closely-controlled iron content has shown that high corrosion resistance is a property of magnesium-aluminium-zinc alloy only when it is of high purity, whereas magnesium-manganese alloy has high corrosion resistance irrespective of its iron content.

The precision absorptiometric method for the determination of titanium has been used for the determination, by difference, of oxygen in a number of alloys. Refinements of technique have reduced the standard deviation of the results on high purity titanium metal to 0.03 per cent, a level at which it is considered that the method is likely to have applications in the field of other high purity metals. The same technique can be extended to an abridged

spectrophotometer of the Spekker type with little loss of precision in the results.

The measurements made by the Physics Division in conjunction with CRL of the heats of formation of a group of pure chemicals (pyridine, lutidine, α-picoline, β-picoline) have been completed and the calorimeter is now being subjected to searching tests of its accuracy as an absolute instrument, in conjunction with determinations of the heat of combustion of pure benzoic acid so that this material may be marketed as a thermochemical standard.

National Physical Laboratory : Report for the Year 1953. Published by HMSO for DSIR, price 3s., by post 3s. 2d.

Sulphuric Acid Returns

A SUMMARY of monthly returns of sulphuric acid and oleum in the UK for the period 1 January-31 March, issued by the Sulphuric Acid Association Ltd., shows that stocks dropped from 58,848 tons at 1 January to 57,355 tons at 31 March.

The following tables have been abstracted from the summary:

CONSUMPTION IN THE UNITED KINGDOM
(1 January—31 March, 1954)

Trade Uses	Tons 100% H_2SO_4
Accumulators	2,438
Agricultural purposes	185
Bichromate and Chromic acid	1,970
Bromine	5,235
Clays (fuller's earth, etc.)	2,248
Copper pickling	768
Dealers	3,733
Drugs and fine chemicals	4,231
Dyestuffs and intermediates	21,817
Explosives	7,099
Export	799
Glue, gelatine and size	103
Hydrochloric acid	15,765
Hydrofluoric acid	3,527
Iron pickling (including tin plate)	27,755
Leather	1,182
Lithopone	3,705
Metal extraction	1,117
Oil refining and petroleum products	14,359
Oils (vegetable)	2,574
Paper, etc.	1,549
Phosphates (industrial)	417
Plastics, not otherwise classified	7,081
Rayon and transparent paper	64,968
Sewage	2,916
Soap, glycerine and detergents	10,563
Sugar refining	136
Sulphate of ammonia	76,214
Sulphates of copper, nickel, etc.	5,772
Sulphate of magnesium	1,344
Superphosphates	137,125
Tar and benzole	7,147
Textile uses	5,322
Titanium oxide	51,121
Unclassified	41,979
Total	534,264

SULPHURIC ACID AND OLEUM
(*Tons of* 100% H_2SO_4)

Data referring only to acid makers' returns	Chamber and Tower only	Contact only	Chamber Tower and Contact
Stock 1 Jan. 1954	30,176	28,672	58,848
Production	175,332	351,600	526,932
Receipts	25,173	33,998	59,171
Oleum feed	—	1,496	1,496
Adjustments	−1,748	+1,314	−434
Use	104,968	148,069	253,037
Despatches	99,185	236,436	335,621
Stock 31 Mar. 1954	24,780	32,575	57,355
Total capacity represented	196,600	385,150	581,750
Percentage production	89.2%	91.3%	90.6%

RAW MATERIALS
(*Tons*)

Data referring only to acid makers' returns	Pyrites	Spent Oxide	Sulphur and H_2S	Zinc Concentrates	Anhydrite
Stock 1 Jan. 1954	145,513	177,827	41,541	66,980	790
Receipts	134,162	75,151	75,110	16,708	44,597
Adjustments	−1,973	+1,340	+18	−2,398	—
Use	130,269	76,807	64,522	49,147	44,657
Despatches*	1,537	13,985	941	—	—
Stock 31 Mar. 1954	145,896	163,526	51,206	32,143	730

* Including uses for purposes other than sulphuric acid manufacture.

Prohibition of Drugs

THE Narcotics Commission now meeting in New York has decided to recommend the Economic and Social Council to call upon governments to prohibit the use of heroin. It was also agreed in principle that there should be a special clause on the subject in the proposed Single Convention on Narcotic Drugs which will supersede all existing international treaties.

The Commission agreed that a resolution be drafted recommending that governments tighten as much as possible their regulations regarding the use of synthetic drugs. The resolution is also to recommend that new drugs be placed under provisional control even before the World Health Organisation lists them as liable to cause addiction.

Governments are to be urged to prohibit the manufacture, import and export of a synthetic drug called ketobemidone, and its derivatives. Because of its addiction-producing qualities, this is considered as one of the most dangerous synthetic drugs.

The Replacement Flow Direct Separation Evaporator

by DR. M. S. FRENKEL

IN this new-type evaporator, the whole of the liquid to be evaporated is divided by guide-vanes into thin layers which are guided to a number of 'replacement-positions' spaced along the vertical flow-path, each layer arriving with the same initial temperature at one position and leaving with evaporation temperature at the next position where a fresh layer arrives with initial temperature. Due to this 'replacement,' there are a number of positions along the vertical heat transferring wall which have liquid layers at initial temperature on one side and at evaporation temperature on the other side of a guide-vane, and which therefore restore the temperature difference through the heat transferring wall and provide a high rate of heat transfer over the whole flow-path into all the layers of liquid.

Such replacement takes place both during up-flow and down-flow of the liquid with the layers being heated from both sides, where the up-flowing layers discharge vapour at a number of positions from the bottom of the apparatus upwards into a common up-flowing vapour column, into which the down-flowing liquid layers discharge vapour according to the 'counter-flow' principle (see references).

Further, due to the replacement, the temperature difference, and hence the heat input (on the one hand from the surrounding heat-transferring walls to both up-flowing and down-flowing liquid, and on the other hand from secondary heat-transferring walls to up-flowing vapour in the central column), increases with height along the evaporator passage. Hence the proportion of liquid evaporated from each layer in up-flow and down-flow increases step by step with the height, and the vapour is superheated to an increasing degree with height.

Since the number of layers of liquid treated is proportional to the height of passage, this evaporator enables an increased throughput of liquid to be accommodated by extension upwards rather than in width, thus saving floor-space.

Owing to the multiple evaporation at a high rate of each liquid layer in the cycle,

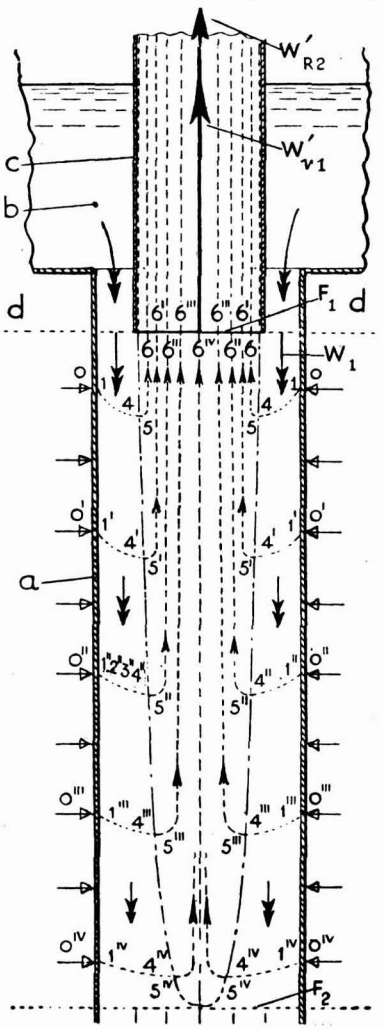

Fig. 1. Diagrammatic arrangement of counter-flow evaporator element and steady state flow formation

a Evaporator passage 7 (see Fig. 2).
b Liquid arriving via aperture 5.
c Nozzle 8.
1—4, 1′—4′, 1″—4″ . . . flow lines for heat through liquid.
5—6, 5′—6′, 5″—6″ . . . flow lines of minimum resistance for vapour.
5—5′—5″ . . . continuous phase-boundary buffer zone.

the evaporator provides for an extremely high ratio of evaporation per cycle while still permitting great flexibility of performance by direct adjustment, together with direct separation of vapour from liquid without external separators.

While being generally suitable for many kinds of evaporation, this new type is particularly effective in the utilisation of sensible heat from a heating medium, and thus operates particularly well as a waste heat evaporator. It can further be adapted or adjusted by valve-gear to carry out partial or complete separation of fluids from mixtures.

The Operation of the New Evaporator

This evaporator has many additional advantages over the author's 'Counter-Flow' evaporator (see references), which itself has considerable advantages over conventional types. To make this clear the operation of the Counter-Flow type is briefly outlined.

As proved in the paper referred to, the direct separation of vapour and liquid without the use of external separators, together with other advantages, is achieved by the provision of a guide-passage **c** (see Fig. 1) at the top of the evaporator tube or passage **a**. This brings about layer-flow of the suitably preheated evaporating liquid all down the heat transferring walls **a**, and provides flow-paths 5-6, 5'-6', 5"-6", . . . of minimum resistance to the up-flow of vapour continually formed from this layer-flow, in a central vapour column leading through the liquid reservoir **b**.

The result of this is that not only the vapour flow (which proceeds upwards at great speed after reversal of flow direction of newly-formed vapour at the phase boundary buffer-zone 5-5'-5"- . . . , on account of the very large ratio of liquid to vapour density —1.75 at 1 atm.; 40 at 50 atm.; 15,000 at 0.1 atm.—and other factors), but likewise the heat flow through the liquid along lines 1-4, 1'-4', . . , and the liquid down-flow itself, proceed along shortest paths of minimum resistance.

In the apparatus of Fig. 2, the liquid to be evaporated (single black arrows) flows from the entry-troughs 12 up the entry-passages 6 From the entry-passages 6 the liquid is peeled off in a number of thin layers to both sides by vertically spaced guide-vanes having entry-slots 4, these thin layers being guided into casings 3 where they contact the heating elements 1 at a number of spaced positions along their length with the initial temperature of the liquid.

Each thin layer then flows upwards immediately adjacent to the heat transferring wall 1 from one position to a second one, at which it is diverted from the heat transferring wall by the guide-vane through exit-aperture 5 and led into the evaporator passage 7. At the same position where it is diverted, a fresh layer of liquid at the initial temperature is brought into contact with the heat transferrng wall and flows adjacent to its continuation up to a third position, a further step higher, at which this process is repeated, these positions being called 'replacement positions.'

On entering the evaporator passage 7, each layer divides into two opposite flows: on the one hand, the vapour flows upwards, passing under the gutters 9 (as indicated by treble arrows) to join the common vapour-column (shown dotted) in which it flows upwards centrally in the passage; while, on the other hand, the remaining liquid flows as a thin layer down the walls of passage 7, formed by the walls of guide-casing 3. Due to further heat input from these walls, which are conductively connected to the main heat transferring walls 1 by secondary walls 10, these down-flowing layers provide further evaporation according to the 'counter-flow' principle.

Each down-flowing layer is diverted from the wall 3 by gutter-guide-vanes 9 after a down-flow of one step only. The layers are diverted either into several separate liquid-paths distributed along the width of the guide-casing 3 (as indicated on the detail Fig. 2A), or into two paths arranged at the extreme ends of a passage 7 (as seen on the plan-section Fig. 2B). Such a diverted liquid-layer is replaced below exit-port 5 by a fresh layer having the evaporation temperature corresponding to the pressure at this height.

In the bottom sections 13 of the passages 7, extra heating elements 14 provide further counter-flow evaporation from all the down-flowing layers, into the special nozzle 20 provided.

The vapour formed from all the layers flowing upwards as well as from those flowing downwards forms the common vapour column in each passage 6—a distingushing feature from other types. This vapour-column extends through nozzles 20 and numbers of nozzles 8 as well as pairs of gutter-guide-vanes 9 at various positions along the height and these, apart from acting as

counter-flow nozzles, operate as secondary heat-transferring walls with respect to the vapour on account of their connection to the main heat transferring walls 1, and superheat the vapour.

Advantages of the New Evaporator

(1) In contrast to evaporators without the replacement feature, in which many liquid layers are prevented from contacting the heat transferring wall (which reduces the rate of heat transfer), in the present type the whole of the liquid to be evaporated is divided up into thin layers which are each separately guided into contact with the heat transferring walls at their replacement-positions in up-flow and in down-flow.

(2) Whereas in evaporators without replacement the heat transferring wall is contacted by liquid at its initial temperature at only one position, in the present construction the heat transferring wall is contacted by liquid layers having the initial temperature at a number of replacement positions spaced along the heat transferring wall.

(3) While in evaporators without replacement the heat transferring wall has contact with liquid at the initial temperature only at the entry-position at one end and has contact with liquid at the evaporation-temperature at the other, in the present construction the heat transferring wall has a number of replacement positions at which a liquid-layer with the initial temperature flows at one side of the guide-vane and a layer at the evaporation-temperature flows at the other side of the guide-vane.

This serves to keep high the immediate temperature difference through the heat transferring wall, and hence the rate of heat transfer through this wall, along the whole length of the heating elements.

(4) In evaporators without replacement, vapour bubbles have to penetrate upwards through liquid at decreasing temperature (since the evaporation temperature falls with pressure), so that the vapour loses heat and leaves at the top with the lowest temperature corresponding to the lowest pressure there. In the present construction, the vapour formed from up-flowing layers leaves through the exit-port 5 of each of a number of replacement positions to flow directly

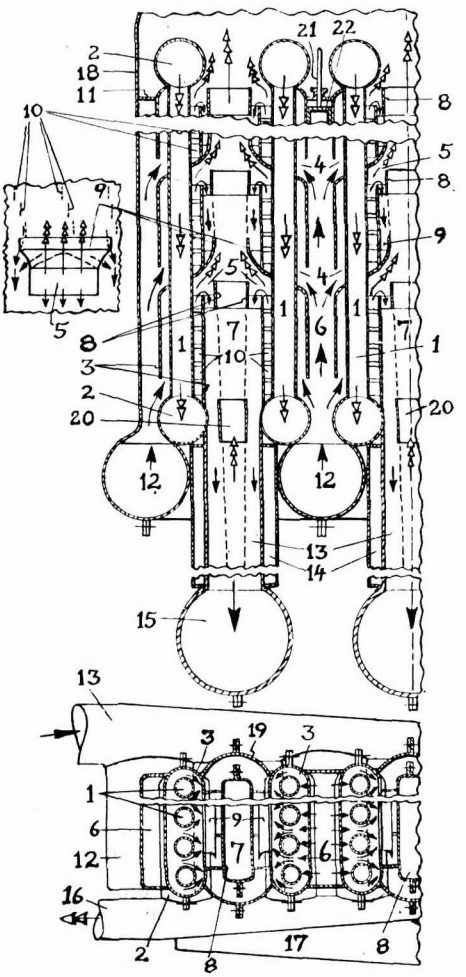

Fig. 2. Cross-section of replacement counter-flow evaporator; 2A detail of gutter liquid path; and 2B plan of evaporator

Single arrows : liquid to be evaporated.
Double arrows : heating medium.
Treble arrows : vapour.

1 Heat exchanger elements.
2 Entry and exit for heating medium.
3 Guide casing.
4 Entry slots in guide casing.
5 Exit slots in guide casing.
6 Entry passage for liquid.
7 Evaporator passage.
8 Counter-flow nozzle.
9 Gutter guide-vanes.
10 Secondary heat-transferring walls.
11 Top cover of passage 6.
12 Bottom entry trough for liquid.
13 Syphon leg of passage 7.
14 Heating elements for 14.
15 Bottom trough for liquid.
16 Exit main for heating medium.
17 Exit main for liquid.
18 Outer casing.
19 Down-flow channel for liquid diverted from 3.
20 Counter-flow nozzle for 13.
21-22 Adjustable piston.

into the common vapour-column at different heights, being further superheated therein.

(5) After emerging from the exit-port, each of the thin liquid layers flows down the secondary heat transferring wall 3 for a distance of one step, supplying vapour according to the counter-flow principle into nozzle 8, and is diverted and replaced below the next exit-port 5 by a fresh thin layer having the evaporation temperature corresponding to the pressure at its height. This saves input of sensible heat into a down-flowing layer.

(6) Further to these properties, since the wall of the guide-casing 3 and the nozzles 8 are conductively connected to the main heat transferring wall 1 and thus operate as secondary heat transferring walls, each thin layer flowing upwards within the guide-casing not only flows adjacent to the main heat transferring-wall but has heat input from both sides. This applies also to the down-flowing layers, insofar as they contact nozzles 8. Apart from this, due to the secondary walls 10, of special shape and disposition (Fig. 3), the interior of even the thin layer in guide-casing 3 is heated at many positions.

(7) In this way, each thin layer flows in isolation between its heat transferring walls, both during up-flow and down-flow, the rates of heat transfer being kept high, which leads to large proportions of these layers being evaporated every time. In fact, each thin layer:

(a) supplies a large proportion of vapour in up-flow for one step;

(b) supplies a further considerable proportion of vapour during down-flow for one step;

(c) supplies further vapour according to the counter-flow principle as part of the collective down-flow in the bottom section 13 of the evaporator passage 7.

This makes a triple evaporation in one cycle, providing a very high ratio of evaporation.

(8) A most important and unique feature of this replacement construction is that all this vapour forms a common vapour-column, which leads to the following advantages:

The temperature difference, and hence the heat input, from the surrounding heat transferring walls into the liquid (both in up-flow and in down-flow), on the one hand; and from the secondary walls 8 and 9 into the up-flowing vapour, on the other hand; increase from step to step with the height, so that the proportion of liquid evaporated from each layer increases step by step with height, and the vapour is superheated to an increasing degree with height.

A useful feature of the present type is that the width of evaporator passages 7 can be designed independently from heat transfer considerations, so that the required volume of vapour can be accommodated under best conditions. Furthermore, in certain designs, the high speed of the vapour in the column can be utilised.

(a) During up-flow, the temperature of the liquid at all entry positions 4 is the same, while the temperatures at the exit ports 5 fall with the height, since the evaporation temperatures fall with pressure, which decreases with height. Therefore, particularly in the case of a medium giving up sensible heat with maximum temperature at the top, the immediate temperature difference through the main heat transferring walls 1, and hence the heat input into the liquid layers, will increase step by step with the height. Hence, the higher a layer is when brought into contact with the heat transferring wall, the larger will be the proportion evaporated.

(b) For the same reasons, the temperature difference from the secondary walls 3 to the down-flowing liquid-layers increases step by step with the height, so that these also have a greater heat input, and hence greater proportion of liquid evaporated, the higher they are in the passages 7.

(c) In contrast to evaporators in which vapour carries entrained liquid particles, in this case the vapour not only is not wet, but becomes superheated as it flows upwards from the lower ends of passages 7. This is because the pressure, and hence the evaporation temperature, falls with increasing height, and therefore the temperature difference between vapour and nozzles 8 and gutter-guide-vanes 9, which operate as secondary walls, increases with the height.

(9) The separation of liquid and vapour, when the mixture leaves the exit-ports 5, proceeds under these influences:

(a) The buoyancy of the vapour due to the very large difference of density between vapour and liquid;

(b) The explosive expansion of volume of the vapour emerging from an exit-aperture 5 accelerates the liquid downwards and the

vapour upwards, due to preservation of linear momentum.

(c) Apart from this, the horizontal velocity component of the mixture of vapour and liquid emerging from the exits 5, which impinges on the nozzles 8, produces an impact-pressure which in the vertical direction operates additionally to accelerate the liquid downwards and the vapour upwards.

(10) Since in this construction the heating elements with their secondary surfaces and nozzles are surrounded by vapour and liquid, heat radiation is taken up by these media, leading to a further improvement in the heat transfer.

(11) A further important feature is that in this construction the number of layers of liquid peeled off by guide-vanes, and hence the mass of liquid treated in a given pair of passages, is proportional to the number of steps (replacement positions) and hence to the height of the unit. Since point **(8)** shows that the performance not only retains but increases its positive qualities with height, it becomes advantageous with this evaporator to use extension in height rather than extension in width to accommodate a given throughput of liquid. This brings about a considerable saving in floor-space.

(12) Further to all the above properties, through the provision in the entry-passages 6 of an adjustable piston-closure 21, the number of operative steps can be reduced from the full number n to m. The liquid to be evaporated then flows through only m steps and m layers only are heated and evaporated in up-flow and down-flow. Since each step corresponds to a certain evaporation temperature depending on the pressure, the evaporator, apart from enabling units to be designed for a particular purpose in the first place, can be adjusted to effect separation to a certain degree of mixtures of liquids having different evaporation temperatures. With minor modifications, involving e.g. separate entries to the remaining $(n\text{-}m)$ steps, the apparatus can also be used to bring about graduated changes in composition of mixtures.

Fig. 3. Details of alternative plate-type heat exchanger elements and guide casings in place of heat exchanger elements 1 and guide casing 3

6 Entry passage for liquid.
7 Evaporator passage.
30 Plate type heating element.
31 Guide casing round element.
32 Bulges in guide casing to permit flow by side of element.
33 Exit ports from replacement positions.
34 Central aperture through heating element.
35 Gutter guide vanes.
36 Secondary heat transferring walls.

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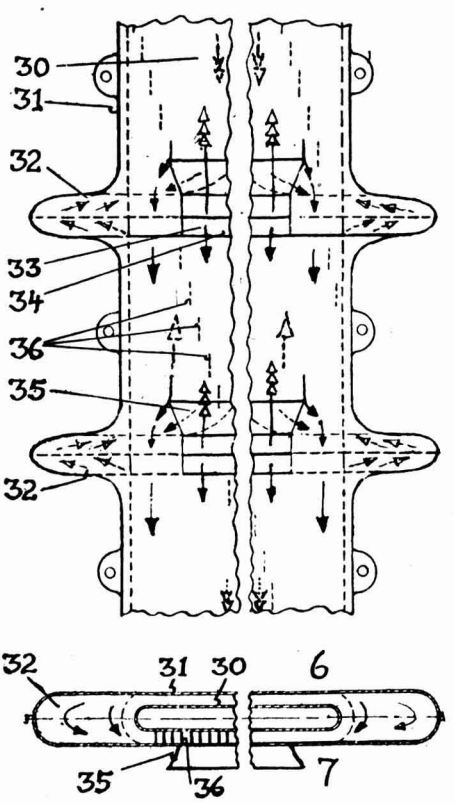
Dr. Frenkel graduated in mechanical engineering at the Technical University, Vienna, and became Dr. Phil. in physics and mathematics. He has carried out research in various fields and published a number of papers. During the war, while in charge of research for Coventry Climax Engines Ltd., Dr. Frenkel was able to prove, purely theoretically, solutions of fundamental engineering problems which were subsequently confirmed by experiment.

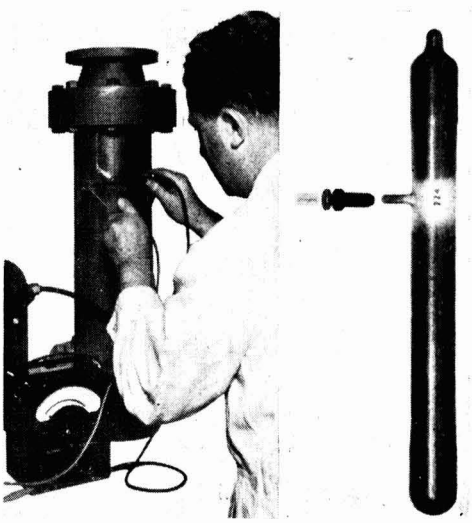


Water Treatment Unit

AN important development in the manufacture of glassware is announced by Quickfit & Quartz Ltd., who are now producing glass electrodes in various sizes for Superstat Ltd., manufacturers of the Superstat Electronic Process for the treatment of water, sugar juice and other liquors.

The Supersat unit is of robust bronze casting in which is housed an electrode completely insulated with a suitable material of high dielectric constant and having no direct contact with the liquid being treated since it is housed in the liquid-carrying pipe-lines. The electrode is charged with a high frequency electrostatic field which causes the hard scale-forming salts to undergo a physical change so that, when concentrated, they cannot coagulate and deposit as a tenacious scale.

In addition to a domestic unit there are 17 varying sizes manufactured. The electrodes manufactured by Quickfit & Quartz vary in size from 12¼ in. to 54 in. in length. Superstat equipment is in use throughout the world on all classes of hard water problems, for treatment of boiler feed, sea water evaporators, bottle-washing plant, turbine condensers, air-conditioning plant, diesel engines and the like. It is utilised in every important sugar mill throughout the world to treat either cane or beet sugar juice to prevent scale deposits in the evaporators and boiling pans.



The unit and its glass electrode

Canadian Company's Changes

UNANIMOUS shareholders' approval was accorded by-laws increasing the capital stock of Canadian Chemical and Cellulose Co. Ltd., and increasing the number of directors from eight to nine, at annual and special meetings held at Montreal recently. The capital will be increased by the creation of 100,000 $100 par value preferred shares, proceeds to be used for the settlement of a $10,000,000 loan obtained from Celatino S.A., a subsidiary of Celanese Corporation of America.

Dr. C. J. Mackenzie, former president of Atomic Energy of Canada Ltd., and of the National Research Council, was elected to the board. He has been serving the company as scientific adviser.

At a subsequent meeting of the board, the president, Mr. Harold Blanke, who is also president of Celanese Corporation of America, with which Canadian Chemical is affiliated, was appointed to the new post of chairman of the board. He was succeeded as president of Canadian Chemical by Mr. M. W. Mackenzie, who has been executive vice-president for the past two years.

$20,000,000 Oil Refinery

WORK has been started on the construction of a complete $20,000,000 refinery for a new oil company, Canadian Petrofina Ltd., on a site near Montreal, the major refining area in Eastern Canada.

The contract for the design of the major part of the processing units was recently awarded to the M. W. Kellogg Co., New York, and that company's wholly owned subsidiary, Canadian Kellogg Co. Ltd., will erect the units and all the off-site facilities. Much of the new plant will be of integrated combination design, which will eliminate considerable intermediate storage. It will also be designed with flexibility to handle both Middle East and Venezuelan crudes.

Processing facilities to be built by Canadian Kellogg include a 20,000 barrel-per-day topping unit, vacuum flashing capacity of approximately 10 000 bpd., a 4,000 bpd. visbreaking unit, a 3,600 bpd. catalytic reforming unit, catalytic polymerisation and alkylation units with feed desulphurisation facilities, 2,500 bpd. distillate treating unit, and a 6,500 bpd. gasoline treating unit.

Hot Dip Aluminised Coatings

A Process of Possible Future Importance

SPRAYED aluminium is now an established method of protecting steel, but hot dip aluminium coatings also have valuable properties. Tests carried out by the American Society for Testing Materials have shown that a hot dip aluminium coating usually gives better protection than a zinc coating of equal thickness and, therefore, of more than twice the weight. With aluminium roughly twice the price of zinc, there is a slight saving when metal is aluminised in preference to galavanising.

Hot dipped aluminium coatings are more resistant than zinc coatings to normal atmospheric conditions. Their superior corrosion resistance is particularly marked in humid or sulphuric conditions, when zinc coatings are liable to fail rapidly. Another useful property is excellent heat resistance. Samples of aluminised coatings tested by the British Iron and Steel Research Association were found to be in good condition after being subjected for 1,500 hours to a temperature of 600°.

When annealed to produce a completely alloyed coating for applications where heat resistance is important, the hot dip product behaves better than a sprayed aluminium coating during the annealing process. In practice, it should be easier to produce completely alloyed coatings from pure aluminium baths in a single operation than to produce 'galv-annealed' sheets.

Thinner Coat Possible

A further advantage of hot dip aluminising is that a thinner coating is possible than in galvanising. Using 5-6 per cent silicon in the aluminium bath, a coating of 0.6-0.8 oz. per sq. ft. of sheet may be applied to smooth strip without the necessity of using 'skimming' or 'exit' rolls. Products of bright and attractive appearance are obtained and the finish can be improved by light cold rolling.

While hot dip aluminising appears to offer important benefits, there are certain disadvantages which may limit its field of applications. It is well known that aluminium's resistance to corrosion is due to a surface film of oxide or hydroxide which is very tenacious. Though the metal is very low in the electrochemical series, the protection which might be expected is largely discounted by the presence of this film. Once the oxide is broken down, the coating becomes anodic. For this reason, a 'pore' in the coating is more serious than a pore in a galvanised coating. Cracks formed during deformation, which might be regarded in zinc coatings as relatively harmless, may be more serious in aluminised coatings. It is evident, therefore, that the occurrence of uncoated spots presents a more serious problem than in the case of hot galvanised coatings. Galvanic protection at cut edges also appears to be less than with zinc coatings.

Other Disadvantages

Another disadvantage is the hardness and brittleness of the alloy layer, when pure aluminium is used in the bath. Under compression an aluminium coating fails badly, though its performance under tension is better than that of hot dipped zinc. The bending properties are improved, however, by the addition of silicon to the bath, and other bath additions are also reported to be helpful.

While hot dip galvanising and hot dip aluminising are each likely to have their own fields, the fact that the future availability of aluminium may possibly be much more than that of zinc enhances the potential importance of the former process.

Considerable attention has been devoted in recent years to the continuous aluminising of strip and to the aluminising of fabricated articles by batch processes, but hot dipping presents certain difficulties which have hindered its commercial application. It has been reported, however, that in 1950 the United States used 1,000 tons of aluminium in hot dip aluminising, and it is probable that consumption is now on a very much greater scale.

The most outstanding application so far developed in the United States is the hot dip aluminising of cold-reduced wide strip in continuous units to produce 'Armco-Aluminised' sheet, which has been in commercial production since about 1939. The cold-reduced strip is first lightly oxidised to a temper colour and then annealed in a pro-

tective atmosphere of cracked ammonia in which it remains until immersion in the molten bath. The addition of certain elements to the bath improves the ductility and appearance of the product, which has found many applications.

The 'Al-fin' Process

Another technique which has been commercially developed is the 'Al-fin' process for bonding aluminium to steel or cast iron. This process was evolved during the war by the Fairchild Aviation and Engineering Co. in the United States, its original application being for coating the fins of aircooled cylinders of aircraft engines. It is entirely different from hot dipping, however, being essentially a form of casting. The finished product is dipped in molten aluminium; while the metal is still molten it is inserted in a prefabricated or a special mould; the top half of the mould is then placed in position and the aluminium is poured.

In order to obtain further information on the variables of the process, the British Iron and Steel Research Association has been working on hot dip aluminising in its laboratories at Sketty Hall, Swansea. The investigators started by examining the results obtained when cold-reduced steel sheet was dipped into molten aluminium after various preliminary treatments. The temperature and composition of the bath were varied and samples produced under different conditions were studied.

Based on the results obtained in this preliminary work, experimental batch aluminising was carried out on a larger scale, using small samples of fabricated materials such as tubes and rolled sections. Finally, a small pilot plant was constructed for the continuous aluminising of strip and wire. As a result of this work, the preliminary treatment of strip before aluminising has been greatly simplified, resulting in a process which appears to be well suited for commercial operation.

The steel used for laboratory work was mainly cold-reduced mild steel sheet of 23 SWG. The initial experiments were made with strips approximately 3 in. × ¾ in., but subsequent work was carried out with small panels, 3½ in. × 2½ in., which were lightly oxidised in a muffle, pickled and dried. The samples were then immersed in a molten flux bath containing sodium and potassium chlorides with varying additions of zinc chloride, calcium chloride, sodium fluoride, or mixtures of these compounds. Fairly good results were also obtained with a proprietary flux recommended for the joining of aluminium.

As an alternative to the flux treatment, thin coatings of electro-deposited tin, zinc and cadmium were tried, but gave erratic results. A more satisfactory method, subsequently employed on a larger scale, involved dipping the samples, after pickling and rinsing, in an acidified solution of copper sulphate.

The purpose of these metallic films is merely to prevent oxidation of the steel surface during immersion. It has been found that a pickled and dried sample of mild steel sheet can be completely coated without the use of any fluxing process, provided that it is immersed quickly and that the temperature and time of immersion are increased. In continuous processing of strip and wire, however, conduction of heat up the ingoing film leads to oxidation, and some form of protection is essential. A film of copper gave satisfactory results in continuous processing, but corrosion resistance was liable to be adversely affected by increasing amounts of copper in the bath. For this reason, the method was later superseded and a preliminary film of glycerol was applied.

Extremely High Purity

Pure aluminium coatings were prepared from aluminium with a purity of 99.99+. The effects of adding silicon and chemically pure zinc were studied and both temperatures and immersion times were varied. The samples were withdrawn slowly and were either cooled in air or quenched in warm water after the coating had solidified.

The samples produced were examined for appearance, coating thickness, coating structure, hardness of the alloy layer, bending properties, corrosion resistance and heat resistance.

The laboratory experiments were followed by work on a larger scale, using samples of steel tube, angle iron and other rolled sections, up to 15 in. long. The samples were again prepared by pickling in hot sulphuric acid, rinsing, and applying a copper film. The dipping time was governed by the thickness of the section and the bath temperature was kept within the range 700-750°.

From the results of these experiments it was concluded that 'general aluminising', on lines similar to 'general galvanising', should not be too difficult a process to operate. Since fabricated articles are not generally expected to withstand bending, it is possible to use pure aluminium baths, which have a more vigorous alloying action and would therefore reduce the danger of uncoated areas, besides producing thicker coatings with a longer life. The process has certain limitations, arising mainly from the relatively high temperature of operation, and these will be discussed. Nevertheless its economic and technical advantages suggest that it has its own field of application.

In considering the continuous aluminising of strip and wire, BISRA have concluded that smaller manufacturers would require either a simpler and cheaper continuous unit, or a method of producing single sheets. In view of manifold advantages of continuous processing, a small pilot plant, suitable for the continuous aluminising of strip up to 2 in. width, or of wire, was erected at Sketty Hall, the main objective being to reduce the process to the simplest form consistent with satisfactory coating.

Previous observations had shown that clean cold-reduced strip could be coated without preliminary treatment of any kind. In its original form, therefore, the steel preparation section of the pilot plant consisted only of two degreasing operations, using hot alkali and trichloroethylene, followed by a thin 'immersion' coating of copper. After being rinsed and dried, the strip or wire entered the molten bath, having an immersed path of 4 ft. 6 in. and passing through at speeds from 3 to 30 ft. per min. On leaving the bath, it passed vertically upwards for some distance and then downwards to a coiler. The bath contained 2 cwt. of commercially pure aluminium to which additions of silicon up to 5 per cent were made. Coils up to 300 ft. in length were aluminised, sections of a coil being processed at different speeds.

Good Results from Strip

Good results were obtained with strip, but some trouble was experienced with wire of different gauges. This was attributed to the need for more thorough preparation of wire and the pilot plant was, therefore, modified so as to include a brushing and pickling treatment. A further modification was the substitution of glycerol for the filming with copper. The unit has recently been altered to permit the coating of strip up to 4 in. wide and has been equipped with a new pot capable of holding 7 cwt. of aluminium.

Bright Matt Appearance

The coils of coated strip and wire have a bright matt appearance, which is quite attractive. The finish is improved when the strip is cold rolled after coating or the wire is cold drawn. A mean coating weight of 2.68 oz. per sq. ft. was recorded for strip when using a bath composition of 'pure' aluminium at 3 ft. per min. and 735°. A higher speed means less immersion time and less alloying. When the speed of strip was increased to 25 ft. per min. the mean coating weight fell to 2.09 oz. per sq. ft. of sheet. Silicon additions also have the effect of reducing coating thickness. Generally speaking, satisfactory thicknesses are obtained at moderate speeds and uniformity is very good.

To obtain good bending properties from a pure aluminum bath, the time of immersion must be short and the temperature low. If, in addition, the outer layer is thin as the result of slow withdrawal, the coating behaves well in the alternating bend test, though not as well as a corresponding thin zinc coating. As previously stated, the addition of silicon to the aluminising bath improves the behaviour of the coating in cupping and bending tests.

From an economical standpoint, the fact that tensile wire loses strength when hot dip aluminised is of particular interest to wire drawers, since this softening effect makes it possible to omit an annealing operation when a soft wire is desired.

As compared with hot dip galvanising, aluminising has the advantage of greatly reduced ash formation on a quiet bath, while dross formation is also less. Dross should settle more readily than in galvanising, since the difference in density between it and the bath is about 40 per cent against 3 per cent in galvanising.

On the other hand, the higher temperature of hot dip aluminising results in increased fuel cost and more discomfort to the operator. The fact that cold-worked high tensile material is almost completely annealed is also a disadvantage for many applications. Another limitation is the

greatly reduced mechanical strength of the immersed 'rig' in mechanised processing for sheet and strip. In continuous processing of thin strip or wire, excessive tension leads to marked thinning and even to rupture of the material passing through the bath.

The dipping of fabricated articles, such as tanks or window frames, also presents certain difficulties, since it is likely to lead to more warping than is encountered in galvanising. Moreover, the film of oxide on the surface of the bath is liable to be troublesome by resulting in an unsatisfactory finish. It has also been suggested that the materials to be used for plant construction and the probable life of the container may present bigger problems than in galvanising.

In choosing between the two processes, the decision will frequently be influenced by such factors as the annealing action of aluminising or the relative danger of warping. Nevertheless, the potential scope for hot dip aluminising appears to be extremely wide. Because of their excellent resistance to both corrosion and heat, hot dip aluminised coatings might find many applications in the chemical industries.

The same combination of properties seems to render them suitable for use in coke burning plants and in any flues or chimneys where the products of combustion are corrosive. Hot dip aluminising might also be used for the protection of such articles as heat exchangers, brake linings, turbine blades, or aircraft cylinder barrels, while another very large potential outlet is afforded by the building industry.

It seems evident that extensive trials of corrosion and heat resistance will have to be carried out before the protective value of hot dip aluminising in specific fields of application can be finally assessed, while cost may be an obstacle to the development of BISRA's process on a commercial scale. In view of the encouraging results obtained, however, the commercial possibilities of hot dipped aluminium coatings seem to merit careful investigation, having regard to the very large potential markets which exist.

Daily average production of furnace and contact carbon blacks in the US during March increased by 9 per cent and 3 per cent respectively, in comparison with the previous month according to the Bureau of Mines, Department of the Interior.

Fuel Efficiency Service

TRANSFER of responsibility to the National Industrial Fuel Efficiency Service from the Ministry of Fuel & Power took place on 1 May. Sir Leslie Hollinghurst, chairman of the board of the new Service, stated that most of the engineering staff of the Ministry's Fuel Efficiency Branch are being seconded to NIFES to form the nucleus of the new organisation.

Sir Leslie stressed that NIFES will collaborate with other organisations aiming at improving the efficiency with which fuel is used in industry. The new organisation, he said, has been formed to give greater latitude for the development of what is already a going concern, and proposes to streamline existing methods, so that prompter service can be given.

Among ideas under consideration is that firms might wish to register with NIFES for a regular service. There was also the possibility that firms conscious of the need for overhauling their use of fuel and steam, but unable to spare their own engineers for this purpose, might be prepared to hire the services of a NIFES engineer for a few months.

The head offices of the new Service are at 71 Grosvenor Street, London, W.1. A Scottish office is at 145 St. Vincent Street, Glasgow, C.2.

Big Steel Pipe Order

THE contract for over 350 miles of 16 in. seamless pipe for Sui Gas Transmission Co. in Pakistan has been awarded to Stewarts & Lloyds Ltd. The order involves more than 40,000 tons of pipe and the value exceeds £2,000,000. It is one of the largest individual orders for steel pipe ever placed in the UK and was obtained in face of world competition. Shipments to Karachi will begin in about a month's time and the whole of the order will be supplied from Stewarts & Lloyd's modern seamless mill in Scotland.

It will be recalled that the Sui Gas Transmission Co. was recently incorporated in Pakistan and the recent offer of shares to the public in Pakistan was oversubscribed more than six times. Other shareholders are the Pakistan Industrial Development Corp., the Commonwealth Development Finance Co. Ltd. and The Burmah Oil Co. Ltd.

Up-to-Date Concepts in Theory & Practice

Advanced Work Described in BISRA Report

RADIOACTIVE materials are being increasingly used in the investigations of the British Iron and Steel Research Association, as their report for 1953, published last week, demonstrates.

A pellet of active cobalt was inserted under the brickwork of a carbon hearth. By measuring the intensity of activity present in iron samples from a series of subsequent casts, the life of the brickwork could be predicted. The results obtained have been valuable but have not always been unequivocal due to incomplete mixing of the cobalt with the total quantity of iron.

Pellets of active cobalt have been placed in the main brickwork of the lower furnace wall in such a position that detection can be made from the outside of the furnace with a portable radiation monitor; a 10 mc pellet can easily be detected through 2 ft. of brickwork. On six furnaces, pellets have been built into the hearth side walls. Subsequent checks have indicated that some pellets are still intact after two years. On one furnace a pellet placed behind nine inches of protective brickwork in front of the carbon side wall was detected in a sample of metal two weeks after insertion.

Radon as a Tracer

The measurement of gas transit times through blast furnace burdens has been made, using radon as tracer. The technique previously used required the adsorption of radon gas by a number of charcoal samples, and it was considered too tedious and possibly too inaccurate to provide the large number of individual results necessary for statistically significant measurements. The possibility of using other direct reading techniques was explored: the detection of beta and gamma radiations from the solid daughter products of radon proved unsatisfactory, but the use of an improved ionisation chamber for direct detection of alpha radiation from the radon itself has shown promise.

The two most important factors which affect tinplate behaviour when it is used as a food container are the type of food and the presence of unplated areas of steel. A radioactive technique has been devised in collaboration with Harwell, by means of which any untinned areas are easily detected and an actual estimate of these areas may easily be obtained.

These are but small examples of the work carried out by the Association. Under the aegis of the Coatings Committee alone, for example, processes for the recovery of acid from pickle liquor have been worked out and the erection of pilot plant for autoxidation is nearly complete; tinplate coatings have been studied, as described above, and the effect of fruit juices is being observed; work has been done on electrodeposition of iron-zinc alloys, and hot-dip aluminising (p. 1105); and a process has been devised for the recovery of nearly 90 per cent of the zinc contained in galvanisers' dross.

Chemistry Department's Functions

As for the Chemistry Department, its functions are to keep in touch with chemical advances with a view to their possible application in the iron and steel industry; to conduct and sponsor fundamental research; to be responsible for research on refractories and slags; and to conduct research on the corrosion of iron and steel.

In the Department's own laboratories, work has been done on the activities of ferrous oxide, manganous oxide and phosphorus pentoxide in steelmaking slags, making it possible to calculate the equilibrium contents of oxygen, manganese and phosphorus in steel under any slag.

It has been shown that oxygen and phosphorus dissolved in iron reduce each other's activity coefficients, though, at the concentrations usually encountered in steel making, the effect can be neglected. It has been demonstrated that the factor by which two elements dissolved in liquid iron lower or raise each other's activity coefficients is related to the free energy of formation, and thus the stability, of the compound likely to be formed from them.

Papers on the heats of formation of manganous sulphide, manganous orthosilicate, magnesium orthophosphate and manganous orthophosphate have been submitted for

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See also THE CHEMICAL AGE, 1953, **69**, 1117.

publication. A calorimeter to determine high temperature heat contents has been constructed and is being used for measurements on various substances.

The values of the solubility of sulphur in solid iron determined at temperatures between 900° and 1,100° are in agreement with those obtained by other workers, and an apparatus is now being erected to study the solubility of sulphur in solid iron-manganese alloys at temperatures up to 1,400°.

The solubility of nitrogen in solid iron has been shown to obey accurately Sievert's law up to the separation of iron nitride at 500°, or of the γ-phase at 600°. The results for the maximum solubility at these two temperatures are in good agreement with those obtained by previous workers. Equipment is being erected to permit four experiments to proceed simultaneously so as to speed up the progress of the work. The effect of silicon on the iron-nitrogen system is to be studied in view of its importance in connection with transformer sheet.

Viscosity Measurements

Work is also carried out for the Association at Imperial College, where the diffusion coefficients of carbon and cobalt in molten iron have been measured, and from the results it has been possible to devise a model to explain the movement of carbon in the melt. Similar experiments are being carried out on iron-sulphur and iron-sulphur-carbon melts. Viscosities of molten iron-carbon, iron-sulphur and iron-carbon-sulphur alloys are being determined to ascertain whether these will throw any light on the structure of the ternary metals.

Viscosities have been measured on a large number of lime-silica slags and the temperature coefficient of viscosity has allowed the calculation of the activation energy for the viscous flow process. By applying considerations of absolute rate theory, it has been possible to estimate the size of the silicate ions. It appears that at any given lime/silica ratio the size of the silicate ions is extremely uniform and this size varies as the lime/silica ratio changes. At the orthosilicate composition, the anions are simply SiO_4'''' tetrahedra. As the proportion of silica increases, these tetrahedra polymerise to short chains, which, on reaching a certain critical length, break down to small rings. These in turn polymerise to tetrahedral clusters of increasing size. Present studies indicate that the same phenomena occur in strontia-silica, magnesia-silica and baryta-silica slags.

An apparatus has been developed by which it is possible to investigate the effect of ambient hydrogen pressure on the rate of evolution of this gas from samples of iron at temperatures from 300-900°, and thus to help distinguish between surface reactions and diffusion processes. At higher temperatures and low pressures the evolution process is normal.

Research conducted at the Royal Technical College, Glasgow, includes a study of the sulphur equilibrium between slag and gas; the manganese oxide-sodium oxide-silica system; the iron oxide-phosphorus pentoxide system; deoxidation of steel at 1,500°; and the surface tension of slags.

Particularly interesting is the work on the corrosion resistance of low-alloy steels. It is found that under conditions of atmospheric exposure the corrosion rate of steels containing small percentage additions of chromium, copper and nickel is not more than one-third that of ordinary mild steel.

When immersed in sea water the small additions of alloying elements are not so beneficial; the corrosion rate is halved by the addition of 3 per cent chromium and there are indications that aluminium and beryllium additions may be of value. Differences in carbon content had little effect on the measured corrosion rate and there was a negligible effect due to heat treatment.

Paint Inhibitors

It has been found that the true inhibitors in red lead oil paints are not the soaps contained in them but salts of dibasic acids and other degradation products of these soaps. The combined inhibitory action of calcium compounds and condensed phosphates on the corrosion of steel in water containing chlorides is not long-lasting, due it is believed to the breaking down of the initially-formed protective film.

The Methods of Analysis Committee has prepared a series of mild steel spectrographic standards containing varying controlled amounts of 17 residual elements, and these are to be analysed by chemical methods in industrial laboratories. Certain specialised spectrographic techniques, on which reports will shortly be available, have been examined.

German Output & Export Maintained

Magnesium Production to be Resumed

GERMAN chemical industry has not been materially affected by the decline in building activity during the cold winter and the recession in the heavy industries, and most manufacturers report an expansion in demand both at home and abroad. The production of sulphuric acid is currently running at about 10 per cent above the 1953 level, with most works making full use of their capacity.

Final production figures for 1953 are now available for most groups of the German chemical industry. They show output gains almost everywhere (in metric tons): Nitrogen fertilisers (as nitrogen), 626,010 (1952: 602,690); phosphate fertilisers (as P_2O_5) 426,447 (421,887); pest control chemicals 53,736 (53,299); plastics 209,019 (163,163); paints and lacquers 238,639 (217,566); tanning agents, tanning and dyeing extracts 14,781 (12,234); textile and leather chemicals 98,565 (77,001); soap 109,912 (112,424); detergents 185,859 (156,248); cosmetics 20,883 (17,224); glues and adhesives 85,874 (80,611). The production of pharmaceuticals had a value of DM. 991,722,000 (863,091,000) and that of photographic chemicals of DM. 97,831,000 (75,322,000).

Soviet Potash Competition

The West German potash industry anticipates more severe competition from the Soviet zone, where increased efforts are being made to penetrate directly into western markets. Characteristic is the development in the British market where Soviet zone potash has been marketed by a separate organisation since September last in competition with Potash Ltd., which continues to distribute West German, French and Spanish potash in Great Britain. West German potash producers believe that the East German potash mines, owing to their extensive deliveries to Eastern Europe, may not always be in a position to meet contracts with Western customers, the more so as the Soviet Government is reported to have inserted a clause stipulating preferential treatment into its contracts with East German suppliers.

Permission to resume the production of metallic magnesium at a rate of one ton a day has been granted to Knapsack-Griesheim AG by the Allied Security Authority. An experimental furnace will be started first, but the company anticipates an increase in permitted and actual production later. Knapsack-Griesheim AG has also applied to the Allied authorities for permission to increase the thermal production of elementary phosphorus, but the negotiations have not yet been concluded. Phosphorus production at Knapsack near Cologne was resumed early last year after the Allied authorities had licensed it at a rate of not more than 4,500 tons a year. Current production appears to be around this level.

Bayer-Monsanto Agreement

Great hopes are based in Germany on the recent agreement between Farbenfabriken Bayer AG, Leverkusen, and Monsanto Chemical Corp., St. Louis, for the formation of a joint subsidiary in the USA to undertake the production and distribution of isocyanates for the manufacture of foam agents, elastic plastics, adhesives, lacquers, etc. The new company is able to draw on the research findings and technical experience of Farbenfabriken Bayer and the industrial potential of Monsanto and appears to be the first joint enterprise since the war in which a German company provides the research and 'know-how' and the foreign partner the industrial plant for a new production.

Three German firms—E. Merck AG, of Darmstadt, Heinr. Propfe, of Mannheim, and Schering AG, of Berlin—have concluded an agreement with a US concern, the California Spray Chemical Corporation of Richmond, Cal., for the distribution in Germany of pest control chemicals containing Captane. A spray for fruit trees will be marketed first under the trade name of Orthocid 50, and it is intended to sell others in the German market later.

The first platformer cracking plant to be erected in continental Europe will be the cracker now being set up at the BP refinery at Hamburg-Finkenwerder by BP Benzin und Petroleum GmbH. The cracking plant is

expected to come into operation this summer and will be able to convert 250,000 tons of ordinary petrol a year into high-octane spirit.

Degussa AG, Frankfurt, has announced that it will double its plant capacity for making methionine and pentaerythritol.

IR Development

Sensitive Lead Sulphide Cell

AN important contribution to the numerous applications of infra-red radiation in science and industry is made by a new photocell recently introduced by the Communications and Industrial Valve Department of Mullard Ltd. This cell, the 61SV, is of the photoconductive lead sulphide type, and is characterised by extreme sensitivity to infra-red radiation and an unusually high speed of response. It has the additional advantages of a high signal-to-noise ratio, small size and robustness.

These features make the new cell of considerable value for applications in a large number of industries and branches of research. For example, it makes possible notable advances in radiation pyrometry, enabling very small temperature variations to be detected in low temperature sources down to 100°. This means that the 61SV cell can be used for such typical applications as controlling and monitoring the work in radio-frequency heating and similar industrial set-ups where the detection of temperature or temperature changes without actual contact with the work is required. A further and very important extension in this field of application is the monitoring of gas, oil-fired and pulverised fuel furnaces, when the cell is used to follow the temperature fluctuations rather than the luminosity of the flame.

In these various applications an important feature to stress is that no physical contact is necessary between the detecting instrument and the source under investigation. Under suitable circuit conditions the new cell is, in fact, capable of detecting the heat radiations from relatively low temperature sources situated at distances of 100 yards or more away.

This is a feature of great significance in a large number of industrial processes. It means that temperature detection and control of low temperature sources can now be effected on work which is moving at high speeds on production lines and in industrial processes. Temperature measurement on this class of work, i.e., below 700°, has previously been extremely difficult to achieve. Other important applications of the 61SV lead sulphide cell include intruder or burglar alarms, infra-red telephony, and industrial and astronomical spectroscopy. It also opens up possibilities for the rapid measurement of humidity and for gas analysis.

Standard Soxhlets

A BRITISH Standard for Soxhlet Extractors (BS. 2071:1954) just issued by the British Standards Institution covers 40, 60, 100 and 200 ml. Soxhlet extractors fitted with interchangeable joints for ordinary laboratory use. Full dimensions and constructional details are given, and those relating to the siphon tube have been selected to give satisfactory refluxing with a variety of solvents. A new design has also been included with a concentric type of siphon tube which is robust and has been proved very satisfactory in use. An appendix indicates suitable sizes of flasks, condensers and thimbles for the extractors specified. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 2s. 6d.

Canadian Chemical Interests

A MESSAGE from Montreal states that Canadian Industries Ltd. has voted in favour of a plan to segregate the interests of Imperial Chemical Industries Ltd. and E. I. Du Pont in Canada by a division of plants and properties.

Canadian Industries is making application to the Quebec Superior Court for sanction of the plan and when this is granted will apply to the Secretary of State in Ottawa for confirmation of the plan by means of supplementary letters patent.

It is hoped that steps can be taken to permit the division to take place as from 1 July next. Canadian Industries (1954) will have I.C.I. as the principal shareholders, while Du Pont will be the principal shareholder in the Du Pont Co. of Canada.

HOME

Tungsten Ores Cheaper

On 11 May the Ministry of Materials lowered the price of wolframite and scheelite by a further 15s. per long ton. The standard 65 per cent grade of ordinary quality is now 205s. per ton plus the usual 10s. charge, delivered to consumer's works.

Rayon Production Record

Production by the British rayon industry, which has been expanding steadily since the war, broke all previous records during March. Staple fibre output increased by 5 per cent to almost 20,000,000 lb. and continuous filament yarn production was just over 20,000,000 lb. Total rayon output for the month was 40,200,000 lb.

Oil Monopolies Inquiry ?

Questioned recently in the House of Commons whether he would ask the Monopolies Commission to hold an inquiry into the prices charged by the petrol and oil companies, the President of the Board of Trade replied that, without accepting the implication that prices were excessive, he would continue to bear in mind the supply of these products as a possible subject for reference to the Commission.

Transhipment Licensing

The Board of Trade has issued a revised Transhipment Open General Licence which came into force on 11 May and the effect of which is to release certain goods from the requirement of individual transhipment licences. Principal releases include natural rubber and natural rubber latex, mixtures containing carbon black, cobalt naphthenate, cobalt linoleate, certain ferro-alloys, platinum and platinum alloys and certain semi-manufactured goods of platinum.

Fluoridation of Water Opposed

Strong opposition to the policy of fluoridation of water supplies was expressed at the annual meeting of the Scottish Section of the Institution of Water Engineers last week. Dr. J. R. Lumsden, M.O.H. of Airdrie, spoke in favour of the policy, saying that fluoridation would promise a decrease in tooth decay by perhaps two thirds, but water engineer critics contended that freedom of choice should be retained and were also sceptical of American reports on successful adoption of this policy.

Metal Defects

At a meeting of the Institute of Metals at 4 Grosvenor Gardens, London, S.W.1, on 27 May at 5.30 p.m., a lecture entitled 'Lattice Defects and Energy Stored in Deformed Metals' will be given by Dr. W. Boas, head of the Division in Tribophysics, Commonwealth Scientific & Industrial Research Organisation, Melbourne. The meeting will be open to visitors, without ticket.

The Leeuwenhoek Lecture

Because of exceptional transport delays, Professor Juda Hirsch Quastrel of McGill University was unable to deliver the Leeuwenhoek Lecture before the Royal Society on 6 May. Arrangements have now been made for the lecture to take place in the Society's apartments at Burlington House, Piccadilly, London, at 4.30 p.m. on Friday, 28 May. The subject is 'Soil Metabolism'.

New Courtauld Factory

A large site on the bank of the Humber, near Grimsby, has been bought by Courtaulds Ltd. for the erection of a factory to produce viscose staple fibre which will be sold under its registered trade mark, 'Fibro.' When the factory is in operation —probably in two-and-a-half years—it will have a production capacity of 100,000,000 lb. a year. It will supplement production at Greenfield Works, North Wales, claimed to be the largest staple factory in the world.

Surface Properties of Ceramics

A symposium on 'Some Surface Properties of Ceramics' was held by the Basic Science Group of the British Ceramic Society at the British Ceramic Research Association, Queen's Road, Penkhull, Stoke-on-Trent, on 14 May at 10.30 a.m. Papers were presented as follows: 'The Adsorption of Long Chain Compounds on Solid Surfaces, with Special Reference to Alumina,' by B. D. Cuming; 'Some Observations on the Interaction of Kaolin & Water Vapour,' by S. J. Gregg; 'The Expansion of Porous Silica Glass Produced by the Adsorption of Non-Polar Gases at Liquid Air Temperatures,' by D. J. C. Yates; and 'The Mechanism of Moisture Expansion and its Inter-relation with Other Properties which Depend on Surface Effects,' by A. N. Smith.

• OVERSEAS •

Plant in Operation

The Maximilian Works in Bavaria, which is expected to produce 50,000 tons of steel tubes per year has commenced operation. The works is equipped to produce pipes of all sizes up to 4.8 inches diameter.

Rum Jungle Uranium

Mr. Menzies, Prime Minister of Australia, has announced that the Rum Jungle uranium fields will be in production months before schedule. He believed output would be double that expected.

Plastic Film Venture

Entry of Canadian Resins and Chemicals, Ltd., into the vinyl plastic film converting field has been announced by Mr. V. G. Bartram, president. An up-to-date printing and embossing plant is under construction at Ste. Therese, Que., and is expected to be in operation in July. As a convertor of vinyl film (not sheeting), Canadian Resins will print and emboss its own Vinylite plastic film which is produced at Shawinigan Falls, Que.

Big Refinery Orders

Orders worth more than £11,000,000 have been placed with British, Australian and American manufacturers for materials for the 3,000,000 tons a year Kwinana refinery being built near Fremantle by Anglo-Iranian's Australian associate, Australasian Petroleum Refinery Ltd. British and Australian orders each total £4,500,000, while an additional £1,500,000 has been spent with Australian firms who sub-contracted for preparatory and building work on the site.

Dunlop in Brazil—Official Inauguration

Dunlop Do Brazil S.A. recently inaugurated their factory near Campinas in the presence of the Prefect of Campinas, the Bishop of Campinas, the deputy chairman and managing director of the Dunlop Rubber Co. who had journeyed from London especially to attend, and a concourse of distinguished persons and representatives of Brazilian National and State organisations. The new plant, occupying 27,000 square metres, stands in the midst of 800,000 square metres once covered with eucalyptus trees—and it was built in the record time of eighteen months.

Potash Exploitation

A work-gang of 80 Jordanians recently began exploratory work at the north end of the Dead Sea to establish the feasibility of large-scale potash exploitation.

Swedish Iron Ore

It was recently stated by Mr. Erland Waldenstroem, managing director of the Graengesberg Co., Sweden, that that country is to increase its output of iron ore from just under 12,000,000 tons a year to more than 17,000,000 tons. This will be achieved by reorganising the two big Lappland mines at Malmberget and Kiruna, owned by the company mentioned in partnership with the Swedish State.

Refining Capacity Increased

With the recent commissioning of a new combined atmospheric and vacuum distillation unit at Anglo-Iranian's BP Hamburg refinery, the AIOC Group's refining capacity in Germany has been raised to 1,440,000 tons a year. BP Hamburg refinery now has a capacity of 1,240,000 tons a year (last year it was 700,000 tons), while the Group's Schindler refinery has a capacity of nearly 200,000 tons.

New Japanese Plant

It was announced recently that Pfaudler Co. of Rochester, New York, is establishing a new company at Kobe, Japan, to manufacture plant for the chemical and food industries. The company is to be owned jointly with the Kobe Steel Works Ltd. and will be known as the Shinko-Pfaudler Co. Pfaudler make a wide range of stainless steel storage and chemical processing plant and equipment.

Tenders Out for Fertiliser Plant

Tenders for the urea and ammonium nitrate plant at Sindri (see THE CHEMICAL AGE, 1953, **69**, 1125) have been invited by the Government of India from two American, two German and one Italian company. It is hoped to manufacture 90 tons of ammonia per day from gases from a coke oven battery now being erected at Sindri. This will be processed to give 70 tons of fertiliser grade urea and 110 tons of ammonium nitrate, or 35 tons of urea and 150 tons of ammonium nitrate.

• PERSONAL •

At the annual general meeting of the Royal Institution recently, LORD BRABAZON OF TARA was elected president, DR. L. H. LAMPITT the hon. treasurer, and MR. S. ROBSON the hon. secretary.

MR. G. H. COXON, who was head of the Anglo-Iranian Oil Co.'s central planning department until his recent retirement, has been awarded the Eastlake Medal of the Institute of Petroleum. He is the first to receive this medal, awarded for long and meritorious service to the Institute. Mr. Coxon was chairman of the Institute's Council for the year 1946/47 and has been its hon. treasurer since 1946. Another of his interests has been the Oil Industries Club, of which he was elected president in 1945. He held this office four years.

MR. J. RICHMOND has been appointed London manager of Rhodes, Brydon & Youatt Ltd., and will be responsible for sales organisation in the London area, covering the heating, ventilating and industrial user fields. MR. C. W. HAYDON has been appointed technical representative in the London office, covering the company's interests for heating, ventilating and air-conditioning pumps.

MR. NORMAN B. B. JOHNSTONE, lecturer in the Chemistry Department of Dundee Technical College, has been elected chairman of the Dundee section of the Royal Institute of Chemistry. The vice-chaiman is DR. A. BELL, research chemist, British Jute Trade Research Association, and the hon. secretary and treasurer is DR. J. BASIL WILSON, Dundee. The committee consists of MR. ALEX. HOOD, MR. J. SMART, MR. H. A. WATSON, MR. J. WYLIE, DR. T. J. MORRISON and DR. ROBERT ROGER.

The International Nickel Co. of Canada, Ltd., has announced that MR. RALPH D. PARKER has succeeded MR. J. ROY GORDON as general manager of Canadian operations. Mr. Gordon, a director of the company, is transferring from Copper Cliff to New York City. Mr. Parker was appointed superintendent of Inco's Creighton mine in 1928. Seven years later he became general superintendent of the Mining and Smelting Division. For the past two years he has been closely associated with the company's exploration and prospecting programme.

SIR HENRY WILSON SMITH, K.C.B., K.B.E., has been appointed deputy chairman of Powell Duffryn Ltd.

MR. GEORGE BOEX will be retiring from his joint managing directorship of the British Aluminium Co. Ltd., on 4 July, when he will reach the retiring age, and will be succeeded by MR. W. J. THOMAS. Mr. Boex will remain a director of the company and has agreed to carry out any special work as a consultant which the board may ask him to undertake from time to time.

At the recent annual general meeting of British Laboratory Ware Association Ltd., MR. T. A. DRYDEN, of T. Dryden Ltd., Greenfield Chemical Works, Landore, Swansea, was elected chairman for the ensuing year. Other elections were as follows: *vice-chairman*: MR. A. A. WALKER (Southall Bros. & Barclay, Ltd., Birmingham); *treasurer*: MR. N. MCKINNON WOOD (Griffin & Tatlock, Ltd., London); *members of council*: MR. J. E. C. BAILEY, C.B.E. (Baird & Tatlock (London) Ltd., Chadwell Heath); MR. V. J. MARTIN (Brady & Martin, Ltd., Newcastle-on-Tyne); MR. W. H. NICOLSON (W. B. Nicolson [Scientific Instruments] Ltd., Glasgow); MR. C. PRESTON (J. Preston, Ltd., Sheffield); MR. R. MACINNES (Scientific Supplies Co., Ltd., London); MR. J. S. TOWERS (J. W. Towers & Co. Ltd., Widnes, Lancs); MR. A. W. RUNDLE (A. Gallenkamp & Co., Ltd., London); MR. N. TREPTE (W. & J. George & Becker, Ltd., London); and MR. W. H. ADAMS (secretary, BLWA). MR. D. ALLAN (Townson & Mercer, Ltd.), was re-elected convener of the Technical Committee, and MR. R. W. PARKER (A. Gallenkamp & Co. Ltd.), MR. C. A. MERRY (Griffin & Tatlock Ltd.), MR. A. COWLING SMITH (W. & J. George & Becker Ltd.), and MR. S. J. KENNEDY (Baird & Tatlock [London] Ltd.), the other members of the committee, were also re-elected.

DR. BASIL F. J. SCHONLAND, C.B.E., F.R.S., head of the Bernard Price Institute of Geophysical Research in the University of the Witwatersrand, is to be appointed Deputy Director of the Atomic Energy Research Establishment at Harwell. The appointment will take effect towards the end of this year.

MR. P. A. HOLT, joint managing director of the Bradford Dyers' Association, Ltd., will be attending the International Congress of Man-Made Textiles, which is to be held in Paris from 31 May to 3 June. He will present a paper entitled 'Progress in the Dyeing of Spun Rayon Woven Fabrics with Direct and Vat Dyes.'

DR. JOSEPH WILLIAM CUTHBERTSON, at present Assistant Director of Research at the Tin Research Institute, has been elected to the recently endowed Cripps Chair of Metallurgy in the University of Nottingham and will take up his duties on 1 October. Dr. Cuthbertson is a graduate from the University of Manchester and from 1928 to 1944 was on the staff of the Department of Metallurgy at Manchester, where he became senior lecturer in electrometallurgy. From 1942 to 1944 he was carrying out research work for the Ministry of Supply.

Vitamin Research

WORK at the Ovaltine Research Laboratories during 1953, described in the annual report, was concerned with developments in various nutritional and health problems.

The photochemical formation of hydroxocobalamin from cyanocobalamin, with liberation of cyanide, was studied and a spectrophotometric method of determination was evolved. This study was instrumental in the emendation of the official BP monograph on tests for B_{12} injections.

The spectrophotometric methods were extended to include chlorocobalamin and thiocyanatocobalamin, and a picture was built up of a system in which the different cobalamins undergo changes *in vitro* which may be similar to those *in vivo*. Methods were evolved for the determination of B_{12} in different types of food and pharmaceutical products, which gave reasonable agreement with microbiological methods.

Other work in the laboratory was concerned with plant proteins in child feeding, the amount of animal food required in human nutrition, and vitamin fortification of foods.

Aluminium Prospects

AT the recent annual meeting of the British Aluminium Co. Ltd., the chairman, Lord Portal of Hungerford, reviewed the conditions in the industry which, he said, had led to an inevitable readjustment.

The point had been reached, said Lord Portal, where competitors from certain companies tended to quote entirely unrealistic prices for export. It had to be remembered that there was an abnormal expansion in the industry in the war years and they had since benefited by shortages of other materials which were now in free supply. Some readjustment therefore was bound to come. On the whole, however, world aluminium consumption was extremely buoyant.

Rubber Industry Directory

WHAT is claimed to be a complete review of the rubber industry throughout the world is contained in Handbuch Der Internationalen Kautschukindustrie (Directory of the International Rubber Industry), published by Verlag Fur Wirtschaftsliteratur GmbH, Zurich, 55. In addition to separate lists of manufacturers of rubber products, and manufacturers of synthetic rubber, also a list of suppliers, it gives lists of schools and research laboratories, professional organisations and professional journals. More than 70 countries are covered in this way. The inclusion of a glossary of the rubber industry in three languages—English, French and German—makes for ease of reference.

Sewage Works' Products

THE annual report of Bradford Corporation Sewage Works Department shows that in 1953 a record quantity of recovered wool grease was extracted at the Esholt Works, Bradford. The total was more than 10,000 tons, but there was a drop in the sales of grease and grease products by £64,886 to £252,896. Sales of organic fertiliser went up by £1,336 to £13,921. Over the past 50 years a total income of £5,100,000 has been earned by the department's by-products.

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.)

Mortgages & Charges

R. F. WIDDOWSON & Co. LTD., London, S.W., manufacturers of candles. 1 April, mortgage to Midland Bank Ltd. securing all moneys due or to become due to the Bank; charged on land off Shripney Road, Bognor Regis, with fixtures. *Nil. 29 December, 1953.

BIOREX LABORATORIES LTD., London, E.C. 26 March, debenture to Barclays Bank Ltd. securing all moneys due or to become due to the Bank; general charge. *Fluctuating Bankers up to £3,000. 30 December, 1953.

COMMONWEALTH PORTLAND CEMENT CO. LTD., London, S.W. 3 April, equitable mortgage, to Bank of New South Wales, Sydney, securing all moneys due or to become due to the Bank; charged on undertaking and assets present and future including uncalled capital for the time being within the State of New South Wales. *Nil. 27 April, 1953.

EVODE LTD. (formerly Evode Chemical Works Ltd., Dove Chemical Products Ltd., Spic & Span Chemical Products Ltd., and Spic and Span Shoe Polishes Ltd.), Stafford. 2 April, £20,000 mort., to Stafford Permanent Building Society; charged on land and buildings at Common Road, Marston, Stafford. *Nil. 2 March, 1953.

Increase of Capital

The following increase of capital has been announced: RECKITT & COLMAN HOLDINGS LTD. from £2 to £18,897,895, for the purpose of acquiring not less than 90 per cent of the issued share capital of RECKITT & SONS LTD. and J. & J. COLMAN LTD.

Change of Name

The following change of name has been announced: NEW METALS & CHEMICALS LTD. to NEW METALS & CHEMICALS (HOLDINGS) LTD., on 22 March.

New Registrations

John F. Purdy & Partners Ltd.

Private company. (532,216). Capital, £100. Research workers into the development, transmission and application of power, and the construction, improvement and manufacture of plant, machinery, apparatus and appliances therefor; engineers, chemists, metallurgists, water supply engineers, gas makers, etc. Directors: John F. Purdy and Michael D. Wood. Reg. office: 205 Hills Road, Cambridge.

Akenol Ltd.

Private company. (532,132). Capital, £100. Manufacturers of and dealers in preservatives, and protective liquids of all kinds for wood, metals, stone and other materials, etc. Directors: David Griffin, Alfred H. Mansell and Harold Boot. Solicitors: Culross and Co., 65 Duke Street, London, W.1.

Paroxite (Holdings) Ltd.

Private company. (532,408.) Capital £1,000. Importers, exporters and manufacturers of and dealers in chemicals, gases, drugs, medicines, plastics, etc. First directors to be appointed by subscribers. Reg. office: 417 Victoria House, Southampton Row, London, W.C.1.

Company News

Albright & Wilson Ltd.

In a review of the 1953 activities of Albright & Wilson Ltd., the chairman, Mr. K. H. Wilson, states that the 'abnormally heavy' expansion programme which the company has undertaken during the past few years is now almost complete. In the past three years nearly £11,000,000 has been spent on extension of manufacturing facilities. Group trading profit for 1953 was £2,790,254, compared with £2,272,014 for the previous year, and the net profit rose from £1,526,518 to £1,782,570 (before tax). As previously reported (THE CHEMICAL AGE,

1954, **70**, 852) the final dividend of 12½ per cent made a total of 17½ per cent for the year.

F. W. Berk & Co. Ltd.

The final dividend of 8⅓ per cent which is being paid by F. W. Berk & Co., Ltd., makes a total of 14 1/6 per cent for 1953, which is the same as for the previous year. The group net profit was £109,071 (compared with £71,486) after tax of £148,390 (£87,209) and including miscellaneous credits of £16,021 (£18,707).

William Blythe & Co. Ltd.

The 1953 group trading profit of William Blythe & Co., Ltd., amounted to £335,647, compared with £238,561 for the previous year. The net profit of £139,799 compares with £107,282. The ordinary dividend is 25 per cent, plus 5 per cent bonus on doubled capital, as against 20 per cent on the smaller capital for 1952.

Burmah Oil Co. Ltd.

Higher taxed profits and a final dividend of 15 per cent, making 17½ per cent against 15 per cent, are announced by the Burmah Oil Co. Group net profit has increased from £2,871,838 to £3,252,324, after providing £4,424,792 (£4,741,422) for taxation. General reserve received £1,100,000 (£1,018,257).

Dunlop Rubber Co. Ltd.

The Dunlop Rubber Co. Ltd. has announced a Group trading balance of £15,488,545 for last year, as against £13,060,412 for 1952, and an available net profit of £4,953,986, as against £3,497,825—less tax.

A. B. Fleming (Holdings) Ltd.

A. B. Fleming (Holdings) (oil and colour manufacturers) recommend a final dividend of 8 per cent for the year ended 31 March last on capital increased by nine-for-eleven free scrip issue. Interim on smaller capital was 5 per cent, and total for previous year was 18 per cent. During the year a capital dividend of £145,341 was received from a subsidiary company and was credited to capital reserve account. The directors recommend that out of this reserve a capital dividend of 1 per cent on the Ordinary stock be paid. Group profit attributable to the members of the holding company for the year, after all charges, but before taxation, was £413,903 (£242,605). United Kingdom and overseas taxation required £239,580 (£135,562), leaving a net profit, after tax, of £174,323 (£107,043). Income tax reserves no longer required of £3,989 (£15,132) have been brought back, but are excluded in arriving at above profit figures.

Gas Purification & Chemical

The directors of Gas Purification and Chemical are proposing to acquire the share capital of Smart and Brown (Machine Tools) for £158,000. It is also planned to place privately 6 per cent unsecured 10-year notes. At a meeting on 24 May, shareholders will consider proposals that the capital be increased to £100,000, the old and new shares be subdivided into 2s. shares and the articles be altered.

Thomas Hedley & Co.

After tax of £1,088,064 (£164,027), including E.P.L. of £30,000 (nil), net profit of Thomas Hedley & Co. for the year to 30 June last was £1,350,625 (£221,651). Dividend on 'A' shares absorbs £9,475 (£1,894) and £3,974,283 (£2,633,133) goes forward. Balance sheet shows total assets of £9,937,070 (£7,714,451), with current assets of £5,837,575 (£4,208,233), including cash of £930,082 (£10,189). Current liabilities were £2,694,587 (£2,760,245).

The low level of profit in respect of 1951-52 was caused, as stated a year ago, by a deliberate decision to spend heavily on the company's development in a period of great activity and change in the industry, and also to abnormally high cost of raw materials during that period. This development programme has now begun to mature, and this is reflected in the greatly improved profits for 1952-53.

Woodall-Duckham Co. Ltd.

A final dividend of 15 per cent maintains the total at 20 per cent on the capital as increased by a one-for-eight scrip bonus. With the preliminary statement showing a sharp rise in earnings the directors also announce another scrip issue, this time in the ratio of one for three. Group profit before tax is £840,312 (£949,330) and tax £616,383 (£648,930), giving a group net profit of £223,929 (£295,308).

Wright, Layman & Umney

A final dividend of 7½ per cent is being paid by Wright, Layman & Umney, Ltd., making 10 per cent for 1953, which is the same as for the previous year. Net profit after tax, etc., was £22,695, as against £25,279.

Next Week's Events

MONDAY 17 MAY

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. First of three Cantor Lectures on 'The Chemistry of Leather,' by Dr. Henry Phillips.

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street, E.C.1, 6.15 p.m. Election of London branch committee, followed by paper by R. S. Brown: 'Protective Metallic Coatings Applied to Wire.'

TUESDAY 18 MAY

Royal Institute of Chemistry

Chiswick: London Transport Executive Laboratories, Chiswick Works, W.4, 2.30 p.m. Visit by London Section.

Society of Chemical Industry

London: Chemical Society's rooms, Burlington House, Piccadilly, 5.30 p.m. Agriculture Group meeting. Chairman's address by W. Leonard Hill.

WEDNESDAY 19 MAY

Royal Institute of Chemistry

Wimbledon: Wimbledon Park Golf Club, S.W.19, 9 a.m. London Section golf tournament.

British Ceramic Society

Gleneagles, Perthshire: Gleneagles Hotel, 5.30 p.m. Opening of Refractory Materials Section Spring meeting.

THURSDAY 20 MAY

Society of Chemical Industry

Beckton: North Thames Gas Board products works. Road & Building Materials Group works visit.

British Ceramic Society

Gleneagles, Perthshire: Gleneagles Hotel, 9 a.m. Works visits in connection with Refractory Materials Section Spring meeting.

FRIDAY 21 MAY

Society of Chemical Industry

London: Hotel Rubens, Buckingham Palace Road, S.W.1, 6.45 p.m. Annual general meeting of Chemical Engineering Group, followed at 7.30 p.m. by annual dinner.

Society of Cosmetic Chemists

London: St. Ermin's Hotel, Caxton Street, S.W.1. Annual general meeting.

British Ceramic Society

Gleneagles, Perthshire: Gleneagles Hotel, 10 a.m. Continuation of Refractory Materials Section Spring meeting.

SATURDAY 22 MAY

Society of Chemical Industry

Silsoe, Bedfordshire: National Institute of Agricultural Engineering, 11 a.m. Agriculture Group Summer outing.

Market Reports

LONDON.—The general improvement in most sections of the industrial chemicals market has been fully maintained and the increasing interest shown by buyers in placing forward business is a reasonable indication that the consumers are taking a more hopeful view of the future trends. Overseas trade has again been on a good scale. There are no important price changes to record and the undertone generally is firm. Almost the whole range of the soda products is moving well, and a steady trade has been reported for the potash compounds, formaldehyde, hydrogen peroxide, borax and boric acid. There is again no outstanding feature in the coal tar products market, the demand in most cases absorbing available supplies.

MANCHESTER.—Enquiry for most of the alkali products on the Manchester chemical market during the past week has covered a fair aggregate quantity, and fresh buying interest has also been reported in the potash and ammonia compounds, as well as in a wide range of other materials. The cotton, woollen and rayon textile trades and other leading industrial outlets are calling for steady deliveries under contracts. Little price change of any consequence has occurred since last report. Fresh business in the general run of fertilisers is now showing a seasonal slackening off. Most of the light and heavy tar products continue to meet with a steady demand.

GLASGOW.—Business was again very brisk during the past week and prices have remained steady, with the exception of one or two minor increases here and there. There has been quite a spate of inquiries from the export market and generally speaking prospects look very promising.

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.

A. BOAKE, ROBERTS & CO., LTD., London, E.15, erequire **SENIOR CHEMISTS** for their **PROCESS DEVELOPMENT DEPARTMENT.** These appointments would appeal to qualified men with some years of experience of Organic Chemistry, seeking the opportunity to lead a team in developing new projects from laboratory to plant scale so as to provide new or improved products. The minimum salary envisaged is £800 per annum.

The Company also require **ASSISTANT CHEMISTS** to participate in these projects. Industrial Chemical experience is desirable in these appointments. Minimum salary is £550 per annum. Applications in detail to **PERSONNEL MANAGER.**

CHEMICAL ENGINEER, age about 25-30 years. Knowledge of Thermodynamics, Heat Transfer, Fluid Flow. Preferably some experience in plant design and installation of instrumentation. Write, stating details of experience, qualifications, salary required, to **BOX No. C.A. 3316, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

CHEMIST, London area, experienced in Quantitive Analysis and Bitumen. State age, experience, qualifications, salary and when available. **BOX No. C.A. 3315, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

"ALITE" 400 lb. **MIXER,** for sale, type GM. Opening at bottom of powder chamber 6 in. by 6 in. Electrics for 400/440/3/50 supply.

F. J. EDWARDS LTD., 359, EUSTON ROAD, LONDON.

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1880; contractors to H.M. Government.— THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.

TWO DE LAVAL SEPARATORS, VEE-BELT DRIVE. Good condition.

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

FOR SALE

PHONE 98 STAINES

DUPLEX "Z"-BLADE MIXERS—42 in. by 28 in. by 38 in.; 38 in. by 31 in. by 28 in.; 36 in. by 30 in. by 26 in.; 29 in. by 27 in. by 27 in.; 20 in. by 20 in. by 18 in.; and 16 in. by 16 in. by 14 in.

TWO GALVANISED 2,250 RECTANGULAR TANKS. 1,500, 1,200 and (2) 600 **ALUMINIUM ENCLOSED TANKS.**

"STEROPHAGUS" 5 in. **PUMP**—400 g.p.h., 10 ft. head, 400/3/50.

"MO-PUMP"—6 in., 48,000 g.p.h., 28 ft. head.

DITTO—4 in., 7,800 g.p.h., 16 ft. head, 400/3/50.

THREE WELDED STEEL HOPPERS—7 ft. 2 in. by 7 ft. 2 in. by 7 ft. 6 in. deep.

JACKETED AUTOCLAVE—7 ft. 6 in. by 3 ft. Steam, 40 w.p. Chamber, 30 w.p.

850 gal. **RUBBER-LINED CYLINDRICAL ENCLOSED TANK** (2).

100 gal. **STAINLESS STEEL MIXER**—220/1/50.

UNUSED ELECTRIC STIRRING ARMS—24 in. long, 440/3/50.

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ECONOMIC BOILERS, 10 ft. Danks. 12,000 lb. evap. 250 lb. pressure. Two Brand New 14 ft. by 8 ft. by 150 lb. w.p. **IMMEDIATE DELIVERY.** 400 other Boilers in stock.

Whessoe Riveted Steel **MIXING TANK,** 13 ft. diam. by 15 ft. deep, 9-16 in. plate, cone base.

TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**

ONE Stainless **CONICAL HOPPER,** 7 ft. 3 in. diam., overall depth 7 ft. 6 in.

SIX Stainless Steel **JACKETED PANS,** 60 galls.

TWO Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m.

SIX Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ¾ in. o.d.

FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lb. w.p. Numerous other sizes.

Solid Drawn **STEEL PIPES,** 6 in., 8 in., 10 in., 12 in., 14 in., thousands of feet in stock, plain and flanged.

CAST-IRON PIPES. 400 yds. 8 in. **NEW.** Also most other sizes, up to 24 in. bore.

VALVES in Stainless, Gunmetal, Enamel Lined.

Free Catalogue. "Watkins Machinery Record," available.

FRED WATKINS (BOILERS), LTD., COLEFORD, GLOS.

HEATPROOF GLASSWARE. Large quantity for disposal. Full details from **BOX No. C.A. 3317, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SACK AND BAG MERCHANTS AND MANUFACTURERS. New and reconditioned for Home and Export. (Use JUTEX for sack repairing). ALTRINCHAM JUTE LTD., WRIGHT STREET, BROADHEATH, ALTRINCHAM, CHESHIRE.

SPECIAL INDUCED-DRAUGHT TOWER COOLER, Type TID.419; timber construction; capacity, 32,000 gallons per hour from 90 deg. F.—70 deg. F.; size, 19 ft. 3 in. by 19 ft. 3 in.; chimney height, 26 ft. Tower treated creosote. Complete with 4-blade hardwood impellor fan, 9 ft. 6 in. diam. Motor driven. **BOX No. C.A. 3314, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

STAINLESS STEEL STEAM JACKETED ENCLOSED VACUUM PANS, Hemispherical. 3 ft. 8 in. at top by 1 ft. 10 in. deep at centre with 1½ in. bore bottom centre outlet. Bolted-on domed cover, fitted with two 6 in. sight glasses, 1 in. and 1½ in. bore flanged branches and thermometer pockets. Polished internally and suitable for 28 in. vacuum. Mild steel jacket. Working pressure 30 lb. p.s.i. Mounted in mild steel angle stand. Unused.

STAINLESS STEEL PLATE HEAT EXCHANGER by **A.P.V. CO., LTD.** Type HH. 76 plates 43 in. by 16 in., total projected area 346 sq. ft. Hydraulically operated opening and closing gear.

STAINLESS STEEL CRYSTAL DRIER by **MITCHELL,** 3 ft. 6 in. diam. by 1 ft. 6 in. deep. **STEAM JACKETED** flat bottom with two S.S. paddles underdriven through bevel gearing from direct-coupled 1 h.p. 400/3/50 geared motor. Jacket working pressure, 15 lb per square inch.

M.S. SPIRIT EXTRACTION PLANT, comprising 3 ft. diam. by 5 ft. deep extractor with dished bottom jacketed for 5 lb. per square inch working pressure, condenser, separator, storage tank.

KESTNER HORIZONTAL TUBULAR EVAPORATOR, having six turns copper tube 1½ in. bore by 6 ft. long, complete with copper reception pot.

STEAM JACKETED COPPER STILLS, 150 gallons capacity. Fitted swan-neck, sight and light glasses, etc., and complete with copper coil condenser. Jacket working pressure 40 lb. per square inch.

STEAM JACKETED COPPER BOILING PAN, 100 gallons capacity. Bolted-on cast-iron jacket suitable for 40 lb. per square inch working pressure.

DOUGH MIXER, having " U " trough 1 ft. 5 in. by 1 ft. 7 in. wide at top by 2 ft. deep. Sheet brass trough, cast-iron ends, G.M. agitator. Belt driven and arranged for hand tilting.

M.S. HORIZONTAL " U " TROUGH MIXER, 3 ft. by 1 ft. 9 in. by 2 ft. deep. Fin-type agitating gear belt driven through helical gearing from fast and loose pulleys. Arranged for hand tilting.

Cast-iron VACUUM DRYING OVEN by **TAYLOR,** 4 ft. by 2 ft. 10 in. by 4 ft. 6 in. front to back, having ten steam-heated M.S. platens pitched at 3 in. Hinged door at each end. Steam working pressure 15 lb. per square inch.

HARRISON-CARTER DISINTEGRATORS, sizes 2½ and 00. Belt driven.

PROCESS & CHEMICAL ENGINEERING CO., LTD.,
6/8, NORTHUMBERLAND PARK,
TOTTENHAM,
LONDON, N.17.
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7 BRAND NEW Jacketed **STERILIZING VESSELS**—7 ft. long by 3 ft. diam., complete with fittings.
2—18 in. **KEK PLATE MILLS,** complete with feeders, delivery bins, motors and entablature.
9—Worssam **ROTARY PRESSES.**
POWDER DRESSING OR SIFTING MACHINES.
1—Johnson **FILTER PRESS**—47 plates, 32 in. sq.
1—Johnson **FILTER PRESS**—30 plates, 25 in. sq.
Wood FILTER PRESS—69 plates, 2 ft. 8 in. sq.
24 in., 30 in. and 36 in. **HYDRO EXTRACTORS.**
Heavy Cake **CRUSHING MILL**—2-pair high, by Nicholson.
" U "-shaped Horizontal Jacketed **MIXER**—7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven.
3—5-roll **REFINERS** by Baker Perkins.
1—No. 1A Water-cooled **CIRCULATOR MILL.**
2—Excellent Nickel-lined Jacketed **TILTING PANS.**
5—Excellent Porcelain **DISC MILLS.**
1—Very Fine **GARDNER SIFTER** and **MIXER,** trough 5 ft. 9 in. by 24 in. by 28 in. deep, with wood-built hopper, elevator, A.C. motor and starter.
2—**GARDNER** ' G ' size **SIFTERS AND MIXERS.**
2—**GARDNER** ' H ' size steam jacketed **MIXERS.**
6—**JOHNSON FILTER PRESSES** 30 chamber 24 in. square.
RICHARD SIZER, LIMITED, ENGINEERS, HULL.
Telephone: 31743.

FOR SALE

C. BARBER, LTD.

C.I. FILTER PRESS, 32 in. square plate and frame type by **MANLOVE ALLIOTT** with hydraulic closing gear. 40 chambers giving cake capacity of 40.3 cu. ft. New and unused.

500-gal. Over-driven M.S. **MIXING VESSEL.** M.S. pressure filter, 4 ft. 3 in. diam. by 5 ft. 3 in. overall height.

C.I. FILTER PRESS, 25½ in. square, by **MANLOVE ALLIOTT,** plate and frame type, 13 chambers, arranged for washing. Excellent condition.

CANNON STEAM JACKETED ENAMEL-LINED PANS 10 and 25 gallons. All new and unused.

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WORKING NOTICE

THE Proprietor of British Patent No. 574,803, entitled **"APPARATUS FOR THE TREATMENT OF BLOOD,"** offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BOULEVARD, CHICAGO 4, ILLINOIS, U.S.A.**

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EXPORTS

LATIN AMERICA.—A $2,500 million export market must be approached in the buyer's own language. Specimen copies of the Spanish and Portuguese editions of **INDUSTRIA BRITANICA,** the leading British monthly trade journal covering these nineteen Republics, together with details of free translation service available on request to: **INDUSTRIA BRITANICA, BOUVERIE HOUSE, FLEET STREET, LONDON, E.C.4.**

MISCELLANEOUS

THE MINISTRY OF MATERIALS has for disposal about 989 tons of **BUTYL ALCOHOL.** The material is packed in painted iron drums of approximately 45 gallons capacity and is offered as it stands ex Ministry of Materials Depots at Easton Grey, Malmesbury, Wiltshire, and Stoney Cross, near Lyndhurst, Hants. Details of inspection arrangements may be obtained from **THE MINISTRY OF MATERIALS, BRANCH 2B, EMPIRE HOUSE, ST. MARTIN'S-LE-GRAND, LONDON, E.C.1** (telephone: Monarch 1020, Extn. 23).

Offers are invited for this material and should be made in writing to the Ministry of Materials at the above address not later than June 5th, 1954, in a sealed envelope endorsed in the top left-hand corner "Tender for Butyl Alcohol."

The Ministry does not necessarily bind itself to accept the highest or any tender.

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