The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXII. March 30, 1935 No. 822

Notes and Comments

A Triple Alliance

AFTER deliberations extending over several years, the councils of the Chemical Society, the Institute of Chemistry and the Society of Chemical Industry have produced a draft agreement which may be regarded as a first experiment in the elaboration of a scheme having for its ultimate object a closer co-operation between the societies dealing with chemistry in order that their usefulness in their respective spheres may be enhanced. The Chemical Society was formed in 1841, the Institute of Chemistry in 1877, and the Society of Chemical Industry in 1881. Thus for well over fifty years they have been serving chemistry side by side. Many of their members have for years subscribed to two or all three organisations, and a good deal of overlapping of effort has been inevitable. Complete amalgamation, even if it were possible, would in our opinion be undesirable, but it is hoped that when the agreement becomes operative it will go a good way towards the breaking down of unnecessary and artificial barriers and the promotion of the best interests of those engaged in chemical enterprises.

In the first place, it is proposed under the draft agreement, the full text of which was published in the Journal of the Society of Chemical Industry last week, to establish a fund to be administered by a chemical council having for its sole object the allocation of grants to the constituent bodies for charitable purposes, especially for the co-ordination of scientific and educational publications, the publication of new discoveries in chemical science and of their application to the arts and manufactures, the promotion of research, the maintenance of a library for research and education purposes, and the provision and equipment of a suitable building or buildings for all or any of those purposes. The object in establishing the fund is to collect funds from outside sources, for example, from industrial firms, to receive legacies from testators who may wish to leave money to chemistry generally, rather than to earmark it for some particular body, to collect funds to provide new accommodation as and when occasion may arise, and to allocate the fund as laid down in the agreement. It is proposed that the new Chemical Council shall comprise three representatives from each of the three societies and three representatives of industry, co-opted in the first instance on the nomination of the Association of British Chemical Manufacturers. Nomination by the Association is to be regarded as a temporary measure pending the determination of the best manner in which industry can be represented.

The Chemical Library

UNDER the terms of the draft agreement the Chemical Society's library at Burlington House will remain the property of the Society, but the three constituent bodies undertake to contribute to the net annual expenditure of the library a proportion based on their respective memberships, with due allowance for overlap and excluding those not yet admitted to full membership. In the past the Institute has contributed £250 and the Society of Chemical Industry £100 yearly to the upkeep of the Chemical Society's library, but under the agreement these sums would be increased to £654 and £448 respectively, taking the present memberships and the 1933 maintenance costs of the library. It has been pointed out by the presidents of the three organisations that this is one of the essential features of the agreement, and, if the three bodies are to justify their existence as a triple alliance, serving the interests of pure chemistry, professional chemistry and industrial chemistry respectively, they must see that nothing is allowed to occur derogatory to any one of them or to the alliance as a whole

Further clauses in the agreement provide for the retirement of members of the council after four years' membership, with an interval of at least twelve months before reappointment, and for the allocation of special funds to the library in diminution of the contributions to be made by the constituent bodies. The final clause states that the agreement is to be for seven years, subject to the right of any one of the constituent bodies to retire at the end of seven years upon giving one year's previous notice. After seven years it is intended that the agreement should continue for successive periods of three years. There is a proviso for the setting up of a permanent and centralised body to take the place of the arrangement made under the agreement. The term of seven years has been selected so that contributors to the fund may be able to continue their contributions over that period and be in a position to deduct income tax which could then be recovered by the fund from the Inland Revenue authorities in accordance with the terms of the Finance Act of 1920. The draft agreement has been submitted to the members of the three organisations, but no announcement has yet been made as to the probable date for its completion. In any case, it is regarded in the nature of an experiment which will be tried over a period of years. If it fails, recourse will be had to the *status quo*. If it succeeds, however, the presidents of the three organisations state that it is reasonable to suppose that a way will be found by

which subscriptions to the three organisations may be reduced, and it is probably on this ground more than any other that the movement towards co-operation will appeal to the rank-and-file members.

The Indian Lac Industry

THE Indian lac industry was profoundly affected by the war, which altered both the value and the direction of the lac trade. Although virtually an Indian monopoly, the high price levels reached, both during and after the war, rendered it peculiarly open to attack from the manufacture of rival products. The Indian Government, with the example of the fate of the indigo industry before it, recognised that steps should be taken if the lac trade was not to meet with a similar one. A Commission was therefore appointed to report on conditions in the lac industry and to make recommendations to safeguard it. The Commission issued its report and recommendations in 1921, and four years later the Indian Lac Research Institute began its work. Now, nearly ten years since the start of these endeavours, the Institute has published a book on " Lac and the Indian Lac Research Institute," by Dorothy Norris, P. M. Glover and R. W. Aldis, to give to those interested in the trade, whether cultivators, manufacturers, shippers, brokers, or members of the consuming industries, some idea of the development of the original scheme.

The report recalls that the discovery of aniline dyes and the perfection of chemical dyes put an end to the cochineal trade and at the same time to the Indian lac dye industry, an example of natural products being supplanted by a synthetic, laboratory-made substitute. By that time, however, the importance of lac resin had been realised in Europe and methods and directions of using it had been discovered. The importance of the lac industry from being that of dye production became that of resin production, and the dye, formerly the main product, took the position of a minor by-product of the resin factory, and it is this resin, both in its unmanufactured form (lac) and in the manufactured form (shellac), which now mainly comprises the industry.

The Uses of Shellac

THE industries into which shellac enters are extremely numerous and diverse in character. The most important are the gramophone, electrical, and varnish trades and of these the first named now accounts for 30-40 per cent. of the annual lac output, but this amount is likely to decrease, partly due to competition from substitutes and also to the introduction of new methods of sound recording. For high-class gramophone records those with a shellac base are still undoubtedly the best, but the production of these is likely to decrease for the reasons just stated. In the electrical industry lac products are chiefly employed as insulating varnishes and as a bonding material for laminated insulating materials such as paper boards, paper tubes, etc., and also for bonding mica flakes to form micanite sheet. It is also used in bonding cement for basing electric light bulbs and wireless valves. The varnish trade, which has also been mentioned in connection with the electrical industry, covers a somewhat wide field, but the principal section is the paint and varnish industry and is, together with the electrical industry, one in which competition from synthetic substitutes has made headway. These substitutes combine durability with the labour-saving devices of spraying and dipping. Latterly, however, there has been a movement towards combining the use of shellac with substitutes in lacquers, which should once more lead to an extended trade in this field. The electrical and paint and varnish industries, together, account for about 35 per cent. of the annual lac output.

Miscellaneous industries in which shellac is used cover a considerable range and of these the hatting trade in which lac is used as a stiffening agent consumes about a further 10 per cent. of the annual lac output. So far synthetic resins have not made much advance in this line. Other industries which should be mentioned are: Sealing wax manufacture, leather finishing, rubber finishing, paper finishing, photographic work, tinfoil finishing, lithographic inks, confectionery trade, emery grinding wheel industry, cements and glues, toy and furniture trade, munitions and fireworks, and the moulding industry. With such a wide range of utility the position of shellac might have been expected to be unassailable, but energetic steps are necessary not only to enable shellac to hold its place in the industries at present using it but also to find new uses to permit of an expansion in trade. Trade in lac and shellac has suffered from inroads made as the result of the increasing use of substitutes in place of the natural product in many industries. The whole of the industry in connection with these substitutes is remarkably well organised and, year by year, in spite of trade depression, has progressed rapidly. In recent years, however, there has been an extended use of natural products in combination with synthetic resins and there is, therefore, every possibility that shellac will find an increasing outlet in this direction. To summarise, synthetic resins have made inroads into fields where the natural product was originally supreme, and at the same time have opened out new fields of use in which lac and shellac may find an extended application. Synthetics have helped to stabilise the price of shellac also by providing an upper limit beyond which it cannot go economically.

Outlook of the Industry

LIKE that of all other natural products, the lac industry has passed through a period of depression. There are undoubtedly signs, however, that the lowest level has been reached. The competition from synthetic substitutes has been intense in the past few years, but shellac has come out of the struggle fairly well. The price has been reduced, as was inevitable; but the present figure is a healthy one and is doing much to stimulate renewed interest in the commodity. Another important outcome of this competition is the new fields of use for resins in general which have been developed by the energetic synthetic sales organisations.

It is now being realised that many new uses for shellac may be found in these fields, either alone, or in combination with other resinous materials. The Indian Lac Research Institute and its fellow research organisations are actively engaged in investigating these openings, together with the possibilities of improvements in cultivation, pest control, etc., which will lead to the production of a better grade of raw material.

The report states that it is extremely likely that shellac research interests in America, the United Kingdom and India may be combined. Such a triple entente of research activity should be just what the lac industry needs to help it on the road to recovery and give it the information and confidence it requires.

Co-operation Between Chemical Organisations

A Draft Agreement

THE Council of the Society of Chemical Industry, at a meeting held on February 15, unanimously decided to recommend the adoption of an agreement between the Chemical Society, the Institute of Chemistry and the Society of Chemical Industry in regard to co-operation. We understand that similar action has also been taken by the councils of the two other bodies concerned. The full text of the agreement, together with explanatory notes, was published in the "Journal of the Society of Chemical Industry" last week, and is reproduced below by permission of the Society.

Draft Agreement

An agreement made this . . . day of . . . 1935 between the Chemical Society (incorporated by Royal Charter, 1848), having its registered address at Burlington House, Piccadilly, London, W.1, the Institute of Chemistry of Great Britain and Ireland (incorporated by Royal Charter, 1885), having its registered address at 30 Russell Square, London, W.C.1, and the Society of Chemical Industry (incorporated by Royal Charter, 1907), having its registered address at Central House, Finsbury Square, London, E.C.2 (hereinafter called "the constituent bodies").

Whereas the constituent bodies have established a Fund (hereinafter called "the Fund") to be administered by the Chemical Council hereinafter referred to and having for its sole object the allocation of grants to the constituent bodies for charitable purposes, especially for the co-ordination of scientific and educational publications, the publication of new discoveries in chemical science and of their application to the arts and manufactures, the promotion of research, the maintenance of a library for research and education purposes and the provision and equipment of a suitable building or buildings for all or any of the purposes aforesaid. Now it is hereby agreed and declared by and between the constituent bodies as follows:

1. There shall be set up as soon as possible after the signing of this Agreement a body to be called "The Chemical Council" (hereinafter referred to as "the Council"), which will consist of not less than twelve members, of whom three shall be nominated by the Council of the Chemical Society, three by the Council of the Institute of Chemistry and three by the Council of the Society of Chemical Industry, while the remaining three members shall be three representatives of industry co-opted in the first instance by the other nine members on the nomination of the Association of British Chemical Manufacturers.

2. The Council shall be empowered from time to time to co-opt as members of the Council representatives of other bodies, but only with the separate and collective approval of the respective Councils of the Chemical Society, the Institute of Chemistry and the Society of Chemical Industry.

3. The object and purposes of the Council shall be those set out in the preamble to this Agreement and the promotion of any other object of charitable, scientific or educational interest which may be approved by each of the Councils of the constituent bodies.

4. For the better promotion of the object and purposes hereinbefore mentioned there shall be vested in the Council the collection and allocation of funds contributed by the constituent bodies and from outside sources for the promotion and support of such objects, and the co-ordination of the activities and administration of the constituent bodies in relation to the object and purposes of this Agreement.

5. There shall be vested in the Council the general administration of the funds available for the educational and scientific publications of the constituent bodies, but provided always that each constituent body shall be entitled to decide as heretofore what matter shall appear in its publications. The Council of each constituent body shall after consultation with the Chemical Council appoint its Editorial staff.

6. The Library at present belonging to the Chemical Society and located at Burlington House, Piccadilly, London, W.1, shall remain the property of the Chemical Society, but provided always that:—

(*a*) The management of the library shall be delegated by the Council of the Chemical Society to a joint library committee consisting of representatives nominated by the Councils of the constituent bodies and any other organisations contributing to its maintenance. The representation on the library committee shall be determined by the Council on the basis of the total contributions to the Library Funds. The library committee shall be responsible to the Council.

(*b*) The expenditure on fittings, furniture, books, periodicals and binding shall, after being submitted to and approved by the Council of the Chemical Society, be borne solely by that Society.

(*c*) The net annual maintenance expenditure (that is the total salaries, wages, superannuation, printing, stationery, postages, lighting, heating, storage and insurance, less contributions from sources other than from the constituent bodies) shall be borne by the constituent bodies in proportion to their membership with due allowance for overlap and excluding those not yet admitted to full membership.

7. The Council may in its discretion allocate special funds to the library in diminution of the contributions to be made by the constituent bodies under Clause 6(*c*) above.

8. All members of any of the constituent bodies (and, in addition, registered students of the Institute of Chemistry and Associate members of the Society of Chemical Industry) shall have the right to use the library on equal terms under regulations to be laid down by the joint library committee, and approved by the Council.

9. The existing arrangements between the Chemical Society and other bodies at present contributing towards the maintenance of the library shall be continued until regulations as to contributions shall be determined by the Council and approved by the Councils of the constituent bodies.

10. Societies not at present contributing to the funds of the library of the Chemical Society shall be admitted to the use of the library under regulations to be approved by the Council.

11. The Council shall present an Annual Report and Statement of Accounts to each of the constituent bodies.

12. The income and property of the Council from whersoever derived shall be applied solely towards the promotion of the object and purposes of the Council as hereinbefore set forth, and no portion shall be paid or transferred directly or indirectly by way of dividend, bonus or otherwise howsoever by way of profit to members of the Council. All money not required immediately for the purposes of the Fund may be invested at the discretion of the Council in duly authorised Trustee securities in the name of the nominees of the Bankers of the Council and on behalf thereof.

13. The Council shall have power from time to time to make such rules and regulations as it shall see fit for the conduct of its business, including rules regarding the number of members who shall constitute a quorum and the retirement by rotation of its members. Provided always that any rules and regulations made by the Council shall be subject to the approval of each of the Councils of the constituent bodies.

No member of Council shall serve for more than three consecutive years, but shall be eligible for reappointment after the lapse of twelve calendar months. Provided always that the members of the first Council shall serve for three years and thereafter one-third of the members of the first Council shall retire at the end of each year but shall be eligible for reappointment as hereinbefore mentioned. Failing agreement, the members to retire at the end of each year shall be decided by lot.

14. This agreement is to be for seven years from the date hereof subject to the right of any one of the constituent bodies to retire therefrom at the end of seven years upon giving one year's previous notice in writing to the other constituent bodies and after the expiration of seven years shall continue for successive periods of three years, subject always

to the right of any one of the constituent bodies to retire therefrom by giving one year's notice expiring at the end of any triennial period to the other constituent bodies.

Provided always that it shall be competent for the constituent bodies by mutual agreement at any time during the currency of this agreement or any extension thereof to set up a permanent and centralised body to take the place of the present arrangement.

In Witness, etc.

Notes on the Proposed Agreement

Preamble.—The proposal to establish a "Fund" under an agreement arose as the outcome of many discussions between representatives of the Councils of the three participating Bodies as being likely to make the scheme elastic and yet achieve the objects desired.

Stated briefly, these objects are (*a*) the collection of funds from outside sources; for example, from industrial firms, (*b*) the reception of legacies from testators who may wish to leave money to "chemistry" generally rather than to earmark it for some particular Body, (*c*) the collection of funds to provide new accommodation as and when occasion may arise, (*d*) the allocation of funds within the organisation in such manner as may be provided for by the terms of this agreement.

Clause 1.—Is self-explanatory. The nomination of three members by the Association of British Chemical Manufacturers is to be regarded as a temporary measure pending the determination of the best manner in which "Industry" can be represented.

Clause 2.—It should be noted that the inclusion of representation on the Council of "other bodies" is very carefully safeguarded.

Clause 3.—This clause is regarded by the solicitors as necessary in order that the "Fund" may not be subject to Income Tax. Of the three constituent bodies the Chemical Society and the Society of Chemical Industry are regarded by the Commissioners as "Charitable Institutions" and, as such, are free from Income Tax.

Clause 4.—This clause arises out of the preamble and is self-explanatory.

Clause 5.—This clause provides for complete freedom of action in respect of the matter published by each constituent body. It aims at the possible provision of means by which the business procedure of publication may be simplified, and economies may be effected.

Clause 6—(*a*) and (*b*) are self-explanatory.

(*c*) Under this section the three constituent bodies undertake to contribute to "the net annual expenditure" of the Chemical Library a proportion based on their respective memberships, due allowance having been made for overlap and excluding those not yet admitted to full membership (that is to say, Registered Students of the Institute of Chemistry and Associate Members of the Society of Chemical Industry). Hitherto, the Institute has contributed £250 and the Society of Chemical Industry £100 yearly to the upkeep of the Chemical Society's Library. Under this agreement these sums would be increased to £654 and £448 respectively, these figures being based on the full membership of the Institute and the Society, and on the maintenance cost of the Library for the year 1933.

(*Personal note by the Presidents of three constituent bodies.*)

These sums are substantial and mean an annual increased cost to the Institute of about £400 and to the Society of Chemical Industry of about £350—sums which will increase if the membership of these bodies should increase at a greater rate than that of the Chemical Society. Nevertheless, it must be remembered that it is one of the essential features of the agreement. None of the bodies can stand alone. Each represents one of three great branches of chemistry, namely, the Chemical Society, representing pure chemistry; the Institute, the profession of chemistry; and the Society of Chemical Industry, industrial chemistry. These three branches are essential to the growth of the tree as a whole, and the well-being of any one is essential to the well-being of the others. If the three bodies are to justify their positions as members of a Triple Alliance they must see that nothing is allowed to occur derogatory to any one of them or to the alliance as a whole. Chemistry, represented by three prosperous and healthy organisations, each dealing effectively with its own particular branch, but each closely bound to the other by ties of mutual goodwill and understanding, and encouraged by industry, can stand four-square to any adverse influence and can place chemistry in a position which it has not hitherto occupied.

Clause 7.—This clause enables the contributions of the three constituent bodies towards the Library to be diminished should (*a*) further Societies or Institutions be added to the list of those contributing to the upkeep of the Library, or (*b*) sums become available for distribution from moneys at the disposal of the Chemical Council.

By increasing the contributions to the Library of the Chemical Society funds will be released for the publication of new knowledge and abstracts.

Clauses 8 *to* 11 *are self-explanatory.*

Clause 12.—This clause is required in order to constitute the "Fund" as one raised for "charitable purposes" and therefore not subject to Income Tax. By constituting the nominees of the Bankers of the Chemical Council, as Trustees of the Fund, the constant alteration which would arise through the changes in personnel on the Council is avoided.

Clause 13.—(Second Section.) This provides for the change in personnel referred to in the note on Clause 12 above.

In order to ensure continuity of effort, it is provided that the first Council shall remain intact for three years.

Clause 14.—The term of seven years has been selected in order that contributors to the "Fund" may be able to continue their contributions over that period and be in a position to deduct Income Tax which could then be recovered by the "Fund" from the Inland Revenue authorities in accordance with the terms of the Finance Act of 1920.

(*Personal note by the three Presidents.*)

Doubtless some who read these notes may ask: "But what effect will this agreement have on the subscriptions paid to the three constituent bodies." In this connection it must be remembered that, unlike individuals, the life of a society is not determined by time. Years, therefore, are of less account in relation to policy. Organisations—such as ours—obtain the bulk of their annual incomes from the subscriptions of their members, and these incomes are dependent on the membership being maintained. It is wise, therefore, in the first instance, to proceed cautiously and to make no drastic move which might seriously affect the financial positions of the constituent bodies. The agreement represents, therefore, an experiment which is to be tried over a period of years. If it fails, recourse will be had to the *status quo*. If it succeeds, however, it is reasonable to suppose that a way will be found by which subscriptions to the three organisations may be reduced. It is evident that this object will be in the minds of the proposed Chemical Council from the beginning.

Personal Notes

MR. A. H. KILNER has been appointed a director of Courtaulds, Ltd.

MR. E. C. GORDON ENGLAND has retired from the board of the Vacuum Oil Co., upon being appointed joint managing director of General Aircraft, Ltd.

MR. A. J. GRANT, managing director of Thomas Firth and John Brown, Ltd., who led the British iron and steel delegation at the Ottawa Conference, is among the magistrates recently appointed at Sheffield.

MR. JOHN ROGERS, a director of Imperial Chemical Industries, Ltd., and a vice-president of the Chemical and Allied Employers' Federation, has been appointed to the board which is to consider the cotton weaving wages agreement.

DR. JAMES CHADWICK, the eminent English scientist, who discovered the neutron in 1932, has been appointed to the Lyon Jones Chair of Physics at Liverpool University. Dr. Chadwick will succeed Professor L. R. Wilberforce, who retires at the end of the present session.

DR. R. H. PICKARD, director of the Shirley Institute, has been appointed technical adviser to the committee of merchants set up at the Manchester Chamber of Commerce, under the chairmanship of Sir Kenneth Stewart, to co-operate with the Lancashire Indian Cotton Committee.

LT.-COL. STEPHEN HUNGERFORD POLLEN died at Hammerwood Park, East Grinstead, Sussex, on March 26, at the age of 66. Lt.-Col. Pollen was vice-chairman of the British Aluminium Co.

Tendering for Plant and Equipment

By J. H. West, M.I.Chem.E

IN connection with a recent chemical engineering contract it may be of interest to record some of the things to be avoided on the part of manufacturers of plant and equipment when tendering, and also some curious features of the tenders which were received.

To begin with, it should be explained that in sending out the inquiries unusual care was taken to give full and exact requirements in specifications and drawings, and the precise form the tender should take was also shown by a blank form of tender at the end of the specification. Indeed, everything was done to ensure that all tenders should be on an equal and comparable basis. This should have led to close tendering, but one of the surprising features of many of the summaries of the tenders received was the extraordinary range of prices, the highest sometimes being two and a half or nearly three times the lowest. It would be interesting to know the reasons for this; it cannot be that the low prices represent an inferior article, either in materials, workmanship or finish, for all those points are taken care of in the specifications.

The Allowance for " Overheads "

In some instances possibly a high price may be accounted for by an unsuitable firm having been asked to tender, in the sense that the inquiry covers plant which is a little outside their particular line, or does not quite fit in with their standard types or sizes. In others, firms may be so full up with work that they can afford to pick and choose and only want work at a high rate of profit. One cannot help feeling, however, that in many instances this wide divergence in prices for exactly the same thing is due to faulty estimating. One fruitful source of this may be the allowance made for overheads. Many manufacturers still keep to the old method of adding on a fixed percentage to the direct labour item to cover overheads, say, 100 or 120 per cent., quite irrespective of the actual ratio of overheads to direct labour costs in their works as a whole at the time, and with still less regard to the proportion of overheads really chargeable on a particular order if secured. Another item on which some manufacturers seem prone to cover themselves unduly heavily is that of erection. Whilst some firms send the superintendent of their outside erection department to the site to see exactly what the erection will involve in the way of handling, others do not bother to do so and, being in doubt as to what may be involved, put on a very stiff price to cover themselves.

Some extraordinary mistakes are made in tendering which seem to indicate a lack of proper checking. The prize example was a case where two complete sets of apparatus were called for, and an extremely low lump sum price for the two sets was quoted by one firm. This price seemed rather too good to be true, but one hardly liked to write and suggest that a blunder had been made. Various technical questions were discussed in connection with the offer, this correspondence occupying about a month as the firm were very slow in replying, and only then they discovered that the price quoted for the two sets should have been the price each!

General Conditions of Contract

Another firm quoting for pumps with gunmetal casings forgot to add the extra cost for these and sent in a price covering C.I. casings. In a third instance a number of sets of apparatus involved a number of special cocks to be made and supplied by the contractor, and also a number of standard cocks which were to be supplied to him from another source and incorporated in the apparatus. One firm, who were specially anxious to get this particular order, and believed that they had sent in a very competitive price, were surprised to learn that their price was the highest of all. On looking into the matter they found that the cost of making the standard cocks had been accidentally included in the estimate!

On this job it is laid down in the " General Conditions of Contract " that on the acceptance of a tender the work is not to be put in hand until the contractor has submitted his working drawings and has had them approved. A number of firms simply ignore this, get the work straight into their shops and then, when the drawings are asked for and found to be incorrect, or to show unacceptable details, are annoyed at having to make alterations in parts already made. In fact, it seems evident that in not a few cases the contractor's staff have not bothered to read through the specification or the " General Conditions of Contract," or if they have read them they promptly forget all about them and expect to be allowed to disregard them with impunity. One firm of national reputation in their own line failed to include for erection in their price although this was specifically asked for.

Now all these points, though irritating enough, and causing a great deal of extra work to the purchaser, are not of vital moment as regards the home trade because they can be put right quickly by means of letters or telephone messages, but if inquiries from overseas are handled in the same way an enormous loss of time and probable loss of business would result. Even for the home trade, manufacturers of plant and equipment would do well to take the greatest possible care with their estimating and tendering, taking pains to ascertain exactly what the inquirer wants and asks for, complying wherever possible with every detail of the specification and conditions of contract, and sending in the tender in just the form required. This not only saves the purchaser much trouble but inspires him with confidence that the work will be carried out in an equally efficient manner. When prices are close the inevitable question arises: " Which of these firms will give us the better job?" Apart from general reputation for workmanship and reliability as regards dates of delivery, that firms whose tender is submitted in the form most attractive to the purchaser, with full technical details, with everything that has been asked for included, and the price or alternative prices set out as required, will book the order every time.

Molecular Structure

Some Problems Discussed before the Chemical Society

SPEAKING on molecular structure at a meeting of the Chemical Society at Swansea, on March 21, Dr. N. V. Sidgwick discussed the general question of the value of the classical organic theory. Laid down in the 50's and 60's of the last century, this theory had not been appreciably altered till recent years.

At the present time, said Dr. Sidgwick, structural formulæ meant much more than they originally did. The distances between the linked atoms were known; also the angles between the valencies. Any particular molecule was visualised as a system of heavy points which could be modified by forces brought to bear on it. This knowledge, he stated, was the result of a whole series of physical methods of measurement, the starting-point of which has always been the structural formula in the ordinary organic sense.

The physical evidence for the mechanism of atomic linkage is derived from wave mechanics. While the primary covalent linkage can be explained as due to the sharing of two electrons between two atoms it can be shown that it is not sufficient to take into account the interaction of each electron with the two particular adjacent atoms, but the effect of all the electrons on all the nuclei in the molecule has to be considered.

IT is understood that the Government of India is considering proposals for the establishment of a fuel research station and that, in this connection, a conference of fuel technologists may be called. One of the suggestions made to the Government is that this research should be financed from the accumulated funds of the Indian Coal Grading Board. Research is in progress at the Indian School of Mines on the manufacture of soft coke and problems connected with its combustion.

Plastics for the Construction of Chemical Plant

Their Limitations in Use

PLASTIC materials are being used in chemical works in increasing amounts as materials of construction, said Mr. M. B. Donald, M.Sc., A.R.C.S., F.I.C., M.I.Chem.E., at the commencement of his paper read at a joint meeting of the Chemical Engineering Group and the Plastics Group, held in London on March 15. This is largely due to the fact that they are non-conductors of electricity, and therefore do not corrode like metals; they have resilience to absorb mechanical shocks; and finally they have a low specific gravity which makes them light to handle. The problem confronting the chemical engineer in choosing a plastic for making or lining plant, however, is a difficult one.

The tensile strength of laminated artificial resins at ordinary temperatures compares with that of the best type of timber. This increase of strength due to lamination has made it possible for the resin to be made into bolts, nuts and gears which give good service. The lamination also gives increased resistance to mechanical shock. It is at higher temperatures, however, that resin is superior to ebonite for chemical equipment. Ebonite softens appreciably at 65° C. and can be bent at 100° C. It can be cut with a knife at 115° C. and melts at 200° C. Artificial resin, however, will stand 150° C. continuously, provided that it has been previously taken up to that temperature in order to allow the resin to further harden and shrink; that is, provided it has been properly annealed. On the other hand, soft rubber can be used up to 110-130° C. so that the choice would depend on the strength required, the relative resistance to the chemical in question, and, lastly, their relative costs.

Avoiding the Formation of Blisters

The chief object in coating metal vessels with resin, where pressure cannot be employed, is to avoid the formation of blisters, due to vapours escaping, whether from the dampness of the materials used or from solvents employed with the resin. The trouble can be eliminated to a large extent by slow and careful drying in the initial stages, the use of porous textiles, etc. Another difficulty is the large difference in the coefficients of thermal expansion of the metal and the coating, which gives rise to internal stresses and tends to dislodge the resin from its base. This can be modified by hardening the resin from the inside to the outside by applying heat to the metal and by the use of an intermediate elastic layer.

In the manufacture of a vessel 6 ft. diameter and 6 ft. high in one piece, the use of a hydraulic press is out of the question, and considerable shrinkage may occur on hardening. In 1925 it was suggested spreading a mixture of half resin and half asbestos in a layer 4 cm. thick over the inside of an iron cylinder, which had been previously dusted with quartz powder to prevent sticking. A certain amount of pressure could be applied to the resin layer by loose segments of sheet metal kept in place with springs. After hardening, the surface crust was removed by sand blasting and the vessel heated to 200° C. or more for 30 to 70 hours. A final coat of resin was then applied to the surfaces. Such a vessel will have a porosity of from 1 per cent. to 3 per cent., although it is stated that for sudden changes in temperature a higher porosity is desirable.

An Important Contribution

An important contribution from the I.G. Farbenindustrie in 1926 was to build a laminated article from resin and wide-meshed fabric, which would have sufficient strength of its own not to need a metal support. Thus, tubes could be made by winding the fabric and liquid resin on to a core smeared with oil, paraffin wax, talc or graphite to prevent adhesion. The core can also be made of oil paper or with Rose metal melting at 95° C. The product is sufficiently strong to bear screw threads and can be sawn, drilled or turned like wood. If the core is a hollow pipe, the initial warming and drying can be easily carried out by admitting steam on the inside. Flanges can be built up by winding on narrow strips of the resin-saturated material.

A laminated resin product known as Keebush has recently been developed in England, with special regard to the chemical engineering aspects of the material, and can also be obtained in moulded forms. Tests on a laminated 1-in. bolt of this material gave a breaking load of 6.7 tons per sq. in., which is considerably in excess of the figure given at the beginning of this paper.

The condensed and hardened phenolic and cresylic resins are remarkably resistant to chemical attack and lists of chemicals. They should not be used for oxidising acids such as nitric and chromic; for sulphuric acid over 50 per cent.; for organic bases such as pyridene and aniline; for acetone or for sodium hypochlorite. Slight swelling is caused by toluene and glacial acetic acid, but this is not usually objectionable.

The fact that a substance is unsuitable is not always an indication that resin cannot be employed. For instance, in the preparation of aniline hydrochloride it is only necessary to fill the vessel with acid and pour in the aniline while stirring. It can also be used for making iron bromide, an intermediate stage in the preparation of alkali halides, from iron and the halogens. Although it is unsatisfactory for sodium hypochlorite it has been recommended for use with calcium hypochlorite and liquors containing chlorine. Care has to be taken in the selection of a suitable filler. Wood flour is definitely unsuitable and even an asbestos filler must be of the acid-resisting kind when vessels are designed for use with strong acid. For fluorine compounds a graphite filler is most suitable.

Phenolic Type Resins

As would be expected from their constitution, the phenolic type resins are not resistant to caustic alkali or to alkaline solutions, *e.g.*, sodium hypochlorite, previously mentioned.

Laminated resin pipes are excellent for handling corrosive liquids because of their strength and toughness compared with other similar materials. A hydraulic test carried out on a Keebush pipe, internal diameter 2 in., external diameter 2.43 in., length of pipe 40½ in. and fitted with 6 flanges, gave the following results: At 225 lb. per sq. in. there was a slight seepage through the flange threads at both ends. At 1,300 lb. per sq. in. a number of pin holes opened along the whole length of the pipe and the pressure could not be increased to more than 1,600 lb. per sq. in. The pipes in question are normally supplied for a working pressure of 50 lb. per sq. in., and to the same standard dimensions and with the same fittings as normal mild-steel piping. The flanges can be joined by using bolts and nuts of the same material, which also conform to British standards.

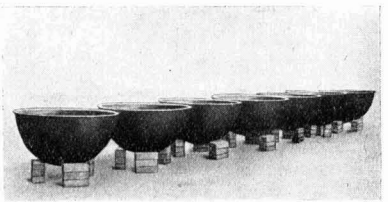
Thick filter plates of resin harden from the outside to the inside, as the resin is a bad conductor of heat, and this effect tends to set up damaging tensions which result in the plate becoming warped or cracked in use. These stresses are especially noticeable if the plate is made of layers having a different composition; for example, asbestos or cellulose fibres as a filler. It has been proposed to anneal plates containing asbestos only at from 150° to 180° C. for 2 to 3 hours, or, if they are made with cellulose fibres and will therefore not stand such high temperatures, for 3 to 4 hours or longer periods at about 150° C. During the annealing the plates must be kept rigid on skeleton supports. Wooden filter plates have been coated with resin to resist the action of hydrogen peroxide and oxalic acid.

The use of laminated resin for making silent and acid-resisting gears is of great interest to the chemical industry. On a felt sizing machine, using a weak solution of nitric acid and mercury, bakelite gears were found to give satisfaction. Fume hoods of resin have been used for removing moisture from pulp- and paper-drying rolls so as to avoid any products of corrosion falling on the material being dried. Oven trays made of Keebush are used in the foodstuff, dyestuff and fine chemical industries.

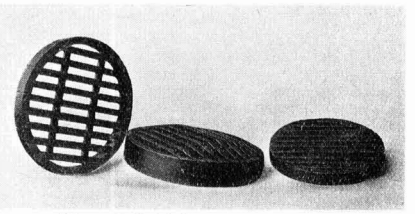
Points from the Discussion

Dr. L. A. JORDAN said that having seen the impressive exhibits and heard what the author had said he felt inclined to wonder whether the development in the use of plastics in chemical engineering had been as much as it ought to have been. Speaking generally on the question, he said it was probable that lamination would go a long way in furthering

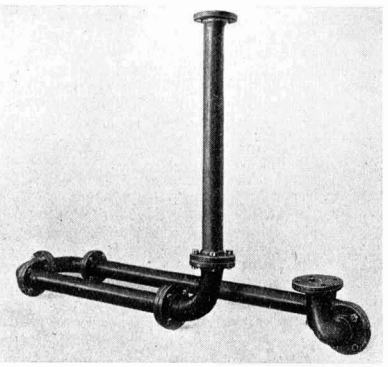
Haveg as a Constructional Material for Plant



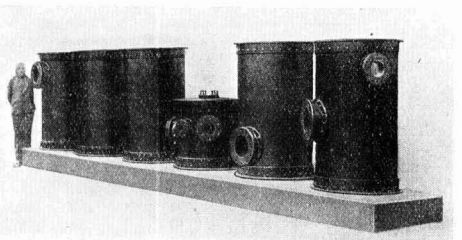
A battery of " Haveg " Hemispherical Vessels



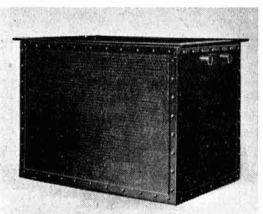
" Haveg " Grids for Absorption Towers



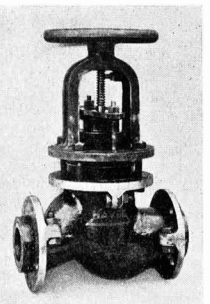
" Haveg," as used for Pipework



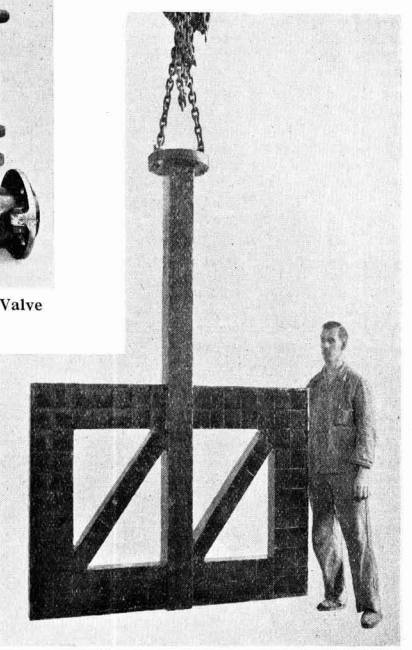
" Haveg " Absorption Tower, in sections before erection



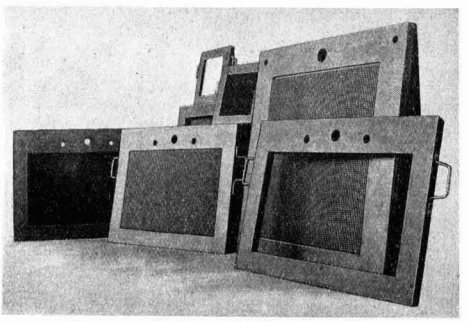
Rectangular Tank made of " Haveg," showing expanded metal reinforcement



" Haveg " Wheel Valve



Agitator with ceramic tiles moulded into the " Haveg " material to give protection against erosive action of sludges



A group of " Haveg " Filter Press Plates

Reproduced by courtesy of Trost Bros. Ltd.

the development of plastics for this purpose, although it would be useful to hear something about the possibilities of moulding or pressing laminated products.

Mr. H. V. POTTER mentioned that the water bottles used by the German army from an early stage of the Great War were sprayed inside with a solution of bakelite and he believed the results were quite satisfactory. The moulding of chemical engineering apparatus from laminated resinol, as suggested by Dr. Jordan, should be a perfectly feasible proposition, for it was already being done in the case of trays for photographic operations.

Mr. J. ARTHUR REAVELL said that in many respects dealing in these materials so far had been loss rather than profit, and perhaps it was as well to say nothing much about cost for the moment. At the same time, the technique of manufacture had been tackled very seriously during recent years and a great many types of material were now available, depending upon the use to which they were to be put. Until the ordinary chemical works could cut and screw this material in the same way that metals could be dealt with, however, it would not have the popularity that it should have and would have. Nevertheless, an enormous amount of progress had been made with these materials in their plastic state. Some extraordinarily interesting experiments had been carried out with this material in a strong hydrochloric acid atmosphere, with exceedingly satisfactory results, and it was now possible to make impellers for pumps and fans running at very high speeds and dealing with hot hydrochloric acid. All this he regarded as very considerable development in a period of only 18 months.

Mr. W. H. STEVENS inquired to what extent these materials were used in handling alkali. Although the resistance of rubber to alkali was very satisfactory in some respects, rubber suffered from a disadvantage and perhaps a combined product might be considered with a view to overcoming such disadvantages as existed. He also referred to the possible use of ebonite for chemical apparatus and spoke of a British patent in which it was claimed to raise the softening point of ebonite very substantially by the use of silica as the compounding ingredient.

The AUTHOR, in his reply, agreed with Mr. Stevens as to the possibilities of a combined rubber and resin material, but as regards ebonite he felt the ebonite people had a good leeway to make up in order to increase the strength to a comparable degree with that now obtained with the artificial resins. Replying to the Chairman on the question of lining aluminium tanks, the author mentioned that aluminium spools for artificial silk had been treated with a bakelite solution and lasted for a long time. The trouble was that the resin tended to develop a fine hair crack which might make it possible for the acid to seep through the filler unless great care was taken in the selection of the filler.

Mr. J. ARTHUR REAVELL, in answer to a comment by the Chairman on the question of cost, said that in the case of pipes the cost was between that of copper and nickel-chrome steel.

Eucalyptus Piperitone

The Story of a Research, 1788—1934

A JOINT meeting of the Chemical Society and the Glasgow Sections of the Society of Chemical Industry and the Institute of Chemistry was held in the Royal Technical College, Glasgow, on March 15, when a lecture entitled "From Governor Phillip to d-neoisoMenthol: the Story of a Research, 1788-1934," was delivered by Professor John Read, of St. Andrews University. Professor G. G. Henderson presided.

Professor Read said that it was his object to select a research paper from the "Journal of the Chemical Society" for March, 1934, and to show what a rich background it possessed when given its proper place in the world of things. The paper he referred to was the concluding chapter in the history of the important chemical family of menthols. The usual source of ordinary menthol is the essential oil of the peppermint plant, *Mentha piperita,* which has been cultivated in Japan for more than 2,000 years. The first mention of crystalline menthol was made by a Dutch botanist named Gambius, in 1771. It is now known that this so-called "mint camphor" is a member of the first of four series of menthols. Professor Read and Dr. Grubb completed the tale of these four series in the University Chemical Laboratory at St. Andrews on Christmas Day, 1933.

Unique Vegetation of Australia

Captain Cook landed in Eastern Australia on April 29, 1770, said Professor Read, and in his "Journal" he wrote of the landing place: "The great quantity of new plants, etc., Mr. Banks and Dr. Solander collected occasioned my giving it the name of Botany Bay." From the earliest days the unique vegetation of this isolated southern land attracted the interested attention of visitors and settlers. Eucalyptus, the outstanding Australian genus of the family *Myrtaceae,* is a specialised form adapted to the barren and extra-tropical Australian areas; it developed after the separation of Australia from the tropical lands. Typically Australian, it is virile, agressive and an excellent colonist.

Dr. John White was surgeon-general to the first settlement, under Governor Phillip, who reached Botany Bay with his fleet of marines, officials and convicts on January 20, 1788, after a voyage lasting eight months. His "Journal of a Voyage to New South Wales" shows that the voyage had its romantic aspects as well as its hardships and notes of grimness. Although Dr. White does not mention it, it is said that Governor Phillip took with him from Brazil some prickly pear plants, infested with cochineal insects. These insects produced the scarlet dye used for the military uniforms of those days.

At that time, oil of peppermint was a much-prized specific, for in the first issue of the "Glasgow Advertiser," dated January 27, 1783, it is stated that "This elegant preparation," sold by J. Gillies, bookseller, above the Cross, Glasgow, gives immediate relief "in gouty and cholicky pains in the stomach and bowels, low headaches, and all disorders arising from wind." Dr. White, being short of this oil, found a very efficient substitute in the essential oil distilled from a certain eucalypt growing around Port Jackson—now known as the Sydney peppermint, or *Eucalyptus piperita.* Many years later, in 1900, the Australian chemist, H. G. Smith, isolated the peppermint ketone imparting the characteristic odour to this oil, and called it piperitone. There are about 300 species of eucalyptus, each kind—as shown by H. G. Smith and R. T. Baker—producing its own characteristic leaf oil: of these more than 20 secrete piperitone. It was then found that by hydrogenation and dehydrogenation piperitone could be changed into menthols and thymol respectively, so that it became a commercially valuable substance.

Eucalyptus piperitone is invariably a "left-handed" substance. Soon after Professor Read became associated with Mr. Smith at Sydney, in 1920, Professor Simonsen, working independently at Dehra Dun, in India, discovered "right-handed" piperitone in the oil of the Indian grass, *Andropogon Jwarancusa.* These two piperitones, of the northern and southern hemispheres, are identical, except that their molecules are related as object and mirror image.

A Source of Four Menthols

One interesting result of later researches, carried out at St. Andrews, has led to a way of proceeding, by laboratory processes, from the "left-handed" Australian piperitone to the "right-handed" Indian piperitone. It has also been found possible, by means of a complicated network of delicate reactions, to utilise piperitone as a source of any of the four series of menthols. Each of the four kinds of menthol exists in a "right- and left-handed" form, and methods have been devised for producing the "right-handed" form of ordinary "mint camphor," which is always "left-handed" in nature.

Developments in the Use of Solvents

DR. OTTO JORDAN, who is on a special visit to this country, read an interesting paper on "Solvents," at the meeting of the Oil and Colour Chemists Association, held in London on March 14. Mr. W. Esmond Wornum presided.

During the past twelve years, said Dr. Jordan, a most impressive development had taken place in the manufacture and use of solvents in various branches of industry, and as the result of research work, especially among the hydrocarbons and their chlorine derivatives—the alcohols, esters, ethers and ketones—a considerable number of new solvents had been made available on a commercial scale. This expansion was closely connected with the development of cellulose lacquers, but once the lacquer field was cleared, research was turned towards the discovery of new synthetic resins and the improvement of the properties of drying oils.

Finding New Applications

Although it had been said by experts in several highly industrialised countries that the cellulose lacquers and synthetic solvents had passed the peak of their possible development—and several experts had declined to devote further attention to them—it was worth while examining whether this conception was correct. If we considered the position of solvents from the point of view of the potential consumer two tendencies manifested themselves, namely, to expand the use of solvents on the one hand, or to limit and even decrease it on the other, but, in his view, the policy which should be adopted was to find new applications for new products and to create new demands. Of the various consumers of solvents, the paint and varnish industries took first place both as regards quantity and value. The largest consumer of synthetic solvents was the cellulose lacquer industry or lacquer made from physically-drying binding media.

Recent developments showed an increase in field of application for lacquers in four directions. In countries which have lost large markets to the Japanese for the products of their key industries, there was the endeavour to create new and refined industries, such as cosmetics, fancy articles, metal work and so-called technological industries which created a demand for high quality quick-drying lacquers. What was of much greater importance, at any rate for some countries, was the entry of cellulose lacquer into the field of railway carriage painting. The use of nitrocellulose enamels for external application to such large surfaces had previously been very limited owing to the fact that these enamels chalked quite rapidly if the surface was not treated regularly. Cellulose lacquers also lost a considerable amount of their elasticity when used as clear lacquers and frequently showed discolouration in the case of pale shades. The three factors involved in these effects were light, air and water, and although the effect was a joint one, most importance should be attached to the light factor.

Discolouration of Cellulose Films

If a nitrocellulose film was exposed to light, and especially to short waves, traces of nitrogen oxides were split off and the properties of such a film depended to a large extent on what happened with the nitrogen oxides, which were chemically very reactive. In clear nitrocellulose films, they attacked the micelles and molecules of the nitrocellulose. The molecules were cut into smaller units and in this way the elasticity of the film was reduced. The new compounds formed in this way had very little colour provided a good grade of nitrocellulose was used. If the nitrocellulose film contained a plasticiser which was chemically completely saturated, such as adipic acid esters or succinic acid esters, the plasticiser could not react with the nitrogen oxide, and although the film became brittle it remained comparatively colourlesss. If, on the other hand, a plasticiser was used which could combine chemically with the nitrogen oxide, the nitrocellulose was not seriously attacked and therefore the elasticity of the film was not reduced to any considerable extent by exposure of the film to the light. Whether a discolouration of the film takes place or not depends on whether the nitrated plasticiser is coloured, and similar colouring effects could be obtained by the addition of resins.

Some Opportunities for Expansion in Meeting the Needs of Industry

By pigmenting the film, these reactions were confined principally to the film surface, but experience showed that there was some effect in the deeper parts of the enamel film. In addition, there was a further oxidation which more or less destroyed the structure of the film surface, but the extent and speed of this oxidation largely depends on the type of pigment and the other additions to the nitrocellulose. In all cases, however, it had been found until recently that the best plasticisers and resins could not give sufficient protection in order to prevent deterioration of the film surface by chalking. By adding certain oil modified phthalic acid resins to the nitrocellulose plasticiser system, however, it had been found possible to bring about a marked improvement, and this type of enamel did not chalk even after long periods of outside exposure, except when a few particular pigments were used. It was assumed that these phthalate resins retard the oxidation reactions of the nitrocellulose because they were either oxidised themselves, forming harmless compounds, or they neutralised the most active type of sun rays. Unfortunately, however, no exact data had yet been published on the scientific causes of this fact which was so important for the whole technique of nitrocellulose lacquers. Such nitrocellulose-phthalate resin lacquers had been used in America and Europe for a few years for various applications, but it was only recently that the German State Railways had specified this type of enamel for many railway purposes, including the exteriors of carriages.

Extended Use of Chlorinated Rubber

During the last few years increasing quantities of cellulose lacquers had been used on aircraft using nitrocellulose as a top coat. On the Continent, as well as in America, there has also been a continuous expansion in the use of chlorinated rubber in fields of application which were formerly reserved to the drying oils. At the same time, there had existed much prejudice concerning chlorinated rubber and it had been a long time before the possibilities were recognised. In the meantime, some manufacturers had learned how to make chlorinated rubber stable, with the result that users began to realise that the chlorinated rubber—the chemical structure of which was so entirely different from that of cellulose derivatives—needs different and special plasticisers. Therefore, quite different types of plasticisers were available to-day, particularly liquid chlorinated diphenyls and high molecular substituted condensation products of cyclic hydrocarbons, known as T oil. In addition, excellent results had been obtained by using in certain proportions, oil modified phthalate resins. There was no doubt, added Dr. Jordan, that in addition to chlorinated rubber, some vinyl resins such as polystyrol would find important fields of application and the same remark applied to benzyl cellulose and cellulose acetate.

The development of cellulose acetate had been retarded among other reasons by two problems in the solvent field. In the first place, there was lacking a solvent of medium volatility, and secondly, plasticisers with improved properties were needed. As far as the first reason was concerned, it had not so far been possible to manufacture a uniform, cheap and harmless medium boiling solvent for cellulose acetate. There had been more success, however, with plasticisers because by introducing chlorine or ether groups into the molecule of some water insoluble plasticisers, particularly those of the aliphatic series, good results had been obtained in Germany, and further research work—with a decrease in cellulose acetate prices—should result in further application of this cellulose ester.

It is now possible to substitute wax in organic removers by using rubber or cellulose acetate or special alkylated cellulose, which later was known as Tylose. In this way, the drawbacks of waxes were avoided and the use of organic removers was increasing at the expense of alkaline material. For organic removers it had been found that methylene chloride, with additions of alcohols and esters, had proved easily the most satisfactory solvent, due to the small mole-

cule and high solvent power of this non-inflammable and comparatively harmless material.

The important opportunities of expansion in the use of solvents, however, continued Dr. Jordan, might meet with obstacles tending to limit or even curtail their use, and these obstacles were chiefly dependent on the improvement of oxidising binding vehicles. Some of them, particularly the so-called "synthetics," had caused a renewed demand for stoves in many industries which for several years had used air-drying lacquers and the air-drying lacquer had lost, at least temporarily, some turnover. A significant example of what might possibly be done with stoving enamels was provided by Henry Ford who, by changing his motor car lacquering to synthetic stoving enamels, had obtained better weather resistance at a lower cost. In addition, the sanding and polishing processes were omitted, and although there had been some objections to this kind of finishing of motor cars Dr. Jordan said that having visited the Ford plant he felt that Mr. Ford had again proved himself a pioneer, because what was being done would stimulate competition in the lacquer industry and assist further progress in producing better materials.

Some Fundamental Problems

Some of the fundamental problems associated with the use of solvents were discussed by Dr. Jordan, who indicated directions in which investigations are being carried out, as, for instance, in connection with azeotropic solvent mixtures—which certain Russian and other scientists have recently started to investigate—the elimination with the solvent, of traces of water which latter assist in the formation of orange-peeling in the drying film, and so on. It was also pointed out what a close connection there is between solvents and dissolved materials, particularly if the materials are of a polar nature, but regret was expressed that not much progress has been made for several years in our exact knowledge of Molcohesion, with the result that values cannot be given exactly for the process of dissolving cellulose esters in solvents and then evaporating the solvents again. The problem of which solvent mixtures volatilised in what was described as an harmonic manner, was also said to be engaging the attention of many workers, but so far it was only in an empirical manner that improvements had been brought about by some new solvents.

Cyclo hexyl acetate was one of the best solvents to improve the flow of lacquers, but its odour remained too long in the film. Therefore, a solvent was being sought with a volatility between that of amyl and cyclo hexyl acetate possessing the same unusually great solvent power for resins and oils, but having less odour. In this connection it was said that interesting products have been found in three different chemical groups, one of which includes the esters of aliphatic alcohols of about 6-8 carbon atoms of which those having a branched carbon chain have proved particularly suitable. The second group included the higher aliphatic ketones, such as dipropyl ketone, which, however, were not so efficient, whilst the third group consisted of water insoluble esters of glycol ethers and particularly of the acetate of 1.3 butylene glycol ether known as butoxyl. This was the only type without odour although it was not soluble in water.

Expected Improvements in Quality

As the result of the attention being paid to synthetic solvents users could expect many improvements in quality. In the sphere of lacquers and paints some increase in the amount of synthetic solvents used would undoubtedly be experienced, at least in some of the highly industrialised countries. As in some countries stoving synthetics for some particular purposes might constitute cellulose lacquers, a decline in the use of several solvents might take place, but the change would be chiefly from one type of synthetic solvent to another. By the extended use of certain synthetic resins, chlorinated rubber and organic paint removers, various hydrocarbons and some chlorinated hydrocarbons would be used in increasing quantities. From the manner in which several new plasticisers, introduced in the last few years, had been received by users, it seemed that all requirements were by no means met by the products at present available and new plasticisers, particularly for new types of binding media, such as vinyl compounds, synthetic and chlorinated rubber, etc., might be expected.

Mr. A. E. LAIN asked for information on the action of resins on cellulose and solvent mixtures and said that although the author had referred to the desirability of choosing a solvent of a polar character and low viscosity he did not mention anything about the chemical composition of the resins. In most present-day lacquers the resin content was gradually being increased and therefore the character of the mixture would be considerably influenced by the resin.

Dr. JORDAN said he had not gone into the question of resins because it was such a big subject, but it could be said that the polar character of the resin itself could never have much to do with the final properties of the film. Exact data of the influence of different resins in this respect, however, had not so far become available.

Harmonic Evaporation

Mr. T. H. DURRANS asked if Dr. Jordan had any experience of the effect of a body such as urea in absorbing the nitrogen oxide particles and thus preventing the coloration of the film. If this was incorporated in a plasticiser the effect might be quite marked. Secondly, did Dr. Jordan think that harmonic evaporation was desirable. After all, what was wanted was controlled viscosity of the film as it dried according to the manner in which it was being applied. For instance, if a lacquer was being brushed on what was required was a slow change of viscosity until the material was applied and then a rapid change in order to prevent flow which gave rise to ripples and that sort of thing afterwards.

Dr. JORDAN said there was a distinct difference between the best composition of a solvent depending on whether it was to be brushed, sprayed or dipped. What he had said in the paper with regard to harmonic evaporation applied more particularly to spraying lacquers. There was no question but that with brushing lacquers the mixture must be different. With regard to urea, the results which had been published were different from those which he had obtained and it rather seemed that the purity of the nitrocellulose used had something to do with the results.

Mr. R. BATTACHARYA asked for Dr. Jordan's view with regard to the behaviour of paints thinned with a solvent like white spirit or turpentine and the same oil-ground pigment thinned with water by means of certain emulsifying agents. Why was the finish glossy in the one case and matte in the other?

Dr. JORDAN remarked that if there was water there would be a dull finish, due to the fact that water was the strongest polar material known.

Research on the Right Lines

Mr. W. GARVIE asked whether the author considered that the research work being done to-day is on the right lines. A great deal of research was being carried on throughout the world and large sums of money were being spent since the discovery of new film-forming materials, such as cellulose esters and the new synthetic resins, but would it not be better that that research should be concentrated a great deal more than it was with the object of simplifying things. For instance, di-terpene, when applied to a surface, resinified with practically no loss of weight and the film dried in practically 24 hours, and although he did not suggest that this was a solution of the problem, there was the possibility that at the present research work into this subject of solvents was being carried on along quite wrong lines.

Dr. JORDAN replied that it was very difficult to say what was the best method of approaching research into these problems. It certainly was desirable that more experienced scientists should take a hand in it without regard to the practical side. Five or six years ago several people started serious research work in the cellulose field and some millions of marks were spent in this way. That, however, was only possible in prosperous times for industry, and this work had been dropped as a consequence of the industrial depression with the result that progress had been slowed down very considerably. He hoped it would be possible for some experienced scientists to continue this work. As to a solvent which resinified without loss of weight, the Du Pont Co., many years ago, made a very highly unsaturated liquid material, which under the influence of atmospheric oxygen resinified and acted in such a way that it seemed an ideal material. It seemed that it could be brushed or sprayed, and under the influence of the oxygen of the air it resinified and hardened. Experiments with this material, however, had not been so successful as had been hoped for, because it took up so much oxygen from the air that it was liable to explode.

Redwood Tanks and Vats

Their Extensive Use in the Chemical Industry

SURPRISE has been expressed by the Redwood Export Co., of California, at the omission of any reference to California redwood (*Sequoia sempervirens*) from the paper which Mr. W. G. Campbell presented to the Chemical Engineering Group, in London, a few weeks ago, on the chemical aspects of timber research. Redwood is considered one of the most important woods by engineers in the United States, and is extensively used for vats. The earliest redwood tanks and vats were constructed on the Pacific Coast and coincident with the development of California following the discovery of gold in 1898 its use for mining tanks and structures spread rapidly. Since that time, redwood has occupied, because of its special fitness for tank purposes, the position of being one of the two leading tank woods of the world. Only prime heartwood of Tidewater red cypress (*Taxodium distichum*) bears direct comparison for durability, workability and generally all-round satisfactory properties for that purpose.

Water Storage

The number of American industries dependent upon the use of redwood tanks and vats is large. There are, in fact, few manufacturing enterprises which may not be benefited by its use to some extent, and failure to pursue that course usually is the result of lack of knowledge of the specific properties of redwood and its application to almost every line of industrial activity. Water storage for gravity or other supply for fire protection purposes represents an important use for redwood tanks and the practically total non-inflammability of redwood thus used is consistent with the theory of fire protection. An interesting test of the fire-resisting properties of a redwood tank was had when an intense fire gutted an industrial plant, destroying on the roof several tanks of other woods but only charring the redwood tank.

Redwood is fire-resistant, independent of the saturation of the tank with water. Saturation with water may not always be relied upon. The fire resistance of redwood is a function of the absence of resin and of the inherent resistance that accompanies a naturally durable non-resinous wood. Mr. F. J. Hoxie, in his "Decay of Wood in Industrial Buildings," states: "Decayed wood ignites more readily than sound wood. Under favourable conditions large pieces will ignite at 290° F. or lower. The greater combustibility of rotted as compared with sound fence posts and stumps is familiar even to casual observers. The margin of safety in a structural member ray be reduced by decay to such an extent that there will be very little reserve strength left to resist fire. Normally, slow-burning construction would be changed to a type readily susceptible to serious damage."

From the standpoint of physical and chemical properties redwood agrees in both the theory and practice of a fire-resistant wood. It is unique among all woods in this respect.

Ammonia Manufacturing Plant

The chemical industry utilises a large quantity of redwood for tank purposes, and so varied have been the applications that the characteristics and durability of redwood for storage and process work can be foretold with a reasonable degree of accuracy. In the grouping of storage tanks, beside the usual water storage, are the containers of acid or other solutions. An interesting application of redwood tanks has been made in a large chemical plant that produces aqua ammonia. The slightest impurity in the distilled water in which the ammonia gas is dissolved results in cloudiness of the solution. The high solubility of distilled water precluded the use of any metal and a large glass tank was tried without success in avoiding cloudiness in the ammonia solution. Redwood tanks in which the acid content of the wood was neutralised by treating with an alkali permanently solved the problem of the storage of distilled water for ammonia-manufacturing purposes.

Redwood has proved its value in storing or processing all of the organic acids, including in particular acetic and tannic acid. The former finds wide application in the textile and paint-manufacturing trades and tannic acid forms the basis of an important part of the leather industry. One of the leading paint manufacturers of America, referring to the storage of acetic acid, reported recently: "The strength of this acid has varied from 30 per cent. to 80 per cent. at normal temperatures. We have not noted that the acid had any ill-effects on the wood, in fact, we believe that acetic acid could be stored almost indefinitely in redwood."

Where redwood tanks have been used in tanning leather, it is not uncommon to find such tanks lasting for more than a half-century. A recent inspection of tanks in a tannery revealed them sound after forty years, even though subjected to a five hours' daily boiling of the contained tannic acid solution. Similarly, redwood tanks are in all respects suited to the production of the esters, the principal applications having been in commercial production of the vegetable and animal fats and oils. An analogous use, but falling within consideration of the inorganic acids is that of "soap-stock" tanks. Notwithstanding the severe effect of the boiling of the vegetable and animal greases in the presence of sulphuric acid, "soap-stock" tanks of redwood last for many years. Failure, when it occurs, is caused by a charring of the tank bottom boards under the combined influence of the boiling acid solution and the steam coils located immediately above the bottom boards. The use of redwood tanks for boiling water, even with steam coils adjacent to the bottom, is to be favourably distinguished from hot acid solutions. A redwood tank lasts indefinitely long and gives perfect satisfaction when used in contact with boiling water.

The Food Products Industry

The food products industry has used redwood tanks extensively, and for the manufacture of pickles there are single plants equipped with hundreds of redwood tanks many of which have witnessed a third of a century of service and are still perfectly sound. One of the marked advantages of redwood tanks in the pickle industry is their unequalled capacity in resisting change of shape or deformation when out of use for long periods as a result of seasonal variation in crops. For best results in pickle tanks, the inner surfaces after assembly should be neutralised by washing down with a 2 per cent. solution of trisodium phosphate (or sodium carbonate), then filled with water and trisodium phosphate (or sodium carbonate) added to make a 1 per cent. solution and let soak for two days; then drained out, washed down and then whitewashed and again washed down. An authoritative writer in "Fruit Products Journal and American Vinegar Industry" recommends the above treatment for all new wood tanks, with the further course of a final neutralisation of the soda with a one-half per cent. aqueous solution of sulphuric acid. This treatment also affords further security against the occurrence of the troublesome iron-tannin compounds that so frequently arise in vinegar processing regardless of the species of wood from which the tank is made.

Effect of Inorganic Acids

The inorganic acids as commercially employed may also be used with redwood, although limitations must be observed with respect to those that are strong oxidising agents, among which are grouped nitric and chromic acid and free chlorine solutions. Strong concentrations of sulphuric and hydrochloric acids, particularly at high temperatures, affect all woods detrimentally, although weaker solutions, in some cases up to 10 per cent., may be used and a satisfactory durability obtained. There is the same wide difference of opinion with respect to the most suitable wood for acid work as obtains with the various acid-resisting metals, but redwood has given excellent results in a wide variety of applications of the inorganic acids. Aside from consideration of oxidising effect the pH value of any inorganic acid offers an index of the corrosive action on wood of any acid as such. Potassium and sodium cyanide as employed in metallurgical operations are without action on redwood. Leaching, agitator and storage tanks for use with acid solutions of copper sulphate are standardised redwood equipment throughout the major mining plants of the world. The action of the copper sulphate is superficial only and affects but the inner surface in immediate contact with the solution.

All woods respond to alkali solutions and particularly those in the caustic group, *viz.*, sodium and potassium hydroxide. The durability of any wood in contact with alkali solutions appears to depend in large part upon the *p*H value of the alkali. Calcium, magnesium and iron solutions are active with respect to all woods, but rapidity of disintegration appears to be a function of *p*H value. This implies a durability conditioned in a measure upon the strength of the alkali.

The successful application of redwood tanks to the wine, brewing and distilling industries is revealed by the large amount of redwood tankage in use for such purposes in America prior to 1920 and subsequent to 1933. The demand for redwood tankage following resumption of the liquor business of the country in 1933 was, and remains, very large. Practically all of the wine produced in California (in excess of 90 per cent. of the nation's output) is made and aged in redwood tanks ranging in capacity from a few hundred gallons to single large tanks holding as much as 50,000 gal. The preference of California wine producers for redwood tanks is not a matter of having the wood available locally. In the history of the liquor industry only three woods have had extensive use, *viz.*, oak, redwood and chestnut, and all three are high in tannin content as appears to be requisite for the proper ageing of vinous or distilled liquors.

Resistance to Change of Shape

The brewing industry prefers redwood tanks for their resistance to change of shape and consequent tightness. Where pressure tanks are employed in brewing, the use of redwood assures maximum retention of carbon dioxide gas and in the ageing cellar the high insulating value of redwood yields, because of ease of temperature control, a more uniform and better-balanced brew. The brewer concerned with the long-time reputation of his product knows there is no substitute for "aged in the wood" and all features considered there is available for the brewer no better wood than redwood for fermenting, pressure or storage tanks. For the distilling industry there is no superior to redwood for large or small fermenting tanks. In fact, because of high insulating value and resistance to change of shape even when alternately wet and dry, redwood fermenting tanks of large dimension are unequalled in control of the finished product.

Where acids, fruit juices or extracts require paraffin-impregnated wood, redwood is particularly well adapted because of its capacity to absorb paraffin. Used in this manner, redwood tanks require less attention than other woods because the paraffin does not affect the natural capacity of the wood to resist shrinkage, warping or change of shape. Natural redwood, like cypress, is free from undue tendency to impart taste to solutions in contact therewith.

The almost total use of redwood tanks for storing "sour" oils (those containing corrosive amounts of hydrogen sulphide) in the great oil-fields of Texas, Oklahoma, Kansas and Arkansas is adequate testimony of the class of oil tank produced from redwood. In fact, redwood is the standard wood for oil storage. Its resistance to warping, shrinkage, etc., is specially valuable for oil tank purposes.

Combination of Desirable Qualities

California redwood for tank purposes is aptly described in the introduction to Bulletin No. 305 of the United States Department of Agriculture, "The Strength and Related Properties of Redwood," in the following words: "Redwood is one of the important woods of the United States. The combination of desirable qualities, including relatively high mechanical properties, medium weight, low shrinkage, ease of working and high resistance to decay, enables redwood to meet the requirements of many special as well as ordinary uses, thus giving it a high utility value."

It would be difficult to state more concisely the advantages of redwood from the standpoint of either tank manufacturer or buyer. For tank purposes redwood is available in a perfection of grading that cannot be duplicated in any other species. This high standard is the result of the normal growth and characteristics of the tree. The redwood, as found in the virgin stands, is one of the largest trees of the world. It is long lived, reaching an age of 1,300 years or more, and commonly attains a diameter of 5 to 10 feet, and a height of over 250 feet. Because of its great size, the tree yields a high percentage of clear lumber. The last sentence is significant and points to the reason for the availability of a range of dense clear redwood lumber in widths and thicknesses that enable tank manufacturers in all parts of the country to furnish structures of prime quality as gauged by the most rigid standards.

Producers of redwood lumber are alert to the advantage of supplying to tank manufacturers stock specially graded and adapted to the rigid requirements of tank manufacture. Tank stock is specially selected in the clear heart classification, observance being made of density, texture and physical characteristics to assure satisfaction for the class of tank service for which the wood is intended. For pressure tank work in breweries and for chemical plants an ultra selection is made and effort put forth to secure the utmost in dense highest-quality stock free from defects.

New Dyestuffs

A Direct Cotton Colour

CHLORAZOL FAST BLUE 2RKS is now a direct cotton dyestuff, introduced by Imperial Chemical Industries, Ltd. It is capable of application to all forms of cotton and viscose materials. On account of its bright shade, which possesses very good fastness to light, this product will be of value where these properties are of primary consideration. It may be used in the dyeing of cotton-wool union when the animal fibre is only slightly stained. Possessing good solubility and level dyeing properties, this dyestuff can be used in all types of circulating machines. It may be used for the direct printing of cotton and viscose and also for the dyeing of ground shades for subsequent discharging with Formosul; the presence of alkali in the discharge pastes giving improved results. This product has good affinity for weighted and unweighted silk when dyed from a dyebath broken with formic acid, and yields bright blue shades of very good light fastness. It possesses very good affinity for the cotton fibre, being absorbed at a regular rate as the temperature is raised. Maximum exhaustion is obtained when dyeing is carried out at 175° F. (80° C.), finally allowing to cool to 140° F. (60° C.).

Bright Yellow Shades on Acetate Silk

DISPERSOL FAST YELLOW 2G150 Powder, another I.C.I product, yields bright yellow shades on acetate silk, which possess very good fastness to light. It is exceedingly suitable for use in combination with other dyestuffs for producing fast to light mode shades and, in conjunction with Duranol Blue GS, gives green shades possessing this important property. In addition, this product possesses excellent resistance to burnt gas fumes, and very good fastness to water, acids, alkalis and perspiration. It is suitable for the dyeing of all forms of acetate silk materials and can be used with other dyestuffs for the production of solid shades on mixed goods by the one bath process, being unaffected by the presence in the dyebath of acids, alkalis, salt, etc. Dispersol Fast Yellow 2G150 Powder possesses excellent affinity for the acetate silk fibre and may be dyed without addition. The addition of soap or Turkey Red Oil retards only very slightly the speed of dyeing.

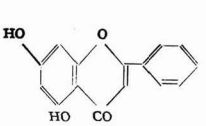
Yellow with Good Fastness

CHLORAZOL DIAZO YELLOW 2GS, also introduced by I.C.I., can be developed with Developer Z to give pure shades of yellow which possess unusually good fastness properties, particularly with regard to washing and light. In addition, the fastness to cross-dyeing, perspiration and hot pressing may be described as very good. It is of value for the production of clear yellow shades on all types of cotton, viscose and natural silk materials, and its dyeing properties are such that it can be used in all types of dyeing machines. It is also suitable for application to tin-weighted silk and may be dyed from a neutral dyebath. Chlorazol Diazo Yellow 2GS is also of importance for the production of solid shades on cotton and natural silk union materials. Dyed ground shades on cotton, viscose and natural silk can be used for white discharge effects, the colour being discharged to a good white with Formosul. Dyeings developed with beta-naphthol yield reddish-orange shades with less general fastness. Chlorazol Diazo Yellow 2GS possesses excellent affinity for the cotton fibre and is extremely level-dyeing. During the dyeing process the colour is absorbed at a uniform rate and maximum exhaustion is obtained when the temperature of the dyebath is 160-195° F. (70-90° C.).

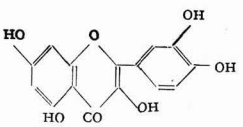
Natural Colouring Matters

Dr. J. D. Johnson Reviews Their Characteristics

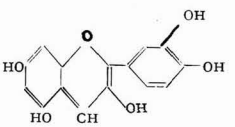
WITH a few outstanding exceptions, the majority of natural colouring matters have been found to fall into five classes, flavones, flavonols, anthocyanins, carotinoids and porphyrin pigments, said Dr. J. D. Johnson in a paper read before the Liverpool Section of the Institute of Chemistry on March 14. The more important substances which do not fall under any of these headings are the dyestuffs indigo, brazilin and hæmatoxylin. With the first-mentioned all are familiar, but to the average chemist hæmatoxylin is a name associated with staining operations in related sciences. Interesting as has been the study of brazilin and hæmatoxylin, they have not been the centre of such interest as has been aroused in connection with the groups of substances given above.



Flavone.

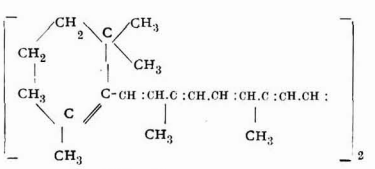


Flavonol.



Anthocyanidin.

The flavones and flavonols were examined by A. G. Perkin, to whom our knowledge gained from the analytical side is primarily due; von Kostanecki approached the subject from the synthetical angle and placed it in a sound position. Nevertheless, there were certain flavones and flavonols which could not be prepared by any of von Kostanecki's methods, but these are much more conveniently prepared by processes


β-Carotin.

elaborated by Robinson and his colleagues. The distribution of flavones and flavonols is wide; flavone itself has been observed in the form of a "bloom" or "meal" on the flowers or stems of *Primula pulverulenta;* other substances of the group are present in the flowers, leaves, buds, stems and roots of various plants. Of their origin we know little or nothing. It is possible that they are formed from, or converted into the anthocyanidins with which they show structural similarities.

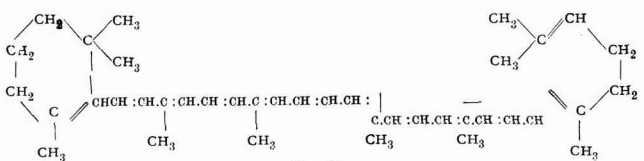
The anthocyanins rarely occur in the free state; in the few cases where their isolation has been reported, it is most probable that hydrolysis of an anthocyanin has taken place during extraction. The anthocyanins are partially responsible for the blues, violets, mauves, pinks and reds of flowers; they are glucosides from which the sugar molecule is readily displaced leading to anthocyanidins. Both anthocyanins and anthocyanidins are salts of oxonium oxygen and their colour is dependent not only upon their structure but also upon the hydrogen ion concentration of the solution. Robinson has shown how the position of the hydroxyl groups in the molecule may be determined from the behaviour of the colouring matter towards alkali and ferric chloride.

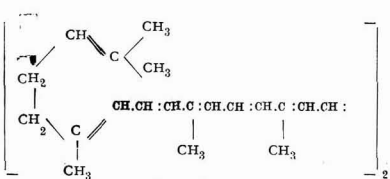
Related to the anthocyanidins is a pigment called *carajurin*, which is the essential colouring matter present in *carajura* used for face adornment by certain South American tribes. This has been converted into scutellareinidin chloride, a synthetic anthocyanidin, by simple reactions.

Carotin, treated as a chemical curiosity until its possible identity with vitamin A was mooted, has become a centre of activity. It is a hydrocarbon, the colour of which is due to a system of conjugated ethylenic linkages; it has been shown to be a condensed isoprene derivative. Actually, the pigment as ordinarily isolated is a mixture of α-, β- and γ-carotins, the latter being present in but small amount. Carotin is optically active, differing in this respect from its two isomers. Closely related to carotin is lycopin, the chief colouring matter of the tomato, and it has been shown that β- and γ-carotin and lycopin form a graded series

Only β- and γ-carotins possess vitamin A activity which is connected with the presence of the β-ionone skeleton which they possess. Bixin, crocetin and physalin are other interesting members of the group of carotinoids, the first two being acids and the last-mentioned an ester.

The porphyrin pigments have received close attention at the hands of Hans Fischer and his school. The most important members are chlorophyll and hæmin, and Fischer has been able to show that the molecular skeletons of these two substances are essentially the same. Willstätter's analytical work on chlorophyll and Nencki and Küster's work on hæmin have been supplemented and the problem attacked from the synthetical angle. Degradation products of chlorophyll, such as phytol, phyllo-, pyrro- and rhodo-porphyrine, as well as phylloerythrin, have been synthesised and as the latter especially is closely related to chlorophyll it is but one


γ-Carotin.


Lycopin.

short step, though apparently not an easy one, to the synthesis of chlorophyll itself. About the details of the chlorophyll molecule there is still some doubt, but hæmin has been completely synthesised.

SELF-ALIGNING single- and double-row spherical roller bearings are described in a booklet (List No. 1339a) which has just been issued by the Fischer Bearings Co. The importance of load ratings is stressed and tables are given showing data for different types of bearings when in use.

New Technical Books

PROGRESS OF CHEMICAL APPARATUS (Fortschritte des chemischen Apparatewesens). Electric Furnaces, Part II. Edited by Adolf Bräuer and Josef Reitstötter. Leipzig: Akademische Verlagsgesellschaft m.b.H.

The review of Part I of "Electric Furnaces" spoke in praise of the great service which the editors, Bräuer and Reitstötter, had performed in undertaking to publish a collection of the patents concerning electric furnaces. Part II of this work on progress confirms once more the great value of this monograph. At a time when the construction of electrically-heated kilns is continually increasing, the value of this literary collection must also increase incessantly. Part II includes induction furnaces and cathode radiation and electric discharge furnaces, and then goes on to the second principal part of the whole work, "mechanical constructional features."

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MANUAL OF CHEMICAL-TECHNICAL APPARATUS, MECHANICAL CONTRIVANCES AND MATERIALS (Handbuch der chemisch-technischen Apparate, maschinellen Hilfsmittel und Werkstoffe). By Dr. A. J. Kieser. Leipzig: Otto Spamer Verlag, G.m.b.H.

Dr. Kieser founded, more than 20 years ago, the first paper for "chemical apparatus." The success of this periodical, the increasing importance of questions of apparatus for the chemical industry, and the treatment of separate questions of industrial chemistry in monographs, induced Kieser to start a collection of all the questions on apparatus. The work appears in single parts as an encyclopædic work of reference for chemists and engineers, and now the first volume is ready (Ab-Fi), so that a preliminary general survey is possible. The new "Manual" gives a wide survey of chemical heavy apparatus and mechanical contrivances for chemical technique. All purely laboratory apparatus is excluded. In corresponding importance to the question, materials and corrosions are dealt with very thoroughly. Kieser thereby intends his work to be for the information and reference of those interested in this special field. He tries to hold the mean between purely scientific knowledge of apparatus and practical questions of the day. Physical-theoretical considerations find due space without, however, diminishing the clearness of arrangement. Numerous references to literature enhance the value of the work. Although Dr. Kieser has ten collaborators for this comprehensive work, the first volume can be considered as a complete unity.

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VARNISH MAKING. By T. Hedley Barry, F.I.C., and G. W. Dunster. pp. 132. Leonard Hill, Ltd. 10s. 6d. net.

Varnish making as an art rather than a science has been reasonably well documented; of varnish making as a science authors have rather fought shy. The latest addition to the Modern Chemical Industries series, however, proves that a literary compromise, at any rate, need not necessarily fall between two stools. It is a compact volume, devoid of fancy trimmings, and the authors have tackled their subject in a plain work-a-day style. In view of their rather diverse qualifications (one of them is a well-known consultant, and the other a varnish maker and one-time lecturer) it might have been expected to be able to detect some little nonconformity of style and theory. The book, however, is in such a homogenous style and follows such an orderly arrangement that it is difficult for the reviewer to apportion the praise for the much of which he approves, or the blame for the little with which he is inclined to differ. The man who has made varnishes every day for 15 or 20 years may think he has little to learn from this or any other text-book. In this he is wrong, for the business of writing involves a degree of orderly thinking that is not within every man's power. Even the man who "knows it all" will benefit by having his knowledge put into sound logical order, and those who do admit they do not know it all (and many of them are far from beginners) will welcome a sound little book, which sets out the principles of efficient varnish making on rational lines. It has a chapter on each of the important raw materials, is really up to date in its comments on plant and equipment, and contains, besides, an invaluable supplement on varnish analysis and a comprehensive bibliography.

THE IMPORTANCE OF INDUSTRIAL CHEMISTRY IN THE WORLD-PICTURE AND RECOLLECTIONS OF ITS DEVELOPMENT (Die industrielle Chemie in ihrer Bedeutung im Weltbild und Erinnerungen an ihren Aufbau). By Prof. Dr. Dr.-Ing. e.h. Albrecht Schmidt, Berlin: Walter de Gruyter and Co.

When a septuagenarian brings out a long book of over 800 pages, and when the book is a consistent creation in the wildest sense of the word, such a collection of personal experience deserves special regard. But that regard must increase to admiration when one sees in this work the ripe experience of decades of work combined with the élan and optimism of youth. From the eminence of his years the author sees the connection of industrial chemistry with pure science, the development of research and its beneficial influence on the chemical industry. Thus, he forms a "Weltbild" of the chemical industry. Schmidt intentionally refrains from writing a text-book; he does not wish to publish an "Encyclopædia of Chemical Technology," therefore he recommends and quotes Fr. Ullmann, of Geneva. In a way worthy of our grateful thanks he has given the reader the experiences of a rich life. It is refreshingly subjective, characteristic of an independent creative mind. Only from his great eminence could he succeed in mastering the many-sided field of chemical technique, to-day scarcely to be visualised in detail, and making a survey of industrial world-chemistry in the form of a "Weltbild." For all those interested in wide relationships and surveys, Schmidt's book is very worth while reading.

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THE DESIGN AND CONSTRUCTION OF HIGH PRESSURE CHEMICAL PLANT. By Harold Tongue, A.M.I.Mech.E., A.M.I.Chem.E. pp. 420. Chapman and Hall, Ltd. 30s. net.

One of the most important developments of industrial chemistry of recent years has been the rapidly increasing use of high pressure in the manufacture of many vital products. Outstanding examples are the synthesis of ammonia and methyl alcohol, and the hydrogenation of coal and crude oil. The employment of pressures from 200 to 1,000 atmospheres (frequently accompanied by high operating temperatures) has necessarily developed a new metallurgical and mechanical technique; in addition, the operating conditions of many high-pressure processes demand large forgings in special steels and alloys capable of resisting high stress at elevated temperature, together with resistance to corrosion and attack by gases such as hydrogen. The object of this book is to describe the principles of design and construction of such high-pressure equipment, based upon the author's wide experience of the subject at the Chemical Research Laboratory, Teddington. A special feature is the large number of drawings and illustrations of satisfactory designs of both laboratory and manufacturing scale installations. To illustrate the fundamental principles of design the author supplements his own experience with extensive references to many other practical examples kindly supplied by many large chemical organisations and steelmakers. Much of this information is now published for the first time. Considered generally, the book deals with the pressure range above that at which riveted construction is permissible, and therefore attention is mainly directed (in so far as the design and manufacture of pressure vessels is concerned) to the technique of hollow forging and fabrication by welding. The Board of Trade Regulations dealing with welded seams in this country are discussed, and suggestions made for the possibility of their review in the light of considerable success abroad with really high-pressure plant of welded construction.

REYNOLDS AND BRANSON, LTD., have issued a catalogue of chemical products, including technical chemicals and analytical reagents. In the latter section the limits of the principal impurities are given under each item. These standards give the impurities which may be present and the maximum percentage allowed. Included in the catalogue are details of volumetric and test solutions, aniline dyes, microscopical stains and reagents, *p*H indicators and comparators.

The Chemical Age Lawn Tennis Tournament

Arrangements for 1935: Early Entries Invited

LAWN tennis players throughout the chemical industry are invited to apply during the next few days for entry forms for the fifth annual CHEMICAL AGE Lawn Tennis Tournament, which will be conducted on the same lines as those which have proved so successful during the past four years. The tournament, which will open in May and continue through the summer months, is open to all men engaged in the chemical industry either as principals or members of staffs throughout Great Britain, and will comprise singles and doubles, the latter being open to members of the same, or associated, firms.

THE CHEMICAL AGE Silver Challenge Cups, one for the singles and one for the doubles, will be awarded, to be held jointly for twelve months by the winners and the firms they represent, and there will also be, as in previous years, smaller trophies to be presented outright to the successful players and the runners-up, particulars of which will be published later in the season.

How to Enter

The last day for receiving entries for the 1935 tournament is Monday, April 29, and intending competitors are urged to read the simple rules appended and to apply by telephone, post or in person for entry forms without delay to The Editor, THE CHEMICAL AGE, Bouverie House, Fleet Street, E.C.4.

The singles cup is at present held by A. Baxter (United Yeast Co., Ltd., London), who was also one of the runners-up in the doubles last September, and the doubles cup is held by F. G. Hawley and J. Haines (Anglo-Persian Oil Co., Ltd., London), who have won it for the past two years in succession.

In previous years the majority of the entries have come from the London area, but a cordial welcome is extended to players in the provinces, for whose benefit efforts will be made as far as practicable to arrange for early round matches to be played as near home as possible.

The rules governing the tournament are printed below. As soon as possible after April 29 competitors will be notified as to the result of the draw and the final date for playing off the first round matches. The first player or players drawn usually suggest(s) immediately to his or their opponent(s) a convenient date and place for the match, and upon completion of the event the result, signed by all players (winners and losers), is posted by the winners in time to reach the offices of THE CHEMICAL AGE by the closing date which will be announced at the time of the draw. In the case of any dispute arising between players the decision of the Editor of THE CHEMICAL AGE is taken as final. The Editor also has the right to scratch any players who do not play off their matches by the stipulated dates or who fail to conform to the rules of the tournament. There is no entrance fee, but it is understood that the players pay all their own travelling expenses, etc., in connection with the matches.

Rules of the Tournament

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.

2. Each pair in the Doubles Tournament must be members of the same, or an associated, firm.

3. The Challenge Cups shall be competed for annually on cou ts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cups shall make arrangements for their safe custody and insurance.

4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches, except in the Final of the Singles, when the best of five sets shall be played.

5. Entries shall be made not later than April 29, 1935, and addressed:

"Lawn Tennis Tournament,"
"The Chemical Age,"
Bouverie House,
Fleet Street, London, E.C.4.

6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.

7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.

8. Except in the case of the finals, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.

9. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers), immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.

10. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the other's appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.

11. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.

12. While competitors will decide as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on courts selected by the Editor of THE CHEMICAL AGE.

British Standard Pump Tests

A New Specification Issued

THE British Standards Institution has published a British Standard Specification for pump tests designed to cover the determination of the performance and efficiency of pumps when handling clean water at temperatures up to 85° F. The specification has been based on the standard pump test code of the Standards Association of Australia and, whilst at the moment there are differences between the two documents made to conform with present-day British practice, it is hoped that in due course the two may be brought into line. The specification sets out the mechanical and hydraulic conditions to be observed and precautions to be taken during a test.

The measurement of a pump discharge, *i.e.*, the rate of flow, is treated at length and the following methods are dealt with in detail: Volumetric, vee notch weirs, rectangular weirs ("suppressed" and "fully contracted"), venturi meters, flow nozzles, orifice gauges and pitot tubes. In each case, formulæ for the calculation of the discharge are stated, also the methods to be employed and precautions to be taken to ensure accuracy are laid down. Further, the limits within which the formulæ can be relied upon for accurate results are definitely specified, as are also the limits of accuracy in each case. The measurement of "head" is dealt with at length and comments are made on the use of gauges in the determination of this.

The specification also deals with the measurement of the power input to, and the efficiency of, a pump. Finally, the tolerances allowed on test results are specified. Tables giving the discharge over 90-degree and half 90-degree vee notches are included. In arriving at the formulæ for discharge, especially the weir formulæ, consideration has been given to the experimental work and recommendations of Barr, Barnes, Burnell, Rehboch and many others. Further, the views of authorities on the question in all parts of the world have been specially obtained and correlated. As a result of this work it has been found possible to recommend formulæ which, within the limits clearly stated in each case, give results of a high order of accuracy. Appendices have been included outlining the information which should be supplied to makers with inquiries or orders and giving a suggested standard form of pump test sheet which incorporates all the information usually required. A table of water densities at various temperatures is also included for the convenience of users, together with notes on centrifugal pump characteristic curves. Copies of this specification (No. 599-1935) can be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d., post free

Continental Chemical Notes

Czecho-Slovakia

POTASH SALTS FOR FERTILISATION PURPOSES are being imported from Russia on a relatively small scale, the 1934 figure (according to " Chemische Industrie ") being only 12,000 tons.

France

A FULL RANGE OF ESTERS OF PROPIONIC ACID suitable as cellulose ester solvents are now being produced on the technical scale by the firm of Lambiotte Frères of Premery (Nièvre). They include methyl propionate (b.p. 78° C.), ethyl propionate (b.p. 90-100° C.) and isobutyl propionate (b.p. 135-157° C.). With the high flash point of 42° C., the latter compares favourably with amyl acetate (flash point 28° C.). Mesityl oxide, b.p. 128-138° C., is another excellent solvent for nitrocellulose also manufactured by the same concern and described as having a pleasant ethereal odour. In the past, mesityl oxide has made little headway in the lacquer industry on account of the unpleasant odour of the commercially available material ("Revue des Produits Chimiques," February 28).

Germany

RAYON MANUFACTURE, utilising German pine wood as raw material, will be commenced this year at Cossel by a new company in which an interest is held by Vereinigte Glanzstoff-Fabriken.

THE PIONEER GERMAN PRODUCER of a black pigment from acetylene by the explosion process (Hostmann-Steinburg'sche Farbenfabriken, in Celle) has transferred its acetylene-black production to a new concern, Deutsche Anacarbon G.m.b.H., with headquarters at Hanover.

POLYVINYL ACETATE IS NOW USED on a comparatively large scale as the intermediate layer in safety glass manufacture in a recently-constructed factory, the layout of which is described in " Metallbörse," March 20. In contrast to safety glass manufacturing processes in which the sandwich material is applied in the form of a previously manufactured foil, the new process applies a solution of the polyvinyl acetate to each of the two glass surfaces which are to be united. Polyvinyl acetate solution is distributed on to the cleaned glass surfaces through a pouring machine with a slit-like orifice, the coated glass sheets then travelling through a well-heated airtight drying chamber about 30 metres long (from which solvent is ultimately recovered). This stage occupies several hours, slow evaporation of the solvent being essential to avoid bubble formation. Before bringing the coated surfaces together, the glass sheets are subjected to a final drying operation in a vacuum in order to eliminate solvent traces as far as possible. The final union of the coated faces is carried out in hydraulic presses, this operation being facilitated by moistening the vinyl acetate-coated faces with a plasticiser. This type of safety glass offers the advantage of not requiring edge-sealing.

Russia

AN AMMONIACAL SOLUTION OF THE COPPER SALTS of naphthenic acids is the declared basis of a new wood and textile preservative production of which to the extent of 2,000 tons per annum is announced to commence at Baku.

A NEW PROCESS FOR MOTH-PROOFING FABRICS, recently developed at the Research Institute of the Textile Industry, is stated to increase the cost of material by 0.02 rouble per metre. During the current year the Moscow Wool Trust proposes to turn out five million metres of the moth-proofed cloth.

LARGE DEPOSITS OF TITANIUM ORES with a titanium oxide content of 10 per cent. are reported to have been located in Berg Jukspor. The Apatit Trust contemplates building a factory with an annual capacity of 12,000 tons titanium concentrate.

A CHEMICAL COMBINATE IS BEING PLANNED on the Eastern coast of the Caspian Sea, where natural sulphates will be utilised as raw material for the manufacture of sulphur, caustic soda, sodium sulphate, etc.

SYNTHETIC RUBBER continues to engage the attention of the chemical industry. A bichromate unit with a daily capacity of 800 kilograms recently commenced production at Erivan and a second unit is expected to be working at the end of the year. This plant is described as the starting-point for the synthetic rubber combinate at Erivan. A figure of 5,000 tons is mentioned as the estimated output of synthetic rubber in all Russian factories in the first quarter of 1935 ("Chemische Industrie").

Finland

THE CONSTRUCTION OF A LARGE LIQUID CHLORINE PLANT at Abo is reported to be under consideration. At present, Finland possesses two liquid chlorine factories the output of which is by no means adequate to the requirements of the paper and cellulose industries.

Italy

STATISTICS OF THE MINISTRY OF CORPORATIONS, quoted in " Chemische Industrie," 125,000 tons of copper sulphate were produced last year in 16 factories as compared with 106,000 tons in 1933, 100,000 tons in 1932 and 77,000 tons in 1931. Notwithstanding the increased production, imports increased from 2,300 tons in 1933 to close on 5,000 tons in 1934, while exports declined in the same period from 5,700 tons to 4,700 tons.

THE OUTPUT OF CRUDE SULPHUR in 1934 is given as 345,500 tons as against 376,600 tons in 1933 and 350,000 tons in 1932. Exports remained steady at 219,000 tons (221,000 tons in 1933) but the value declined from 84.43 million lire to 62.23 million lire.

Imperial Chemical Industries, Ltd.

Increased Final Dividend for 1934

THE directors of Imperial Chemical Industries, Ltd., announce that the gross income for the year 1934 amounts to £7,965,038 and after allocating £1,000,000 to central obsolescence and depreciation fund and providing £615,931 for the company's income tax, the net income for the year amounts to £6,349,107, as against £6,001,605 for 1933, or an increase on 1933 of £347,502.

With the balance brought forward from 1933 of £566,139, the total balance available is £6,915,246. After providing £1,588,897 for the dividend on the preference shares and £1,093,916 equivalent to 2½ per cent. interim dividend on the ordinary shares, paid on November 1, 1934, the directors have appropriated £1,000,000 to general reserve and have decided to recommend a final dividend on the ordinary shares of 5½ per cent. (actual) making 8 per cent. for the year against 7½ per cent. in 1933, and a dividend on the deferred shares of 2 per cent. (actual), both less income tax at the standard rate in force for 1935/36 (reduced by relief in respect of Dominion Income Tax at the rate of 5d. in the £). These dividends will absorb a total of £5,306,795 and leave a balance of £608,451 to be carried forward to 1935

The final dividend on the ordinary shares and the dividend on the deferred shares will be payable on June 1, to the shareholders on the register of members at April 13. For the purpose of the payment of these dividends, transfers must be lodged at the company's registered office not later than April 12.

The directors have decided to submit to the shareholders proposals for the simplification of the capital structure of the company, by the amalgamation of the two classes of ordinary shares and deferred shares into one class of ordinary shares, on the basis of four fully-paid deferred shares of 10s. each being converted into one fully-paid ordinary share of £1 each, with effect from January 1, 1935.

These proposals, which will require the sanction of the shareholders as a whole, of respective class meetings of the ordinary and deferred shareholders, and of the High Court will be considered at an extraordinary general meeting of the company and at class meetings of the ordinary and deferred shareholders respectively, to be held following the annual general meeting, which will take place at the Central Hall, Westminster, on Wednesday, May 1, at 10.30 a.m. The eighth annual report of the directors and a circular letter containing full details of the board's proposals, with the necessary notices and resolutions, will be posted to the shareholders on Saturday, April 6.

News from the Allied Industries

Non-Ferrous Metals

THE APPARENT WORLD CONSUMPTION of tin in January, 1935, was 9,729 tons, compared with 9,361 tons in December, 1934, and 8,554 tons in January, 1934. The apparent consumption in the United Kingdom was 1,617 tons, against 1,667 tons in January, 1934. World production of tinplate in January, 1935, amounted to 235,000 tons, compared with 192,000 tons in December last, and with 207,000 tons in January, 1934.

Rubber

SHIPMENTS OF CRUDE RUBBER in 1934 from producing countries exceeded all previous records, amounting to about 1,010,000 long tons, compared with 846,000 tons in 1933—an increase of 19 per cent. The previous high record—860,000 long tons—was established in 1929.

Glass

THE BRITISH GLASS INDUSTRY will hold its fourth convention at Folkestone from May 16 to 18. Mr. Geoffrey L. Pilkington will preside, and there will be addresses and discussions on design in the glass industry, uniformity and quality of products, planning, and the commercial importance of furnace design. At official luncheons the chief guests will be Sir Harry McGowan (chairman of Imperial Chemical Industries), and Lord Eustace Percy.

Oil Seeds

THE BRITISH OIL AND CAKE MILLS, LTD., held their 37th ordinary general meeting on March 26, at Winchester House, Old Broad Street, London. Mr. John W. Pearson, the chairman and managing director, who presided, said that the new mill at Silvertown was rapidly approaching completion, and would be in full operation for next season. It had also been decided to extend the compound food side of the business in Glasgow, and they were now engaged in erecting a new factory on the Clyde.

Paint and Varnish

THE INTERNATIONAL PAINT AND COMPOSITIONS CO. improved its position during 1934, the net profit rising from £91,209 to £102,435. The final dividend on the ordinary shares is 7 per cent., making 10 per cent. for the year, or one per cent. more than for 1933. It is proposed to increase the amount written off the Standard Paint item from £5,000 to £10,000, but the other appropriations are the same as a year ago, namely, £20,000 to reserve, £3,000 to development fund and £3,000 to staff benefit fund. The carry forward at £17,179 is rather higher. The Standard Paint item on the assets side of the balance sheet has now been written down to £9,000. General reserve will stand at £190,000.

Artificial Silk

RAYON PRODUCTION in the United States in 1934 established a new high of 210,331,000 pounds, an increase of about 1 per cent. over the 1933 output of 208,511,000 lb. Imports of rayon for consumption fell from 934,000 lb. in 1933 to a new low of 77,000 lb. in 1934. In contrast, exports totalling 2,509,000 lb. in 1934 were about 11 times the 1929 exportation of 223,000 lb. and more than double the 1933 exports of 1,110,000 lb. The principal foreign purchasers of these yarns in 1934, in the order named, were Mexico, Cuba, Australia, Colombia, and Canada, all of which took substantially larger quantities than in 1933.

THE BRITISH ENKA ARTIFICIAL SILK CO. increased its output last year by about 12 per cent. and sales were in excess of production, but the financial results are said to be disappointing. Working profits have risen from £65,118 to £76,748, but net earnings are no more than £1,205, compared with £2,038 for the previous year. As a result of the year's operations, the debit balance is reduced from £567,949 to £566,744. Plant has been increased, and improvements in method of manufacture have been introduced with a view to off-setting price cuts, the full benefit of which will be felt in the current year.

Iron and Steel

DR. E. LESLIE BURGIN, speaking in the House of Commons, on March 25, stated that he understood that negotiations have been proceeding between the British Iron and Steel Federation and the International Steel Cartel regarding the possibility of an agreement on various matters It is hoped that these negotiations will be reopened at an early date.

Plaster Board

BRITISH PLASTER BOARD, LTD., held an extraordinary meeting in Liverpool, on March 22, when resolutions increasing the capital from £250,000 to £500,000, by the creation of 1,000,000 new shares of 5s. each, were carried unanimously. The additional capital is required for the acquisition, through an exchange of shares, of the Gotham Co., Ltd. The Gotham Co., from its mines and quarries, obtained every variety of gypsum known to commerce in this country. The fusion was calculated to secure the utmost economy.

Smokeless Fuel

A COMPANY IS BEING FORMED to finance the erection of a £400,000 plant at Garnkirk, Lanarkshire, for the production of smokeless fuel, carbolic acid, various oils and gas as by-products. The plant will have an annual output of 130,000 tons of smokeless fuel and 315,000,000 cu. ft. of by-product gas. The scheme has been submitted to Sir Arthur Rose, Special Areas Commissioner for Scotland, and the Scottish National Development Council, and it is hoped that when the gas grid is established provision will be made for the acceptance of the by-product gas.

China Clay

THE CHINA CLAY TRADE BAROMETER has not only dropped heavily in comparison with the preceding month of January, but also when compared with February, 1934. The shipments for February are: Fowey—27,011 tons china clay; 1,903 tons china stone; 761 tons ball clay. Par—8,219 tons china clay; 678 tons china stone. Charlestown—3,286 tons china clay. Padstow—542 tons china clay. Plymouth—158 tons china clay. Newham—92 tons china clay. By rail throughout—5,186 tons china clay, making a total of 47,836 tons, against 51,271 tons in the corresponding period of 1934.

Far Eastern Chemical Notes

China

SEVERAL NATURAL SOURCES OF SODIUM CARBONATE exist in China. The Western Soda Lake (Hsichienhu), about 100 miles west of Ochi, yields annually about 42,000 piculs, the Eastern Soda Lake (Tungchienhy), 100 miles east of Ochi, about 30,000 piculs and the Hangkai Soda Lake about 20,000 piculs.

Japan

GLYCERINE MANUFACTURE IN JAPAN is in the hands of nine producers with headquarters in Tokio and Osaka. In October last a common sales organisation was formed.

THE JAPANESE PRODUCTION OF CRUDE CAMPHOR during the year 1933-34 was 736,000 kg.; camphor oil, 1,200,000 kg. The industry is said to be represented by no fewer than 1,500 manufacturers.

Manchuria

WITH A CAPITAL OF 1,000,000 YEN, a new vegetable oil extracting concern has been registered under the style of Mandschu Shokubutsuyu K.K. Its objects are the extraction and processing of perilla oil, castor oil and soya bean oil. An anticipated output of 500 tons castor oil and 12,000 tons perilla oil is mentioned for the current year and an increase of capital to 3,000,000 yen is said to be impending.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals, essential oils and intermediates. In the coal tar products section the price of creosote, B.S.I. specification, has been advanced by a farthing per gal., and pyridine has been reduced from 6s. 6d./8s. 6d. to 6s./8s. 6d. per gal. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—The general demand for chemicals in the London market continues steady, with prices firm. Prices of coal tar products are unchanged from last week.

MANCHESTER.—Trading activity in most sections of the Manchester market for chemical products during the past week has been no more than moderate. A few replacement contracts for fair quantities of heavy materialsh ave been reported, with deliveries extending over the next three to six months in most instances. As before, however, the bulk of the new business that has been booked has been in respect of relatively small quantities for near delivery dates, with the leading alkalies and heavy acids and certain of the potash materials prominent. Deliveries of textile chemicals this week have been barely maintained, and there is little indication of any early improvement with regard either to the cotton or woollen branches. Quotations are generally steady. Among the by-products carbolic and creosote are the most active sections; pitch is quiet and easy and no more than a quiet business has been put through in refined tar, whilst the light products are mostly quiet.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 2½%. MANCHESTER: 11¾d. to 1s.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 10s., ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 10s.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. for delivery up to June 30.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £37 to £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £37.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 10½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10½d. to 10¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¾d. ex store. MANCHESTER: Yellow, 8¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £22. SCOTLAND: £20.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per 10. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND; English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p CRESOL 34-5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3ss. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.: 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

AMYL ACETATE, TECHNICAL,—95s. to 110s. per cwt.

CHARCOAL.—£5 15s. to £10 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 4s. per gal.

WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4¾d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. to 8s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 1d. to 2s. 2d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Mar., £7 3s. 9d. per ton; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.

NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, March 27.—LINSEED OIL was stead. Spot, £22 15s. (small quantities); April, £20 2s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec., £21 2s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), March-April shipment, £22 10s. per ton. RAPE OIL was slow. Crude, extracted, £32; technical, refined, £33 10s., naked, ex wharf. COTTON OIL was steadier. Egyptian, crude, £25; refined common edible, £28 5s.; deodorised £30 5s., naked, ex mill (small lots 30s. extra). TURPENTINE was lower. American, spot, 48s. per cwt.

HULL.—LINSEED OIL, spot, quoted £20 15s. per ton; March, £20 5s.; April, £20 7s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec., £21. COTTON OIL.—Egyptian, crude, spot, £25; edible, refined, spot, £27 5s.; technical, spot, £27 5s.; deodorised, £29 5s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £19, naked. GROUNDNUT OIL, extracted, spot, £30 10s.; deodorised, £33 10s. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £24 10s.; deodorised, £27 10s. per ton. CASTOR OIL.—Pharmaceutical, 40s. 6d. per cwt.; first, 35s. 6d.; second, 32s. 6d. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. TURPENTINE, American, spot, 50s. per cwt.

Books Received

A German-English Dictionary for Chemists. By Austin M. Patterson. London: Chapman and Hall, Ltd. Pp. 411. 15s.

Crushers for Stone and Ore. By William T. W. Miller. London: Mining Publications, Ltd. Pp. 234. 15s.

Foods. By H. E. Cox (Reports of the Progress of Applied Chemistry, Vol. XIX, 1934). Cambridge: W. Heffer & Sons, Ltd. Pp 20.

The Composition of Fish Pastes. By H. E. Cox. (The Analyst, Vol. 60, No. 707). Pp. 6.

Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry. 1934. Vol. XIX. Pp. 836. 12s. 6d.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

(March 14 to 20 inclusive.)

PLASTIC COMPOSITIONS.—R. H. Abrey. 8537.

CAST ALUMINIUM MAGNESIUM ALLOYS.—Aluminium, Ltd. (United States, July 24, '34.) 8395.

OXIDISABLE ALLOYS, treatment.—Aluminium, Ltd. (United States, July 24, '34.) 8396.

ALUMINIUM BASE ALLOYS.—Aluminium, Ltd. (United States, Aug. 29, '34.) 8402.

RECOVERY OF NITRIC ACID in nitration of cellulose.—E. Berl. 8022.

PROTECTION OF IRON, ETC., against attack by solutions containing chloride.—E. Berl. 8023.

NITRATED AND STABILISED CELLULOSE NITRATES, manufacture.—E. Berl. 8709.

ACTIVE CARBONS.—E. Berl. 8710.

PRODUCING FAST TINTS on vegetable fibres.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 7931.

COLLOIDAL SOLUTIONS OF CELLULOSE, production.—J. W. Brown. (Australia, March 14, '34.) 7991.

ALLOYS.—A. F. Burgess. 8714.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—A. Carpmael. 8135.

MONOAZO DYESTUFFS, manufacture.—A. Carpmael. 8136.

VAT DYESTUFFS, manufacture.—A. Carpmael. 8444.

POLYMERISATION PRODUCTS from olefines, manufacture.—A. Carpmael. 8445.

UNSATURATED CHOLANIC ACIDS, ETC., manufacture.—A. Carpmael. 7949.

MERCAPTANS, ETC., production.—Chemical Reactions, Ltd. 8579.

PURE CRYSTALLISED ALKALOIDS OF ERGOT, manufacture.—Chemical Works, formerly Sandoz. (Germany, Oct. 1, '34.) 7972.

CHLORINATED RUBBER, stabilising.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, April 3, '34.) 7977.

SULPHUR CONDENSATION PRODUCTS, manufacture.—R. F. Goldstein and Imperial Chemical Industries, Ltd. 8417.

COPPER SILK, ETC., manufacture.—W. W. Groves. 8100, 8101.

AGENTS OF CAPILLARY ACTIVITY, manufacture.—W. W. Groves. 8102.

POLYMERISED VINYL COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, March 15, '34.) 8082.

AMMONIUM NITRATE, production.—I. G. Farbenindustrie. (Germany, March 28, '34.) 8131.

WAX EMULSIONS, manufacture.—J. Y. Johnson. 7933.

CARBON BLACK, manufacture.—J. Y. Johnson. 8372.

AMINOALKYL SULPHONES, manufacture.—J. Y. Johnson. 8373.

SULPHONE-ETHYLAMINES, manufacture.—J. Y Johnson. 8374.

N-VINYL COMPOUNDS, manufacture.—J. Y. Johnson. 8375.

COMPOUNDING LIQUID RUBBER LATEX.—A. T. B. Kell. 8288.

BITUMINOUS EMULSIONS, production.—F. V. Lister. 8428.

SOLID MAGNESIUM SULPHATE MONOHYDRATE, ETC., production.—Metallges. A.-G. (Germany, March 27, '34.) 8409.

VINYL-TYPE MONOHALIDES, treatment.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, March 19, '34.) 8603.

SYNTHESIS OF CHEMICAL ELEMENTS, process.—Neutron Soc. Anon. (Switzerland, Jan. 7.) 7970.

CARBONACEOUS MATERIALS, hydrogenation.—H. E. Potts. 8510.

HEAT TREATMENT OF GASEOUS, ETC., PRODUCTS from distillation of bituminous fuels.—F. H. Rogers. 8459.

BORIDES, manufacture.—Soc. d'Electro-Chimie d'Electro-Métallurgie et des Aciéries Electriques d'Ugine and J. L. Andrieux. (France, March 17, '34.) 8446.

ANDROSTERONES, ETC., production.—W. P. Williams. 8279.

PHENYL MERCURY NITRATES, manufacture.—W. P. Williams. 8734.

Complete Specifications Open to Public Inspection

KETENE AND ITS DERIVATIVES, preparation.—Consortium für Elektro-Chemische Industrie, Ges. Sept. 16, 1933. 22282/34.

MUSCONE, method of preparing.—Soc. Anon. M. Naef et Cie. Sept. 18, 1933. 26103/34.

CONVERSION PRODUCTS OF AZO DYESTUFFS, manufacture.—J. R. Geigy, A.-G. Sept. 15, 1933. 26189/34.

BLUE PIGMENT COLOURS, manufacture.—I. G. Farbenindustrie. Sept. 13, 1933. 26307/34.

AZO DYESTUFFS, manufacture.—Deutsche Hydrierwerke A.-G. Sept. 13, 1933. 26360/34.

TERTIARY AMINES of high molecular weight, manufacture and production.—I. G. Farbenindustrie. Sept. 16, 1933. 26429/34.

PLASTICISING WASTE RUBBER containing fibrous material.—E. Bemelmans. Sept. 15, 1933. 26494/34.

WATER-INSOLUBLE AZO DYESTUFFS on wool materials, manufacture.—I. G. Farbenindustrie. Sept. 16, 1933. 26674/34.

STABLE ALUMINIUM SALTS, manufacture.—I. G. Farbenindustrie. Sept. 16, 1933. 26675/34.

Specifications Accepted with Dates of Application

WATER-SOLUBLE MIXED QUINONE AZO DYESTUFFS, manufacture.—Deutsche Hydrierwerke A.-G. July 8, 1932. 425,302.

VAT DYE, manufacture.—Imperial Chemical Industries, Ltd., and E. Burgoine. Aug. 8, 1933. 425,472.

DISAZO DYESTUFFS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Sept. 6, 1933. 425,307.

SOLUBLE FERTILISERS from tricalcium phosphate, production.—Soc. Anon. Produits Chimiques and L. Bernard Engrais and G. Goormaghtigh. Sept. 11, 1933. 425,477.

PERYLENE, manufacture.—W. W. Groves (I. G. Farbenindustrie). Sept. 13, 1933. 425,363.

METALLIC SULPHIDES to recover sulphur therefrom, treatment.—I. R. McHaffie, D. Tyrer, and Imperial Chemical Industries, Ltd. Sept. 13, 1933. 425,364.

PYRITES and like sulphide ores to recover sulphur therefrom, treatment.—D. Tyrer and Imperial Chemical Industries, Ltd. Sept. 13, 1933. 425,365.

CONVERSION PRODUCTS from natural resins and derivatives thereof, process for the manufacture.—I. G. Farbenindustrie. Sept. 17, 1932. 425,366.

AZO DYESTUFFS containing copper in a complex form, process for the manufacture.—I. G. Farbenindustrie. Sept. 15, 1932. (Addition to 268,754.) 425,367.

DELUSTRING of textile materials.—I. G. Farbenindustrie. Sept. 20, 1932. 425,418.

ACETALDEHYDE, manufacture.—H. Dreyfus. Sept. 18, 1933. 425,550.

AMINES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Sept. 18, 1933. 425,486.

From Week to Week

THE IMPORT DUTIES ADVISORY COMMITTEE has decided not to make any recommendation in connection with the recent application for the addition to the free list of crude ozokerite.

ARTHUR GUINNESS, SON, AND CO., LTD., have made a donation to the South Eastern Agricultural College, Wye, Kent, of a building to provide laboratory accommodation for hop research work.

AN ISSUE HAS BEEN MADE of 200,000 5½ per cent. redeemable cumulative preference shares of £1 each at 21s. per share, and 200,000 ordinary shares of 10s. each at 21s. per share of Cannon Iron Foundries, Ltd.

THE LATEST INDUSTRIAL CONCERN to adopt the five-day week is Macleans, Ltd., manufacturing chemists. All employees will work five days a week only and a day's holiday will be granted on Saturday so that the staff can enjoy a long week-end. The present wages and salaries will be maintained.

INCREASED BUSINESS in "Calgon" has necessitated the removal of Keith Piercy, Ltd., to larger premises at Marlow House, Lloyds Avenue, London, E.C.3 (Telephone: Royal 7111).

RECENT DEVELOPMENTS at the works of Mirrlees Watson and Co., Ltd., Glasgow, include a new nitriding process, its function being case-hardening of steel parts. The new product is a small high-speed steam turbine.

THE IRISH FREE STATE during the month of January imported chemicals, drugs, chemical fertilisers and other chemical products to the value of £113,049, as compared with £111,779 in the corresponding month of last year.

THREE MEN WERE INJURED on March 26 in an explosion at the works of Rotunda, Ltd., cable material manufacturers, Wilson Street, Clayton, Manchester. Suffering from burns and cuts, they were taken to hospital, where the condition of one was stated to be rather serious.

THE PUBLIC SERVICES ESTIMATES of the Irish Free State for 1935-36 have just been issued and show that £18,000 is to be voted in the coming financial year for the production of industrial alcohol. The vote for the State Laboratory is £7,379, an increase of £805, and £11,000 is to be devoted to mineral exploration.

THE VER. HUTTENWERKE BURBACH-EICH-DUDELINGEN A.-G., in Saarbrücken, has placed an order with the Koppers Co. to replace an existing battery of 60 Coppée ovens by 60 Koppers regenerative circulation ovens. The new ovens are to be 18⅞ in. in width and will operate upon compressed coal. With the anticipated carbonising time of 20 hours, the throughput of the plant will be 666 tons of coal per day on the dry basis.

THE DIRECTORS of Horace Cory and Co., chemical colour manufacturers, following the capital reorganisation sanctioned last year, have considered widening the scope of the company's activities. They have entered into an agreement with an American wallpaper company to make wallpaper in this country. A new company, United Wallpapers, has been formed with a capital of £40,000, of which the company has subscribed £20,000. Plant is at present being erected and it is expected that it will be in operation by May 1 next.

THE IRISH FREE STATE has prohibited the importation of the following chemical fertilisers: superphosphates, ground mineral phosphates and compound mineral fertilisers. Under the Government ban, however, limited quantities will be allowed to be imported provided that the importer registers with the Department for Industry and Commerce and obtains a licence for the quantity which he proposes to import. These licences will be issued at the discretion of the Minister for Industry and Commerce.

WORK IS NOW IN PROGRESS on the transformation of Lever Bros.' disused oil refineries at Bromborough Port to meet the requirements of the Commercial Solvents Corporation, which has acquired the premises. A firm of contractors already has men on the site and for the past few weeks a number of Lever Bros.' employees have been cleaning and renovating the building. This new enterprise is the first of a number expected to be started in the district. Commercial Solvents Corporation, which has interests at Dagenham and other places, manufacture alcohol solvents.

THE BRITISH COAL INDUSTRY will, it is claimed, dispose of 1,200,000 more tons of coal per annum as a result of the tax of one penny per gallon on imported fuel oil that was imposed two years ago. The Coal Utilisation Council in a report to the Mines Department says that in the last twelve months reports have been received of conversions from oil to coal or one of its derivatives (including coke, gas, electricity, creosote, and pulverised fuel) and of business retained for them that would otherwise have been lost to oil amounting to the equivalent of an annual consumption of 595,567 tons of coal. For the previous twelve months the corresponding figure was 608,050. This total of 1,203,617 tons means the annual employment of 4,800 British mine-workers.

THE WOOL INDUSTRIES RESEARCH ASSOCIATION has issued the report of the council—in which it is stated that the wool fibre research committee has this year dealt with several subjects of profound interest, especially to the producing industry. In collaboration with the agricultural institutions in the wool producing Dominions, further trials of sheep marking fluids have been made, the W.I.R.A. fluids featuring prominently. The investigations on wool packs have been concentrated upon jute fabrics treated with rubber latex and with cellulose cement, and special attention has been given to the construction of the packs. The committee has also devoted attention to the effects of nutritional conditions upon the fleece. Arising out of the nutrition experiments in conjunction with the Rowett Research Institute, valuable information on certain fundamental principles of fibre growth has been obtained, especially relating to fibre fineness, length and the degree of medullation.

THE BRITISH STANDARDS INSTITUTION has issued a British Standard specification for laboratory thermometers for general purposes. The British Standard series may be divided into four classes as follows:—Series A, accurate thermometers with zeros, about 400 mm. long, covering ranges of about 30 deg. C. (60 deg. F.) and divided to 0.1 deg. C. (0.2 deg. F.). Series B, similar to Series A, but with ranges of about 60 deg. C. (120 deg. F.) and divided to 0.2 deg. C. (0.5 deg. F.). Series C, thermometers for less accurate work, without zeros and about 200 or 250 mm. long, covering ranges of 100 deg. C. (200 deg. F.) and divided to 1 deg. C. (2 deg. F.). The thermometers in this series are intended for use when compactness is essential. Series D, thermometers covering the complete scale from 0 deg. C. (32 deg. F.) up to their respective maximum temperatures, length 300 mm. and divided in a manner suited to this length for each range. In each series, thermometers graduated for total immersion, and thermometers graduated for partial immersion are included for each temperature range. The partial immersion thermometers of series A, B and D, and certain of those in series C, are graduated for 100 mm. immersion and are, therefore, suitable for use with the distillation flasks specified in the British Standard Specification for Distillation Flasks, No. 571.

THE 'ADMIRABLE RELATIONSHIP between the directors of Zan, Ltd. (B. B. and L. Hovey), Wheelock, and the employees, was shown on March 18, when the employees made presentations to the directors as tokens of respect and admiration for business leadership during the period of world depression. Mr. C. Wetherell, of the Ozone Chemical Co., one of the associated companies at Wheelock, expressed the appreciation and thanks of the employees of that company for what the directors had done for them during the past four years. Although they were very busy as directors of Zan, Ltd., and Hopol, Ltd., they found time to assist the Ozone Co. Under their guidance, the latter would be as firmly established as the associated companies. Mr. W. Brookes, the oldest employee in point of service, who made the presentations, said he had seen the firm grow from small beginnings to its present importance, and Mr. Hovey and his brother were responsible.

New Companies Registered

Andrews, Millward & Co., Ltd.—Registered March 22. Nominal capital £2,000. To acquire the business of cellulose solvent reclaimers carried on by G. Andrews, H. Millward, D. Robinson and G. A. Andrews at Birmingham, as "Andrews, Millward & Co." Directors: George Andrews, 70 Frederick Road, Stechford, Birmingham; David Robinson, Harry Millward, George A. Andrews.

Charles McShannon, Ltd., 160 Albertbridge Road, Belfast.—Registered March 11. Nominal capital £300. Chemists, druggists, drysalters, oil and colour men. Directors: Charles W. McShannon, Bertie B. Morrison.

C. G. Fox and Company, Ltd., 61 St. Mary Axe, London.—Registered March 14. Nominal capital £25,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines, disinfectants, fertilisers. Directors: Charles G. Fox, Charles M. Fox, Jules W. Fox.

Gland Research Laboratories, Ltd.—Registered March 25. Nominal capital £100 in 1s. shares. Manufacturers and sellers of chemicals, pharmaceuticals, of serums, vaccines, toxins, antitoxins, biological, bacteriological products, chemists and druggists. Director: Lewis H. Blake, Bush House, Aldwych, W.C.2.

Hughes Stuart Carbon Products, Ltd., Abbey House, Baker Street, London.—Registered March 16. Nominal capital £300. Manufacturers of and dealers in activated carbon, decolourising carbons and carbon products, fertilisers, minerals, bitumastic compounds. Directors: Major C. J. P. Ball, Albert F. Stuart.

Industrial Oxides, Ltd., Union Works, Devonshire Street, Stepney, E.C.1.—Registered March 21. Nominal capital £1,000. Manufacturers and sellers of metallic oxide; merchants of oxides, chemicals. Directors: Herbert Ogden, Charles H. Walters, Edgar Boundy.

Medipac Products, Ltd.—Registered March 14. Nominal capital £1,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines, plasters, disinfectants. Directors: Andrew Thomson, 50 Pall Mall, S.W.1, Frank G. Hines, Fdk. C. Salmon.

Oil Seed Trading Co., Ltd.—Registered March 25. Nominal capital £1,000. To acquire the undertaking, property and assets and all the debts, liabilities and engagements of The Oil Seed Trading Co., Ltd.; purchasers and sellers of, dealers in and manufacturers of oil seeds, essential oils, copra, margarine, glycerine and chemicals, seed crushers, oil extractors by crushing, chemical or other processes; soap refiners and boilers, etc. A subscriber: Adolfo Lopez, 21 Mincing Lane, London.

Scovill Manufacturing Co., 829 Tyburn Road, Birmingham.—Registered March 16. Nominal capital 35,000,000 dollars. Manufacturers and dealers in metals and metal compounds, articles of worsted, silk, horn, bone, wood and woody fibre, paper, glass, chemicals. Directors: Edward O. Goss, John H. Goss, Leavenworth P. Sperry, William S. Fulton, George A. Goss, Roger S. Sperry, John P. Elton, Bennet Bronson, William M. Goss, Chauncey P. Goss, junr., Henry L. Scovill, Wm. T. Hunter, Francis T. Ward, Austin L. Adams.

Company News

William Blythe and Co.—A dividend of 7 per cent. is announced on the ordinary shares, making 10 per cent. for the year, payable on April 9.

Joseph Crosfield and Sons.—The profits for 1934 are £748,731. This compares with £730,041 for 1933 and £696,351 for 1932. The dividend on the ordinary shares is repeated at 30 per cent. and the amount carried forward increased from £86,469 to £157,700.

William Gossage and Sons.—A net profit is reported for 1934 of £291,347, compared with £210,546 for 1933. The ordinary share dividend is raised from 20 per cent. to 30 per cent., and £47,054 carried forward, against £36,957 a year ago.

British Enka Artificial Silk Co.—The company reports a working profit of £76,748 for 1934, against £65,188 in 1933. Depreciation provision is repeated at £32,244, but after charging £12,960 to exchange reserve and £7,963 as "loss occasioned by reduction in excise duty," the net profit is reduced from £2,038 to £1,205.

Viscose Development Co.—The report shows a trading profit of £7,281 for 1934, and, after providing for depreciation and tax, there is a net profit of £3,804, compared with £4,447 for 1933. The ordinary dividend is repeated at 4 per cent., and £1,000 is again transferred to reserve.

John Knight, Ltd.—The accounts show a profit for 1934 of £255,223 which, with the amount brought forward, makes a total of £383,107. A dividend of 40 per cent. on the ordinary shares is recommended and £138,107 is carried forward. The previous year's profit was £183,435 and the ordinary dividend was 35 per cent.

Canning Town Glass Works.—A net trading profit of £32,099 is reported for 1934, against £28,554 last year, to which is added £10,113 brought in, making £42,212; £9,000 is placed to writing down specific items in buildings, plant and machinery, £2,500 to depreciation, £2,500 to development, dividend 5 per cent., carrying £10,275 forward.

Graphite Oils Co.—For the year ending December 31, 1934, the report shows gross profit from trading £13,455, and expenses, directors' fees, depreciation, interest, etc., amounted to £16,875, leaving a loss of £3,420, to which is added the debit balance brought forward £13,061, making a total debit of £16,481, which it is proposed to carry forward.

United Drug Co.—The report for 1934 states that earnings (after providing for additional reserves, Federal taxes, bond interest and loss on guaranteed leases) amounted to $1,833,959, or $1.31 per share (against $647,789); of this, $628,412 was earned from non-recurring transactions, leaving operating profits at 86 cents per share; earned surplus stands at $2,690,197.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—A manufacturers' agent in Cape Town, who covers the whole of South Africa, desires to secure the representation of United Kingdom exporters of fertilisers, insecticides, agricultural and horticultural chemicals, including muriate of potash, sulphate of potash, ammonia sulphate, arsenate of lead, flowers of sulphur, zinc sulphate snow, copper sulphate snow and nicotine sulphate. (Ref. No. 271.)

France.—An agent established at Paris wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of thermostats, expansion thermostatic valves, condensers, compressors, and all control apparatus for refrigerating plants. (Ref. No. 277.)

Holland.—An agent established to Amsterdam wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of pharmaceutical products, medicines and chemists' and druggists' sundries. (Ref. No. 279.)

Lithuania.—A firm in Memel wishes to represent, on a commission basis, United Kingdom manufacturers of non-ferrous metals, and druggists' sundries. (Ref. No. 280.)

Uruguay.—H.M. Consul at Montevideo reports that the State Electricity Supply and Telephone Administration is calling for tenders, to be presented in Montevideo by May 13, 1935, for the supply of 250,000 kilogs. of lubricating oil for Diesel engines, 6,000 kilogs. of light oil, 14,000 kilogs. of medium oil, 3,000 kilogs. of extra heavy oil, 1,000 kilogs. of special oil, 10,000 kilogs. of lubricating oil for steam turbines, 12,000 kilogs. of oil for compressors, 60,000 kilogs. of oil for transformers and circuit breakers. (Ref. B.Y. 7998.)

Forthcoming Events

LONDON

Apr. 1.—Society of Chemical Industry (London Section). "Corrosion-Resisting Non-Ferrous Alloys." Dr. Harold Moore. 8 p.m. Burlington House, Piccadilly, London.

Apr. 3.—Society of Public Analysts. "Commercial Ground Almonds and their Adulteration," G. N. Grinling; "The Application of Analysis to the Study of Liesegang Rings," E. B. Hughes; "The Detection of Japanese Oil in other Peppermint Oils," D. C. Garratt; "Measurement of the Small Volumes of Nitrogen obtained by the Micro-Dumas Method," H. C. Gull. 8 p.m. Burlington House, Piccadilly, London.

Apr. 3.—Institute of Chemistry (London Section). Visit to Electric Lighting Bureau, Savoy Hill, London.

Apr. 4.—Chemical Society. "Studies in Chemisorption on Charcoal," A. King; "4-(5)-B-Alkylaminoethylglyoxalines," B. Garforth and F. L. Pyman; "The Influence of Variations in structure on the Reactivity of an Alcohol with Hydrobromic acid," G. M. Bennett and F. M. Reynolds. 8 p.m. Burlington House, Piccadilly, London.

Apr. 5.—British Association of Chemists (London Section). 17th annual meeting and concert. 7.15 p.m. Broad Street Station Restaurant, London.

LIVERPOOL

Apr. 3.—British Association of Chemists. Annual meeting of Liverpool Section. 7.30 p.m. Exchange Hotel, Liverpool.

MANCHESTER

Apr. 5.—Institute of Chemistry (Manchester Section). Annual general meeting. 7 p.m. Engineers' Club, Albert Square, Manchester.

SHEFFIELD

Apr. 5.—Chemical Engineering Group. Joint meeting with Yorkshire Section of the Society of Chemical Industry. Conference on "Drying" with special reference to Refractory Materials. Sheffield.