The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXI. October 20, 1934 No. 799

Notes and Comments

British Chemical Manufacturers

NO-ONE who read the eighteenth annual report of the Association of British Chemical Manufacturers presented at the annual meeting last week could fail to be impressed by the increasing volume of work which the Association is undertaking in the interests of British chemical manufacturers. The Association was formed in 1916 during the stress of the great war, but the need for a powerful organisation to further the interests of the industry has become increasingly evident under the stress of post-war nationalism. Embargoes, trade treaties, tariffs, free lists, Empire organisation, all these and much more have made the Association an imperative necessity to every British chemical manufacturer and have added immensely to its work and usefulness, as well as to the length of its annual report. The advantage of belonging to the Association has been so far appreciated that the membership has increased by ten firms during the past twelve months.

Import duties have again occupied the largest share of the Association's attention. It has continued its policy of only bringing before the Import Duties Advisory Committee those applications to which consent has been given by all the members directly concerned. In this policy the organisation has been greatly helped by the fairmindedness of its members. The Association has throughout received sympathetic treatment from the Advisory Committee, and Dr. F. H. Carr, chairman of the Council, in presenting the report last week, could not forbear from expressing appreciation of the just and scientific manner in which this committee had dealt with the facts laid before it. The case of superphosphates has at last been brought to a conclusion and the difficulties of the National Farmers' Union have been amicably overcome. There has been a long delay in dealing with one of the applications for addition to the free list, namely, that of vegetable drugs not of Empire origin. These drugs are the raw material of the alkaloid industry, which is an important branch of fine chemical manufacture. It is an industry which has for a long time had to struggle in competition with Continental makers and there are strong reasons why it ought promptly to be relieved from this disadvantage of a duty upon its raw material. Other cases outstanding are complicated ones and delay in settling them is due partly to this cause and partly to the inability of the overworked staff of the committee to cope with more than a limited number of applications at one time.

Safety in the Works

OF the many and varied activities of the Association of British Chemical Manufacturers, none is of greater importance to the public welfare than its efforts to promote safety in the works. The report presented last week showed that the Works Technical Committee had continued its valuable propaganda work in the cause of safety by the issue of quarterly safety summaries and of safety circulars on accidents or occurrences from which useful lessons may be drawn. Five new safety circulars were issued during the past twelve months, and the recommendations in the report on the investigations which followed the Mitcham explosion are being redrafted in the sense of the Association's proposals. The fact that Mr. J. Davidson Pratt, general manager of the Association, continues to address meetings in widely separated parts of the country on the need for safety measures shows that the Association still attaches just as much importance to safety problems as it did when it first decided to take up safety work a little over six years ago.

At an early stage the Association came to the conclusion that adequate publicity should be given to the causes of certain accidents which occur from time to time, in order that the industry might benefit by experience. The service of safety circulars was therefore initiated. These circulars, of which some sixty-five have now been issued, are generally based on the reports of interesting or unusual accidents from which a useful lesson may be learned, and they contain not only an explanation of the cause of the accident but also the recommendations of the Works Technical Committee of the Association as to how similar trouble may be avoided in future. The Association holds the view that questions of safety should be regarded as in the same category as medical science and that the widest circulation of useful information should therefore be secured. As part of this policy the Association collaborates with kindred associations in Continental countries and secures the pooling of non-secret information pertaining to safety, such as reports of unusual accidents, safety devices, etc. Co-operation is also maintained with the National Safety Council of America. The Association also works in the closest harmony with the Factory Department of the Home Office and with the Chemical and Allied Employers' Federation. These arrangements go a long way towards ensuring that the chemical industry in this

country benefits from all the useful experience both in this country and abroad. Furthermore, while these safety services are intended primarily for members, the Association is willing to make them available for other interested organisations under certain specified conditions.

Training the Industrial Chemist

OUR correspondence columns have in recent weeks borne evidence of a keen interest in the training of the industrial chemist. The subject is one that is engaging the attention of men in all ranks of the chemical profession and industry, and we need therefore make no apology for returning to the topic in view of the informative paper which Mr. A. E. Findley read last week at a Liverpool sectional meeting of the Institute of Chemistry. Mr. Findley is head of the chemistry department at the Liverpool Municipal Technical School and chairman of the local section of the Institute of Chemistry. Some twenty years ago, said Mr. Findley, it was beginning to be realised that the man with chemical training was frequently of much greater use in the works than in the laboratory. There was definitely established the necessity for the chemist on the plant in many industries, if efficient control were to be maintained. This has led to the establishment of a new type of foreman, assistant manager and departmental manager, and the displacement of the old type of unqualified semi-trained product of the elementary schools by the fully qualified product of the secondary school.

Although the old order is going and a new highly qualified order is coming, there are still many positions in the chemical industry occupied by non-graduates. For this class a scheme of education was devised by the Board of Education in conjunction with the Institute of Chemistry. This scheme, probably one of the most successful of its kind, has spread to many other industries, and has done more to promote general scientific knowledge in industry than any previous scheme of technical education.

The Institute Education Scheme

IN the case of chemistry the education scheme does not allow the apprentice to go chasing after the shadow. He must get the rudiments of all the auxiliary subjects fully established before he specialises (and even then, in Liverpool, he cannot specialise to the extent that one would like, mainly owing to the lack of accommodation). The scheme generally consists of one year pre-matriculation standard, two years intermediate standard and two years final standard. There are two kinds of National Certificates in Chemistry (1) ordinary, and (2) higher. The ordinary is taken at the end of three years' training and the papers of the final year's examination are assessed by the Institute of Chemistry.

The Higher National Certificate courses vary considerably in different part of the country, but everywhere there is a tendency to introduce some definitely technological subject in the second year's course which comprises the training. Here again the Institute of Chemistry assesses the marking of the examination papers in the final year of the course. The certificates themselves are awarded jointly by the Board of Education and the Institute of Chemistry and signify a knowledge of chemistry somewhere between pass and honours B.Sc. The scheme supplemented by one year's course of further study enables matriculated students to obtain A.I.C. by examination. In Liverpool National Certificates have worked wonderfully well, and during the past twelve years 14 per cent. of the awards for the whole country at the intermediate standard have gone to Liverpool, while 20 per cent. of the whole awards at the final stage have been obtained by Liverpool students.

Successes in Liverpool

ONE of the most important causes of the success of the National Certificates scheme in Liverpool is the fact that all the big firms have fallen in with the proposition to liberate their apprentices and junior chemists one afternoon per week to attend classes in the school, and the courses are so arranged that each year of the courses requires a different afternoon. This avoids taking too many juniors from one firm on any one afternoon of the week. The value of the qualified chemist trained in the evening school lies in the fact that his training is twofold. He gets good laboratory and works training with his firm and later on may even get experience as assistant manager whilst at the same time he is obtaining his diploma by attendance at the evening school.

If industry requires genius it must be prepared to pay for it, to subsidise its development in the universities and in the larger technical colleges and to guarantee tenure of position. Otherwise the best brains will go into the public services and similar avenues where entrance is competitive and only the first half dozen or so are chosen for interiors. In such avenues one might include the Department of Scientific and Industrial Research with its bulletins and papers which may and probably do serve a very useful purpose, but if industry has to rely on Government to solve its problems it may have to wait so long that the department will become a very mixed and doubtless blessing.

The Night School Habit

THE Institution of Gas Engineers is making a valiant effort to develop the training of a chemical engineer suitable to their own peculiar industry. It is handicapped by lack of numbers of suitable candidates, but is tackling the problem on the right lines. Having passed B.Sc., with honours, or A.I.C., many students have acquired a night school habit and others have acquired a desire for knowledge for its own power and the delight in probing into new fields of thought. These are catered for in the new scheme which the Board of Education, in conjunction with the Society of Chemical Industry and the Institute of Chemistry, have recently established quite successfully in Liverpool and still more successfully in Manchester. Much of this success is due to the advisory committee, of which Alderman Edwin Thompson is chairman.

Large numbers of graduates who have been in industry many years, feel the desire to know the latest developments in branches of chemistry, other than their own, and have flocked in unsuspected numbers to specialised lectures. All this goes to show that the Institute of Chemistry is taking an active and important place in the production and maintenance of a good supply of well trained routine chemists.

The Fineness and Grinding of Pigments

The Presidential Address to the Oil and Chemists Association brings interesting facts to light

THE Oil and Colour Chemists Association opened the 1934-35 Session on Thursday, October 11, with the usual informal dinner followed by the Presidential Address. The new president is Mr. G. A. Campbell, who was elected at the final meeting of last Session.

At the commencement of his address Mr. Campbell referred to the scheme for co-ordination of the various chemical societies and associations, and expressed the willingness of the Oil and Colour Chemists Association to assist, if possible, in bringing this about when it is again revived. At the moment, however, it is not regarded as a matter of practical politics and the Council of the Association therefore considers it its duty to conduct the affairs of its organisation with enthusiasm and forethought and to maintain in every possible way the high scientific standard of the meetings of the Association and also its publications. With that object in view, a new post within the Association has been established, *viz.*, that of Technical Correspondent, whose special function is to make contacts with scientific workers on oil, colour and kindred problems for the general benefit of the members. This work is to be done by enlisting the services of members who have specialised knowledge of the subjects in question or acquaintance with persons engaged in them. The Technical Correspondent will have a roving commission and the encouragement, assistance and co-operation of the members is asked for in this work. In short, the view is held that it is definitely wrong to advocate any stand-still stagnation for the smaller societies.

Co-operative Research

Continuing, the president commented on the fact that hitherto it had not been possible for the Association to strike up any degree of co-operation with the Paint Research Station. There had, he said, been talk of co-operative research which would lead to some "get together" measure, but it had yet been beyond the wit of either side to find a suitable subject for inquiry. He expressed the hope that the near future will produce some scheme and some problems which will lead to co-operation between the Paint Research Station and the Association. In all this, however, the president emphasised that the requirements and interests of the works chemist—the backbone of the Association—were not being overlooked. The majority of the members were engaged in buying and selling, and making and using, and too long had there been a sharp division between research and its application in works control. Too long had there been talk of the academic man and the practical man as individuals apart; too often the research chemist was a private adviser to the directors and seldom met the works chemist for discussion on an equal footing. The gap between research and application, however, was difficult to bridge because in many cases the research chemist was interested in the facts *per se* and not at all necessarily interested in their application. That was why it was so often left to the commercial man to provide the bridge to the works and it was one of the most useful functions of the Association to bridge that gap by providing a platform for discussion and exchange of views.

Importance of Particle Size

For this reason the president said he felt he could do nothing better than present a systematic survey of research work bearing upon one simple aspect of the manufacture of fine pigments, *viz.*, the grinding and fineness of pigments, and in doing so he spoke from the works point of view. Attention had first been called to the importance of the size of the particles of pigment powders, in 1921, by a past-president of the Association, Mr. C. A. Klein. Again, in 1926, the Association published a symposium of papers on the question of particle size. Without entering into the actual details of methods for the estimation of particle size, the view was expressed that direct measurement by means of photo-micrograph or by the magnified image thrown on a screen is the most accurate and least fatiguing to the observer. In considering the various methods of tabulating results from the estimations, Klein's method was, in his view, still the best, as it shows at a glance the size distribution as well as the magnitudes involved. This gave a very clear picture, as of two samples leaving the same residue on a 300 mesh sieve, one might consist essentially of very small particles of 10 microns diameter, while the other might be almost wholly composed of large particles of 50 microns diameter. The behaviour of these two powders under exacting conditions would be very different and according to the present method of specifying fineness "by the residue left on a 300-mesh sieve" no accurate information was given why.

A Reliable Measure of Fineness

No account was taken in the present British Standard specifications of the nature or size of the 2 per cent. or 5 per cent. residue on the appropriate sieve, nor of the size distribution of the particles. Criticism, of course, was easier than practical improvement but he would welcome a simple way of estimating the specific surface of a powder instead of the sizes of its particles, for this would not only be a reliable measure of fineness but would give a figure which would be a guide as to chemical activity, adsorption properties and, in fact, all the properties depending on surface and interfacial reactions. To specify the fineness of a powder one would state the limits of specific surface, and limit the size of the largest particle, for if 95 per cent. passed through a 300-mesh, all the damage might be done by the few outsize particles in the residue. The new method would still ignore size distribution but by limiting the largest particle it would tend to decrease the distribution range—the smaller the particles the more uniform the powder. Uniformity of size, perhaps, was not always desirable, but it was necessary to know what was the range size of distribution.

In the colouring of rubber, fine particles were more difficult to incorporate in the rubber mix, but the best results were obtained from pigments of uniformly sized particles. On the other hand, in the manufacture of paint, the success of the process depended upon the extent to which the pigment particles were completely wetted by the medium, and the amount of medium required depended upon how the smaller particles were filling in the voids between the coarse particles. On this depended also the smoothness of the paint film and its durability, limiting as it did the pigment/vehicle ratio. Therefore we should know the size distribution to complete the picture, though it was difficult to see how it could enter into a specification. Here, also, was a snag in regard to specific surface which was defined as the surface per gram of powder—not per unit volume, as it was so often expressed. Unfortunately, its direct measurement was still a cumbrous affair and its estimation by chemical activity and adsorption and wetting methods was not too reliable. For that reason a good deal of interest attached to any effort to simplify the procedure and bring the closer specification for fineness of powders nearer completion. This, however, would entail the consideration of yet another factor, *viz.*, particle shape as for any given dimensions the surface area depended upon the shape of the particle. The essentials for accuracy in calculating specific surface were (1) accurate grinding of particles and (2) making the necessary allowance for the irregular shapes of the particles.

Measurement of Void Content

Having a good knowledge of the particle arrangement of a pigment powder, said Mr. Campbell, one other series of experiments is required to complete the picture, the measurement of void content of the close packed powder. The usual methods for this estimation were (1) by finding the bulk specific gravity of the powder, *i.e.*, the weight of 1 c.c. of the compactly packed material in powder form got by hand

tapping in a graduated glass cylinder, and (2) by liquid absorption on the assumption that the volume of liquid absorbed equals the volume of voids in the close packed powder. For fine powder work the first method was very unreliable as even gentle tapping caused too great vibrations to ensure close packing and did not get rid of air cushions. The second method was better for fine powders but the value depended too much on the particular liquid chosen, and strangely enough water was a good as any. Liquid absorption, however, was not so good for coarse particles, as the mass did not readily form a ball. Another method, more reliable for fine powders, had recently been described by Traxler, Baum and Pittman, 0.5 per cent. Solution high-grade glue being added to the powder to give a similar end-point as in oil absorption tests.

Where Grinding Plant Makers Lead

Discussing the consequences of the work which had been reviewed in their influence upon modern works practice, Mr. Campbell pointed out that colour is now seldom sent out in a coarse condition; it was agreed that fine grinding is essential. Plant had been installed with this end in view and general practice had settled down at present to edge and end runner mills for crushing and blending, with subsequent treatment in high speed mills of the Kek and Raymond pulveriser types for the reduction of particle size. There was still insufficient co-operation between makers of plant and colour manufacturers, though the grinding plant manufacturers were still ahead of general colour works practice.

In Klein's original paper thirteen years ago it was pointed out that very small particles act simply as lubricants to the grinding media and hinder the breaking down of the rest of the material. Therefore, material which was already fine enough should be removed from the mill and this was probably the most effective improvement in the grinding plant of recent years. Air flotation methods of separating the low-sized particles and, by means of a closed circuit system to return the over-sized particles for further grinding, had been developed considerably by makers of grinding plant but had not yet become the universal practice. Particle size estimations were not carried out sufficiently in the average colour works. Grinding was an expensive job and the expense varied considerably with the class of material so that exact knowledge could effect considerable saving in power and considerable improvement of product. Although much was being done in this direction, and much had been achieved, the mechanism of disintegration was still far from being accurately defined, although the work of Dr. Geoffrey Martin on the laws of grinding had done much towards presenting a clearer picture. Much of the power consumption represented so much wasted energy and the maintenance costs were uncertain.

Three Practical Points

There were three commonplace but often ignored practical points in the grinding of colours. In some cases where use was made of the most efficient grinding plant to obtain a very fine product, the whole effect was spoiled by carelessness in packing arrangements. Fine pigments should be sieved into their packages and considering that particular care had been taken to see that particles were of a certain diameter, it seemed little to ask that steps be taken to ensure that no extraneous matter could get into the packages; pieces of wood, cinder, and straw were not unknown and seriously upset results. Secondly the economic running of grinding plant, whether continuous or discontinuous, depended upon output. The greatest enemy of output was plant breakdown, but there was often a reluctance among users of grinding plant to carry necessary spare parts. Thirdly, more use might be made of sifting plant for colours for special purposes. The rubber and synthetic resin trades had set up high standards for the fineness demanded of pigment manufacturers and the tailings might still be sufficiently fine for other purposes or might require to go back for regrinding.

Another aspect for works attention which was receiving a good deal of consideration was the realisation that much that affects the condition of the final powder is established long before the grinding process is reached. Fineness of powder could not be delayed for consideration till the lumps from the drying stove had been dried, because long before then came processes which affected the powder condition considerably. In the case of furnace process colours, conditions of furnacing and such questions as dilution, electrolytes present, *p*H value of precipitating solutions, dispersing agents present, washing, drying, grinding, and ageing were all worthy of study. One had only to compare the heavy, hard, compact solid lumps of certain olive chrome greens, which were inexplicably produced even under control, with the light aerated porous masses of certain modern azo pigment dyestuffs, to appreciate the importance of this point. The latter simply required crushing to give a smooth fine powder whilst the former needed prolonged treatment and gave trouble in all their subsequent processes. A third aspect in the composite idea of fineness was the texture, which was one of the elusive properties, hard to define, and therefore difficult to measure and compare. Soft texture colours and hard texture colours were referred to quite apart from particle size. Some pigments had compact particles and some porous, but how to produce each at will would solve the problem of texture.

Dry Grinding

All these remarks, said Mr. Campbell, referred to the dry grinding of the colour, but the recent developments in the incorporation of pigments in an oily medium without the intermediate processes of drying or grinding was of special interest. This process was a recognition of the baking or compacting which takes place in the drying of pigments and was coming more and more into regular practice, having begun essentially with the production of Reflex Blues in America and having since been introduced into this country for the oil dispersion of the most modern type of pigment colour. The considerations put forward referred only to the pigment powders themselves, but these aspects assumed even greater importance when viewed in regard to the pigment/vehicle relationship. Particle size and surface area affected this relationship in a way which even yet was not fully appreciated. The technology of paint manufacture and of all manufacturing processes consisting of the wetting out of a powder by a continuous phase, as, for example, rubber or synthetic resins, became less and less a study of materials and more and more a study of interfacial relationship.

Electro-Chemical Processes

New Capital Requirements

THE annual report of Electro Chemical Processes for the year to March 31, 1934, shows a net loss of £6,344, against £10,065 for the previous year. This increases the debit balance to £105,938. The directors state that their most urgent concern at present is to ensure the provision of sufficient working capital to enable the colloidal products department to be carried on until it can reap the full benefit of the work which has been done by its technical staff and sales organisation. The financing of the slack season, and stocks required in the colloidal department have locked up a substantial amount of money. They have opened up negotiations with a view to meeting the situation, but should these negotiations prove abortive, they may find it necessary to raise further working capital on terms which will possibly involve a drastic reconstruction of the company. No steps in this connection will, however, be taken until after consultation with the members of the preference shareholders standing committee. The annual meeting will be held at Incorporated Accountants' Hall, London, W.C.2, on October 25, at 12 noon.

THE Greek paint and varnish industry has recorded some progress in recent years. There are no reliable production figures, but current annual output has an estimated value of about 30,000,000 drachmas. Imports increased slightly, from 38,000,000 drachmas in 1932 to 40,000,000 drachmas in 1933, with Germany, Great Britain, Belgium, and Italy the principal sources of supply. Production of linseed oil in 1933 was 1,096 tons, valued at 18,077,000 drachmas, compared with 1,078 tons, valued at 16,170,000 drachmas in 1932.

Pozzolanic, Portland and Aluminous Cements

A JOINT meeting of the Chemical Engineering Group and the Road and Building Materials Group of the Society of Chemical Industry was held at Burlington House, London, on Friday, October 12, when Dr. W. R. Ormandy presided. A paper on "Pozzolanic Cements," was read by Mr. R. G. Franklin, B.Sc., and Mr. A. E. J. Vickers, M.Sc., F.I.C. A second paper on " The Setting and Hardening of Portland and Aluminous Cements, with relation to their Resistance to Water and Mineral Sulphates," was read by Mr. A. Vivian Hussey, M.I.Chem.E.

The essential property of a pozzolanic material is that it should react with lime in presence of water and at normal temperatures to give a cementitious product. Pozzolanas are usually alumino-silicates with an excess of silica, and it is thought that the silica provides the active material which reacts with lime. The lime may either be a straight lime, such as the burnt mountain limestone from North Derbyshire, Yorkshire, or North Wales, or it can be the lime which is liberated on the hydration of Portland cement. The reaction between a pozzolana and lime gives a product which increases the mechanical strength of the mix.

Continental Applications

Although pozzolana cements have rarely been used in Great Britain, their use on the Continent has been the subject of much study and experiment, and they have been widely used, more especially in sea-water work. More attention has been given to the use of pozzolanas in warm and temperate climates, than in cold climates, probably because the attack of sea-water and other aggressive waters on Portland cement increases markedly with rise of temperature. In Italy there have been many examples of serious disintegration of ordinary concrete in contact with sea-water, and lime-pozzolana and cement-pozzolana mixes are in general use for such purposes.

Distinct from the natural pozzolanas are the artificial pozzolanas produced by roasting materials such as clay, which have no pozzolanic activity prior to treatment. Although not yet so widely used as natural pozzolanas, the artificial products are of particular interest in this country, because there are no substantial natural pozzolana deposits, and such materials would have to be imported. Experiments have been carried out at Billingham during the last few years on the production of an artificial pozzolana from a supply of clay which was thought to be of a favourable type. Small scale and semi-technical kiln tests showed that good pozzolanic activity was obtainable. The optimum conditions were found to hold over a comparatively small temperature range and the use of either lower or higher temperatures led to a marked loss of activity.

The question of the heat evolved during the setting and hardening of large masses of concrete is receiving increasing attention, since the temperature rise may be considerable and may lead to severe cracking. Pozzolanic cement provides an alternative method of obtaining a cement with a lower heat of hydration, since the proportion of Portland cement present is substantially reduced. Work has not yet advanced sufficiently for figures to be given, but it is stated by the Building Research Station that the heat evolution is somewhat higher than would be expected solely from the Portland cement content due to the evolution of some heat by the pozzolana. The heat evolved by the pozzolana is, however, much less than that of the cement which it replaces.

Setting and Hardening

Dealing with the setting and hardening of Portland and aluminous cements, with relation to their resistance to water and mineral sulphates, Mr. Hussey said everyone is familiar with the rate of hardening of Portland cement, as indicated by various published data, but one of the outstanding features of aluminous cement is the rapidity with which it attains high strengths. The permeability of ordinary Portland cement and aluminous cement concrete at 28 days, when cured in water, is practically the same, but if cured in air, the aluminous cement and rapid-hardening Portland cement are as impermeable as water-stored Portland cement, a point of considerable importance.

Resistance to Water and Solutions of Mineral Sulphates

Many efforts have been made to ascertain the amount of fixed water in cement. Lea and Stradling, by measuring the amount of water driven off at various temperatures between 98° and 960° C., arrived at a figure of 28 per cent. as representing the total water which had combined with Portland cement when gauged neat. It is impracticable under similar conditions to arrive at the total combined water in aluminous cement as the water requirements being higher it is not possible to gauge it neat with sufficiency of water for complete hydration, consequently the cement must be hydrated under conditions where there is enough water to enable it to become hydrated to the fullest extent. By allowing aluminous cement previously made into a slurry in the water to set and harden in a glass container with an excess of water until water absorption is complete, the loss of water between 98° and 960° C. has been found to be 34 per cent. Le Chatelier has calculated the water requirements of aluminous cement as being 40 per cent., while Werner and Giertz Hedstrom by means of vapour pressure isotherms arrived at a figure for aluminous cement of 39 per cent., as compared with 25 per cent. for Portland cement. Under practical conditions, however, it does not appear that this hydration can be expected to be complete, as a number of observations have shown that on specimens dried at 98 ° C. the combined water varies between 30 per cent. and 33 per cent.

A very necessary procedure in the hardening of concretes is control of the seasoning. Aluminous cements attaining very high strengths in 24 hours require particular attention to this point because the processes happening in this short period are equivalent to those which occur with ordinary Portland cement in seven days and consequently it is essential to take steps to avoid loss of water by evaporation. In general, continuous storage in air, after the first 24 hours moist storage, tends to give higher strengths than when the mortar is stored continuously in water but there is evidence at 84 days of the ultimate strength being the same.

Action of Water

All cements on setting and hardening evolve heat and with aluminous cement the rate of evolution between six and 12 hours after gauging is extremely rapid. In the case of an aluminous cement concrete, this evolution of heat must be controlled as far as practicable by the application of water before and after removing the shuttering.

The main points which distinguish aluminous cement from Portland cement are: (1) the high proportion of alumina and relatively low proportion of silica which it contains; (2) that on setting and hardening, lime is not liberated, but there is an excess of gelatinous alumina produced; (3) they attain very high strengths at an early age; (4) the water requirements are considerably greater and particular care is required in the initial seasoning to prevent loss of water by evaporation.

Natural waters vary considerably in their mineral content, carbon dioxide content, and reaction, so that exposure of concrete to water under various conditions has been observed to affect it with improvement in some cases and in other cases with deterioration. Attack on Portland cement concrete has been observed in pipe lines employed for the conveyance of water supplies, especially where the water is exceptionally pure. To acid attack to which aluminous cement is less prone than Portland cement.

An extensive investigation of the comparative resistance of different cement mortars and the relative merits of surface

treatments has revealed that aluminous cement exhibits marked advantages. Where initial protection is given to Portland cement mortar by the deposition of $CaCO_3$ in the presence of waters carrying a high percentage of CO_2, a further quantity of soluble calcium bicarbonate may be produced which either dissolves or reacts with additional supplies of free lime in the top layers of the concrete, causing further disintegration. Aluminous cement, on the other hand (owing its relative immunity to the presence of alumina, the absence of free lime, and its lower permeability), is capable of resisting attack under these varying conditions, but at the same time the importance of careful control of the proportioning and gauging of the concrete when resistance to corrosion is to be secured, even in the case of natural waters, is very clearly revealed.

Mineral Sulphate Solutions

Although acid-resisting properties are not claimed for aluminous cements in the ordinary sense of the word, during recent years a number of users have carried out experiments leading to the conclusion that there are very definite advantages to be obtained by employing aluminous cement in preference to Portland cement where exposure to sulphur-containing gases has caused disintegration in the past. Although exposure of concrete structures to ammonium sulphate is not of very frequent occurrence, the reaction is very rapid in the case of Portland cement, and the destruction of test pieces may be rapidly shown by immersion in a solution of this salt while a strong smell of ammonia is observed in the early stages of the experiment. In the case of aluminous cement, there is no evidence of such decomposition and no evolution of ammonia, a matter of importance to gas undertakings. The behaviour of sodium sulphate differs somewhat from that of the other mineral sulphates. By reaction with lime, free soda may be produced, but although this may occur with Portland cement, it does not seem to serve as a satisfactory explanation of any attack which may be observed on aluminous cements.

The property of Na_2SO_4 solution of creeping and re-crystallising is well known and this suggests very strongly that one is faced in this particular instance not only with the possibility of chemical attack, but also physical disintegration. In fact, this possibility is always present with highly soluble salts which may behave in a similar manner to Na_2SO_4 and physical disintegration of this nature may occur in any porous structural material. Porous aggregates are an obvious source of danger, while it is imperative that the concrete should be constituted in such a way that it may have the minimum porosity and the avoidance of the employment of aggregates carrying an excessive proportion of fines, clay matter, or organic matter, and the minimum quantity of water necessary for the placing of the concrete. The fact that aluminous cement is capable of combining with more water than Portland cement assists considerably in this direction.

Points from the Discussion

Mr. W. H. WOODCOCK asked whether, in the tests on pozzolanic cements, the temperatures were carefully noted, because some years ago he had been concerned with tests on practically all types of pozzolanas, some of which were extremely successful provided the weather was hot, but in cold weather they acted so very slowly that it was practically impossible to use them. That was why they did not come into commercial use in this country at that time. Some would have very little strength at between 50° and 60°, and yet gave marvellous strength at between 90° and 100°. If the temperatures of the materials tested by Mr. Franklin and Mr. Vickers were recorded, the results would be extremely useful.

Mr. F. M. LEA (Building Research Station) said that the work described in the paper on pozzolanic cements represented the first application in commercial practice of work which had been carried out at the Research Station since about 1926. With regard to the reason why Portland cement was attacked by sulphate waters and aluminous cement was not, he said it seemed that normally there was no attack, that the aluminous cement had not combined with the sulphate; so that the reason for the resistance of aluminous cement was not the manner in which sulpho-aluminate was formed, but that the attack did not occur.

Mr. W. C. HANCOCK, discussing pozzolanas made from burnt clay, asked what character of burnt clays were used for the purpose—whether those with a high proportion of true clay substance or the more mixed clays gave the better results. He also asked to what temperature clays were burnt for this purpose, because it seemed that a great deal of the mechanism of reaction of substances such as clay for the production of pozzolana cement must depend very largely on the amount of burning to which the material had been subjected. Was the temperature of burning far beyond the ordinary temperature at which the clay material was completely dehydrated, or was some further molecular rearrangement between the silica and alumina brought about which enabled the burnt material to act as a pozzolanic material?

Mr. R. BRUCE suggested that, as there appeared to be some doubt as to the compounds formed, a good deal might be learned if sections were made and the crystals examined to determine the optical properties. He also mentioned the trouble that had been experienced in buildings where there was a good deal of steam, the embedded rods in some of the old ferro-concrete buildings in America having commenced to rust; and he asked whether, if aluminous cement were used, the mass was more dense than with Portland cement, and whether the penetration of moisture was less.

Mr. S. G. S. PANISSET said that the extent of the use of aluminous cement had been disappointing. About twelve years ago he was very enthusiastic about it, and was largely responsible for the erection of the first plant for the manufacture of such cement in this country. He had imagined that a cement which would develop in 24 hours the same strength as would a Portland cemeat in a month, would be received enthusiastically by builders, contractors and engineers. But, perhaps because aluminous cements cost roughly double as much as Portland cement, at present only about one ton of aluminous cement was sold for about every 100 tons of Portland cement. The Portland cement manufacturers had made an important advance by producing rapid-hardening Portland cement, somewhere intermediate in strength between ordinary Portland cement and aluminous cement. The sulphate-resisting properties of aluminous cement were about to be imitated by the production of a pozzolanic cement; so that again one's enthusiasm for aluminous cement was being damped, and the century-old Portland cement seemed to be holding its own.

Production of a White Pozzolana

Mr. VICKERS, replying to the discussion, said that, speaking generally, one might say that any type of clay ought to give a pozzolana if one could find out the correct heat treatment. One had to consider its mineralogical constitution and geological history. For any given clay the temperature at which pozzolana could be produced was specific. The principal requirements were an excess of silica over alumina, and that the clay must be capable of burning in such a form that the silica existed in a very active form chemically.

Mr. FRANKLIN, dealing with a question as to the production of a white pozzolana, said he had burnt china clay in small quantities and had found the material to have quite a reasonable pozzolanic activity in reaction with lime. He could not speak of its chemical resistance, however. Replying to Mr. Woodcock, he said all the curing experiments on pozzolanic cements were carried out at room temperature, about 15° C. At the Building Research Station, artificial pozzolanas, at any rate in reaction with lime, had shown quite a reasonable activity at lower temperatures, whereas in one case the activity of a natural pozzolana had fallen very sharply at lower temperatures. He would imagine that, if concrete were really dense, well-graded and well tamped, there would not be penetration of moisture to the reinforcement, particularly if there were no sulphur attack.

Mr. HUSSEY, replying to Mr. Lea, said he did not think it was quite proved that sulpho-aluminate was not formed in solution and thrown out, in the case of aluminous cement, used in connection with sulphate waters. Cracking troubles attributed to the cement might be due to some other cause, of a purely mechanical nature; ordinary brick and mortar buildings developed cracks, which generally had a direct relation to the manner in which the structure had been erected.

Financial Position in the Chemical Industry

By S. Howard Withey, F.C.I.

ACCOUNTS submitted by galvanised iron manufacturers, tank makers, and structural engineers show a decided improvement in relation to the 1932-33 results, and ordinary dividends have been well maintained without the need for drawing on reserves. During the financial year, to the end of June last, for example, a net profit balance of £18,007 was realised by Frederick Braby and Co., Ltd., which compares favourably with the loss sustained during the previous twelve months, when £30,000 was transferred from the taxation and discount reserves. A dividend of 2½ per cent. was consequently declared on the ordinary shares, as before, and a credit balance of £2,529 carried forward to 1934-35, as against £2,476 brought in from 1932-33. This company was registered in 1865, and has an authorised capital of £600,000, of which a total of £588,000 ranked for dividend, comprising £145,000 in the form of 7 per cent. cumulative preference shares, £48,000 in employees' shares, and £395,000 in ordinary shares, all of £10 denomination. In 1930-31 the ordinary shareholders received a dividend of 7½ per cent.

Dyeing and Calico Printing

Dyeing and calico printing companies have reported better results, but in some instances the income has not been sufficient to cover debenture interest and depreciation charges. During the financial year to the end of July last, a trading profit was realised by F. Steiner and Co., Ltd., of Church, Accrington, but, after debiting £36,875 for depreciation, the account showed a loss of £993, which compares with a loss of £21,151 sustained in 1932-33. Other income brought in £3,556, but as the interest on the £450,000 of 4 per cent. debentures amounted to £18,000, there was a net loss of £15,437, as compared with £23,039, thereby increasing the deficit to £222,296. The balance sheet showed liquid assets aggregating £503,100, including stocks assessed at £346,160, and after deducting depreciation the fixed assets had a book value of £688,867. Registered in 1897, the company has an authorised capital of £925,000, all of which has been issued and fully paid, consisting of £450,000 in the form of 5 per cent. cumulative preference shares, and £475,000 in ordinary shares, all of £10 denomination. The debentures were recently quoted at 52. The audited accounts of the Calico Printers' Association, Ltd., were made up to the end of June, and, after debiting debenture interest, depreciation, upkeep and repairs, the net profit proved to be £164,872, which figure compares favourably with £123,926 realised during the preceding twelve months, and enabled the carry forward to be raised from £33,596 to £47,663 after meeting the dividend on the 5 per cent. cumulative preference stock. The balance sheet showed a strong financial position, and the reserve funds amount to £1,600,000. The issued capital totals £5,026,840, composed of £3,016,104 preference stock, and £2,010,736 ordinary stock.

Some Marked Improvements

In the case of the Yorkshire Dyeing and Proofing Co., Ltd., trading profit was £45,353, from which was deducted depreciation, income tax, and directors' fees, leaving a net profit balance of £29,481. This enabled the dividend to be raised from 6 per cent. to 7½ per cent., and the sum of £15,000 to be transferred to the reserve, as against £10,000 allocated a year ago, the carry forward being then slightly higher at £6,305. The profit and loss account of the United Indigo and Chemical Co., Ltd., of Manchester, included an unstated amount of recovered income tax, the net profit for the year ended June 30, being £8,825. This is a definite improvement, as the 1932-33 net profit of £8,040 included profit on investments amounting to £4,052, as well as £500 transferred from the income tax reserve. Owing to the repayment of capital, the preference dividend absorbed £1,500 less, at £4,500, and after distributing a dividend of 5 per cent. on the £52,500 ordinary shares, as before, the account showed a credit balance of £15,185 to go forward, as against £13,485 brought in.

The figures submitted by W. and T. Avery, Ltd., manufacturers of weighing and measuring apparatus, of Soho, Birmingham, were satisfactory, the balance of gross profit for the year to March being shown at £133,065, which is an increase of £9,132. After charging depreciation, fees, etc., the net profit was £102,925, as compared with £95,512 in 1932-33, and consequently the dividend of 15 per cent. on the ordinary shares was repeated, and the sum of £10,000 was placed to reserve, which now amounts to £360,000, leaving the carry-forward slightly higher.

Sulphuric Acid Manufacturers

During the twelve months to June last, a profit of £32,106 was realised by W. and H. M. Goulding, Ltd., manufacturers of sulphuric acid and chemical manure, of Dublin. This is a small reduction in relation to the previous year's figure, but the dividend was maintained at 6 per cent., and £6,000 allocated to depreciation, as before, leaving a credit balance of £3,977 to be carried forward, as against £3,646 brought in. This company was registered in 1894, and has an authorised capital of £500,000, of which £440,000 has been issued and paid up, composed of £125,000 in the form of 5½ per cent. cumulative preference shares—the dividend on which is paid in July and December—and £315,000 in ordinary shares, all of £5.

The manufacture of fireproof materials has been more profitable, and during the year to March a net profit of £2,635 was realised by Cellactite and British Uralite, Ltd., of Rochester. This compares with only £230 realised in 1932-33, and enables the interest to be paid on the 5 per cent. income bonds, and £500 to be placed to redemption of the bonds, the carry forward being then £2,058, or an increase of £1,311. This company was registered in 1928, and the entire authorised capital of £60,000 has been issued and fully paid in the form of 2s. shares of one class. The net profit of £12,295 made by Minimax, Ltd., represented an expansion of £7,845, and in addition to the ordinary dividend of 9 per cent. a bonus of 1½ per cent. was paid on both the preferred shares and the ordinary shares, without any transfer being made from the investment reserve, which a year before parted with £2,500, and after reducing the book value of patents and goodwill by £580, the company's profit and loss appropriation account showed a credit balance of £16,797, or an increase of £2,115.

Engineering Concerns

The experience of hydraulic and general engineers has been varied, some firms reporting better results while others were unable to maintain profit margins. The net profit of £1,508 which was reported by Worthington-Simpson, Ltd., of Newark-on-Trent, compares with £7,746, realised during the proceeding twelve months, and as no dividend was declared on either the ordinary or the preference shares, while £24,000 was transferred from the contingency reserve, the carry forward was raised from £14,578 to £40,085. Registered in 1892, this company is associated with the Worthington Pump and Machinery Corporation, the authorised capital being £400,000, of which a total of £398,768 has been issued and fully paid, comprising £198,768 in the form of 6 per cent. cumulative preference shares and £200,000 in ordinary shares, all of £1. The entire paid-up capital is privately held. During the financial year to the end of March, a net profit of £18,985 was realised by George Kent, Ltd., this figure being arrived at after providing for depreciation and

reducing the book value of investment in subsidiary, the previous year's net profit balance being £13,110, and the declaration of a final dividend of 7½ per cent. on the ordinary shares brought the total distribution for the year up to 10 per cent., as compared with 5 per cent. paid in 1932-33. The sum of £2,000 was allocated to the dividend equalisation fund, and after transferring £700 to the pension fund the carry-forward was slightly higher at £39,636. The accounts of the Paterson Engineering Co., Ltd., of Glasgow, were made up to the end of April, disclosing a net profit of £17,749, and enabling a dividend of 10 per cent. to be declared on the £100,000 of issued 10s. shares, while the taxation account was provided with £5,838, which left a credit balance of £4,641 to go forward, as against only £480 brought in. The company was converted into a public undertaking in June, 1933.

The first accounts of the New G. and S. Processes Syndicate, Ltd., covered the period from January 30, 1933, to March 31, 1934, and reveal a debit of £1,984 to the experimental and research and general administration expenditure account. This company was formed for the purpose of exploiting and developing chemical processes in connection with the manufacture of safety glass, varnishes, paints, and artificial silk, etc., the authorised capital being £22,000, of which £21,399 has been issued in the form of 1s. shares. The activity in the motor industry was largely responsible for the further expansion reported by the Triplex Safety Glass Co., Ltd., whose audited accounts covering the twelve months' operations to the end of June last disclosed a gross profit of £132,349, which is a record figure, and an increase of no less than £32,400 in relation to 1932-33. After charging depreciation, income tax, directors' fees, and staff bonus, the balance of net profit proved to be £75,150, as compared with £55,631, and, although the dividend on the ordinary 10s. shares was maintained at 25 per cent., the sum of £37,500 paid for the goodwill of Protectoglass, Ltd., was written off against the profits, leaving the carry forward only £1,120 lower at £13,331. Registered privately in 1922, and converted into a public concern in 1925, this company has an authorised capital of £200,000, all of which ranks for dividend.

Chemical Trade in the Irish Free State

From a Special Correspondent

THE Irish Free State, an essentially agricultural country, is in process of being turned into an industrial one. This process has not yet, of course, gone very far, but it is undoubtedly being pushed on as rapidly as possible in the endeavour to make the country as self-supporting as possible and reduce the present large adverse trade balance.

So far as the chemical and allied trades are concerned the requirements of the country are by no means negligible, as will be seen from the following table of imports during the past year and a half:—

Description.	Year 1933.		Jan. to June, 1934.	
	Volume.	Value £.	Volume.	Value £.
Copper sulphate	4,098 tons	60,101	3,730 tons	48,813
Disinfectants and insecticides	17,137 cwt.	65,995	9,960 cwt.	33,084
Sodium compounds	322,477 cwt.	123,863	234,151 cwt.	82,527
Chemical products	—	228,880	—	110,788
Perfumery and cosmetics ..	—	87,202	—	33,412
Medicines and medicinal products	—	273,133	—	92,932
Dyes and tanning materials ..	12,240 cwt.	37,360	9,095 cwt.	20,452
Paints, enamels and distempers (in liquid or paste form)	37,816 cwt.	109,416	17,107 cwt.	51,850
Ditto, other descriptions ..	61,485 cwt	75,325	36,920 cwt.	45,408

Apart from the long-established manufacture of chemical manures, several new branches of the industry are being started, including soap, printing ink, explosives, and vegetable essences. Naturally the biggest developments are taking place along lines intended to help the badly hit farmer. There has been a beet sugar factory at Carlow since 1926, and the beet growers have done very well in that time, for they have increased their yield from about 9 to about 11½ tons per acre, and the sugar content from about 17 per cent. to 18¾ per cent. Three additional beet sugar factories are to be established, and when all four factories are in operation they will provide 80 per cent. of the country's sugar requirements.

The long-talked-of scheme for making industrial alcohol from potatoes for use as a motor fuel mixed with petrol has now reached the stage of practical politics. The money has been voted for the first distillery, plans are being prepared and tenders for the necessary plant will shortly be invited. This first distillery is in the nature of a try-out of the scheme, and should it prove successful a large number, possibly 30 or 40 more distilleries, will be established. Some 40,000,000 gal. of petrol are used annually in the Free State, and, allowing a 10 per cent. admixture of absolute alcohol, this would provide an outlet for 4,000,000 gal. of absolute alcohol per annum. The manufacture of this alcohol from potatoes is, of course, hopelessly uneconomic since it is expected to cost in the neighbourhood of 3s. per gal., whereas petrol can be landed in bulk at Irish ports at about 3d. per gal., if duty-free. However, that sort of thing does not matter in the least in the Irish Free State. The farmers have to be helped somehow, and if the motorist has to pay a bit more for his petrol "Shure, what does it matter?"

The policy adopted by the Irish Free State Government with regard to imported manufactured goods and the establishment of local industries is a rather curious one, and one which exporters to that country would do well to study carefully. The Free State wishes to curtail imports so as to improve her trade balance, and she particularly dislikes buying from England owing to the political quarrel over the annuities question. There is, however, every encouragement given to English or other manufacturers who are prepared to put up a factory in the Free State and manufacture there. So far does this encouragement go that in some cases a hard and fast monopoly is granted to such manufacturers. For instance, the Dunlop Rubber Co. has secured a monopoly for motor tyres, the importation of which, except under special licence, has been prohibited. Another monopoly, this time for the manufacture of printing ink, has been granted to an Edinburgh firm, and there are rumours of several others.

The procedure in such cases is for the foreign manufacturer to form a subsidiary Irish company in which two-thirds of the voting power must be held by Irish nationals, but there is apparently nothing to prevent these shareholders from being merely nominees.

When one of these monopolies has been granted, so far as can be ascertained, no competitor, whether of Irish or foreign nationality, will be allowed to enter that particular field of industry, and the Press and people generally are very much concerned as to the effect on prices these monopolies are going to have, particularly as the cost of living in the Free State is already substantially higher than in England.

British exporters to the Irish Free State are thus faced with two alternatives: either to get in first and build a factory over there, or to carry on as before with the possibility, which may before long become a probability, of waking up one morning to find that their products have been added to the list of prohibited imports.

The Free State Government will, of course, find as did Soviet Russia, that home industries, such as beet sugar and industrial alcohol, cannot be started and carried on just by voting the necessary money: technical staffs must be provided. In this connection it appears that the colleges of the Irish University in Dublin and Cork are preparing to give instruction in chemical technology as well as the present purely academic courses in chemistry. Some Irish chemists have been sent to Holland to study the manufacture of industrial alcohol from potatoes over there.

There is so far no attempt being made to give instruction in chemical engineering, but that will no doubt come in time when the development of the chemical industry has advanced sufficiently to warrant it.

At the Sign of the Cheshire Cat—IV

THOUGH without method, our musings have behind them the unhappy feeling that, at Aberdeen, in 1934, Sir James Jeans and Co., acting for British Asses, Ltd., even though aided by our precious Cat, have failed to supply the entire and fine ales the public had a right to expect from so old established a firm. They have given frills and froth, for the most part. Their beer, like that of most brewers of the day, was not " The Best " but with too much sugar used in place of honest malt and insufficient nitrogen to carry over a healthy head of barm for the next brew. B.A., Ltd., in the near future, must pitch their yeast in a wort, with substance, of far higher gravity or go into liquidation; their thin ales no longer meet public demands. Without character or palate fullness, however bright to the eye, they are in no wise to be described at *Mellering to the organ.* Had Mr. Wegg, wandering through the sections, cast his eye along their shelves, he would have seen little upon them he would like well enough to have it down nor have found pies equal to the "weal-and-hammers" of 1885.

That no picture of the advance of natural knowledge since 1885, all but fifty years ago, should have been drawn this year, is more than surprising. We may well ask ourselves what, on balance, is the advance made?

A Pious Hope

Sir Lyon Playfair, a far-sighted statesman after being a professor of chemistry, perhaps because he had been one, while speaking of the task of federating our vast Empire, into a political unit, " as a work only to be accomplished by the labours and persistent efforts of perhaps generations of statesmen," could contemplate " the federation of its science as a subject of dimensions within the range of experiment." He was but speaking in terms of hocus pocus, of pious hope, such as are usual on these occasions—giving his fellows credit for an intelligence not within their ambit. Playfair stands alone in the history of British statesmen, on account of his scientific qualifications and the breadth of his public outlook, as shown in his works.

Actually, individualism has triumphed over fraternalism everywhere—never more than at the present moment. The march of affairs has been anti-scientific, against the dictates of knowledge and experience—because so little progress has been made in the use of knowledge in the conduct of world affairs. The scientific qualifications of present-day administrators are contemptible.

Playfair's lighter task has not even been attempted. Our scientific fraternity is the greater sinner. The Royal Society does nothing to make itself effective in the interests of Natural Knowledge, let alone of the public; in fact, it goes out of its way to put experience aside. The Council is self-appointed and of short life: therefore, necessarily, a mere cover for the doings or undoings of the official element; actuated by no clear-cut policy, it is mainly in the hands of secretaries who become spiritually unadventurous and autocratic through over-long service.

Chemistry Split into Camps

Worst of all is the state of Chemistry, split up as it is into camps, in no way correlated in their actions, serving only to breed a narrow and selfish specialism. The several societies would seem almost to be purposively bent upon making a science of chemistry impossible: the upgrowth of an informed chemist a mere matter of chance. Industry gives no help and itself sets a bad example, by taking every possible opportunity, under the excuse of "rationalisation," of glorifying a narrow commercialism at the expense of technical ability. Modern rationalisation has steadily spelt diminution of technical efficiency—it necessarily must, as it has been mainly the work of the commercial element in our society.

The writer knew the late Lord Playfair well in his most effective period. Were he alive to-day, such a man would be the first to take exception to the present administrative inefficiency in scientific circles. In his address, in 1885, he drew attention to the way in which, after the Franco-German war of 1870, the Institute of France discussed the important question, " Pourquoi la France n'a pas trouvé d'hommes supérieurs au moment du péril?" The general answer was, because France had allowed university education to sink to a low ebb. Our condition to-day is not unlike that of France in 1870. Our answer is that our university education is not of the right kind—there is only too much of the wrong kind.

To be or not to be? that is the question to the British Association

How are we to talk of progress if we have but bred the statesmen out of our ranks? The cry all the time is: " Physicians cure yourselves." We have to use our knowledge to make ourselves—our limitations and our ignorance—known to ourselves; to use it to help ourselves, not merely make machines. We cannot but cry shame upon ourselves, if we reflect upon the infinite delicacy and beauty of the instrumental appliances at our command and contrast these with the utter coarseness of the means of regulating our own actions and of raising our abilities.

A World-Wide Failure

The British Association but mirrors, after all, the world-wide failure to use knowledge to other than mechanical ends, patent in the present world-chaos. We have no ideals set before us in education. A few of us have unlocked the meanings of the great world of Nature but have failed thus far to make the knowledge of general avail. Man lives in the midst of infinite beauty, without understanding; caring for himself and his like alone; taking interest mainly in a few mechanical tricks. The service of knowledge should be in the hands of the Church, as the supposed guardian of truth. Will no Church arise to make this its office?

Sir Lyon Playfair's address in 1885 was one long dissertation, by implication, upon the value of scientific method. The President of A, Professor Chrystal, took as his subject " The diffusion of scientific knowledge." In B, also a similar subject, the development of the scientific spirit, was one of two themes discussed at length; the other being the nature of chemical change. In three out of the nine addresses delivered education was the main theme.

The whole of Professor Chrystal's address should be read. Two of his utterances may be repeated here.

" There are few things where the want of an enlightened scientific public strikes an expert more than the matter of scientific text books. If the British public were educated as it ought to be, publishers would not be able to palm off upon them in this guise the ill-paid work of fifth-rate workmen so often as they do, nor would the scientific articles and reviews in popular journals and magazines so often be written by men so palpably ignorant of their subject."

" All men practically engaged in teaching who have learned enough, in spite of the effect of their own early training, to enable them to take a broad view of the matter, are agreed as to the canker which turns everything that is good in our educational practice to evil. It is the absurd prominence of written competitive examinations that works all this mischief. The end of all education nowadays is to fit the pupil to be examined; the end of every examination not to be an educational instrument but to be an *examination* which a creditable number, however badly taught, shall pass. We reap but we omit to sow."

Main Sources of Evil

Both are main sources of evil in our teaching to-day. We need to burn most of the books and commit all examiners as such to penal servitude—otherwise no possibility of rational education will remain in our country. Section L of the Association has altogether failed the public in this connection. The complaints voiced in three of the nine addresses delivered in 1885 are those to be made to-day—however much architects, builders and apparatus purveyors may have gained from the introduction of Science so-called into the schools, there has been little advance in educational method.

Playfair saw the way out, when speaking of the way in which the old traditions of education stick to the schools, as a limpet does to a rock—the while apologising to the limpet, because this does sometimes move. He drew attention to the enlightened Chinese Emperor of old who invited 500 of the teachers with their books to Pekin and after giving a great banquet in their honour buried the lot in a deep pit. This we need to do to-day. We feel sure that Playfair would now sign the warrant. In 1885 he was milder and advocated milder means, "depending for their adoption on the force of public opinion." This has never yet been brought to bear. The public is sometimes said to be an ass. It certainly is in education, having no real care for its character. The needs of modern life will force schools to adapt themselves to a scientific age, said Playfair. This has not happened; they have only rendered lip service to our cause. We have only to consider the kind of appointment made over and over again to headmasterships to be clear on this point.

A Priestley Preface

Chemists have long taken the lead in promoting the teaching of natural knowledge, beginning with the great Priestley, who wrote as follows in the preface of his collected works published in 1790:

"I am sorry to have occasion to observe that natural science is very little, if at all, the object of *education* in this country, in which many individuals have distinguished themselves so much by their application to it. And I would observe that, if we wish to lay a good foundation for a philosophical taste and philosophical pursuits, persons should be accustomed to the sight of experiments and processes in *early life*. They should more especially be early initiated in the theory and practice of *investigation* by which many of the old discoveries may be made to be really *their own*—on which account they will be much more valued by them. And, in a great variety of articles, very young persons may be made so far acquainted with everything necessary to be previously known, as to engage (which they will do with particular alacrity) in pursuits truly original."

After Priestley, Liebig is to be regarded as the father of the laboratory method, though Faraday made a beginning in his Royal Institution Christmas lectures. Playfair himself made no slight contribution by introducing Liebig to England, one consequence being the foundation of the Royal College of Chemistry, Oxford Street, London; another was the institution of the Science and Art Department Classes. Then came Herbert Spencer, Charles Kingsley, Huxley and Tyndall.

About 1885, not only was the state of the schools deplored; there was special outcry also against the neglect of research in the Universities and Colleges. W. H. Perkin, the first, was one of the most persistent advocates of original work. The subject was brought under notice at the Association meeting in 1884 by Sir Henry Roscoe, perhaps with less enthusiasm but more worldly wisdom, in the course of his Presidential Address in B. His statements have a very modern ring:

"Those who are to become either scientific or industrial chemists should receive as sound and extensive a foundation in the theory and practice of chemical science as their time and abilities will allow, rather than they should be forced prematurely into the preparation of a new series of homologous compounds or the investigation of some special reaction or of some possible new colouring matter, though such work might doubtless lead to publication. . . . the aim should be to prepare a young man by a careful and fairly complete general training to fill with intelligence and success a post either as teacher or industrial chemist, rather than to turn out mere specialists, who, placed under other conditions than those to which they have been accustomed, are unable to get out of the narrow grove in which they have been trained. . . . Far from underrating the educational advantages of working at original subjects, he considered this sort of training of the highest and best kind but only useful when founded upon a sound and general basis."

Elementary Instruction

In the Chemical Section, in 1885, the problem of elementary instruction was considered from a point of view more fundamental than that previously ruling among teachers, in effect that long before expressed by Priestley in 1790. Emphasis was laid upon the need of *creating an atmosphere of the spirit of inquiry* both in school and college. The method advocated was the so-called *Method of Zadig*—the *Heuristic Method*, as it came to be called. Although successfully put into operation here and there by a few enthusiastic if not inspired followers of the method, in practice it has been a failure, because but few teachers can do otherwise than teach doctrine and dogma; they are not prepared to exercise the thought and take the pains needed to train their pupils in the art of thinking for themselves. Hence it is that the public has gained so little from the so-called "science" teaching of the schools. Those who will not think for themselves cannot possibly train others to do that of which they are incapable.

The scientific habit of mind can never be a common possession; none the less, it is clear that much more might be than is done, if only far less were attempted.

During several years, after 1885, a small body, chiefly of chemists, was actively engaged, through the British Association, in formulating schemes of instruction, especially in chemistry, physics and botany. Their work greatly influenced the teaching in schools for a time. The outburst of enthusiasm culminated in the establishment, in 1901, of Section L for Educational Science. Hitherto, unfortunately, this has not answered expectations; it has never received the support of teachers generally, especially those engaged in teaching natural science; it has too often been the mere happy hunting ground of pseudo-scientific freaks. The so-called "Science Masters" have meanwhile formed an Association of their own, now a very large body. They meet yearly with great social advantage but profit not at all as educational experts; their time being spent mainly in imbibing tit-bits of information on ions and electrons and other transcendental subjects entirely beyond the range of schoolboys. They in no way attempt, by discussion, to improve themselves in the art of teaching. They as yet recognise no such art; in fact, as a class they have never been students of method. The great mistake has been made of allowing the schools to undertake work for which they are not suited, belonging to the colleges. The Board of Education has inconsiderately forced the pace by giving grants for higher instruction. The universities have allowed the schools to prepare not only for Matriculation but also for the Intermediate Examination. Now the control of teaching and freedom to experiment is further filched from the schools by the Certificate Examinations. Few realise how complete is now the slavery of the schools to outside control. They are in no way free to improve. Big fleas have little fleas, etc.; the preparatory schools must do as they are bid by those above them. The feet of our children are not bound as are those of the Chinese but youth is now mentally fettered in every direction and grows up so that it can only follow fashion, having no power to think for itself.

Too Big for their Boots

The "Science Masters," as a consequence, are made too big for their boots and forget that their office should be to lay foundations: to teach the simples of natural science and its underlying spiritual method, with full honesty of purpose, to the confusion of all pretence.

As Lord Playfair would have it, since 1885, a great experiment has been made: at least we know what not to do. A few of us have learnt that far too much has been attempted; that only a small minority can be made scientific in any proper sense of the term; that we shall do far more, if only we attempt far less. Yet, who shall lead? The "Old Gang" is gone—successors are not in sight. How then are we to speak of Progress? Our soils, we know, are being depleted by the rains of time. Are our senses too being washed away? We can deal, we know, with agricultural deficiency by methods of intensive culture—shall we not seek to discover similar means of improving ourselves?

The public must be made aware that that which is put upon it as education by the powers that be, from the British Association downwards, is just—Cant! Cant! Cant!

A VALUABLE property of tin compounds is described by Dr. E. W. J. Mardles in a publication issued by the International Tin Research and Development Council (Technical Publication, Series C, No. 2). The deterioration of oils used for engine lublication is due mainly to oxidation, which causes the formation of sludge, and is accelerated by copper, iron, and certain other metals. Tin and its components, on the other hand, are effective in inhibiting sludge formation.

Association of British Chemical Manufacturers

The Annual Dinner

THE eighteenth annual meeting of the Association of British Chemical Manufacturers, held in London on October 11 and reported in THE CHEMICAL AGE last week (pp. 323-324), was followed in the evening by the annual dinner, at the Dorchester Hotel, Park Lane. Dr. F. H. Carr, chairman of the council, presided over an assembly of just under two hundred members and visitors. The principal guests were: Representing the Board of Trade: Dr. E. Leslie Burgin, parliamentary secretary; Sir Horace J. Wilson, chief industrial adviser; Mr. L. Browett and Mr. A. E. Overton, commercial relations and treaties department; Mr. W. B. Brown, Mr. W. Palmer and L. M. Nash, industries and manufactures department; Mr. F. W. Hammond, secretary of the Dyestuffs Licensing Committee. Representing the Import Duties Advisory Committee: Sir Sydney J. Chapman and Sir Allan Powell, members; Sir Percy Ashley, secretary; Mr. H. Meadows and Mr. F. Cooper, staff. Representing the Home Office: Sir Russell Scott, permanent under-secretary; Mr. D. R. Wilson, chief inspector of factories; Mr. M. D. Perrins, secretary to the Poisons Board; Dr. Henry, medical inspector of factories. Representing the Department of Overseas Trade: Sir Edward Crowe, comptroller general; Mr. E. H. Bliss, assistant commissioner to the Overseas Trade Development Council. Other visitors: Sir Hugh Elles, Master General of the Ordnance; Sir Frank E. Smith, secretary of the Department of Scientific and Industrial Research; Mr. E. S. Burtenshaw, Customs and Excise; Mr. N. Garrod Thomas, general manager of the National Sulphuric Acid Association; Professor G. T. Morgan, president of the Chemical Society; Alderman Edwin Thompson, president of the Society of Chemical Industry; Mr. W. Macnab, president of the Institution of Chemical Engineers; Mr. G. E. Holden, technical advisor to the Colour Users Association; Mr. H. N. Linstead, secretary of the Pharmaceutical Society, and Mr. L. W. Meekins, commercial attaché to the United States Embassy.

The Organisation of the Industry

Responding to the toast of the Association, proposed by Sir Edward Crowe, Dr. CARR said it would have been impossible to find a more appropriate proposer of the toast than the Comptroller General of the Department of Overseas Trade. The health of their industry, like that of each one of them, depended upon a well-balanced diet with plenty of each vitamin, and the most important vitamin of their industry was export trade, which Sir Edward and his department had done so much to promote. A lack of vitamins meant deficiency disease; without export trade, we in this country would indeed suffer a deficiency disease. World-wide nationalism was creating difficulties which he was perpetually seeking to overcome, and it was true of almost every country to say that happiness and the health of industry would always continue to depend upon the export trade. It was eighteen years since the Association came into being. The two chief objects at the time of its formation were to promote co-operation in the industry, and to place views before the Government. It had achieved no small measure of success in both these objects. The interference they feared from the Government had become co-operation, and they were glad and proud to say that on every hand they could count upon sympathetic treatment in Government departments. Some credit for this was due to Government officials, many of whom they were delighted to have with them that night, as well as to their successive general managers, Mr. W. J. U. Woolcock and Mr. J. Davidson Pratt.

Though under the present and the preceding Governments they had had no reason to fear interference, it required no act of prophecy on his part to say that unless under their voluntary system they succeeded in organising their industry in the best way and for the common good, private enterprise would some day be replaced by State control, and it might be at no very far distant date. In the chemical industry, every new process, every new manufacture, every fresh improvement, was an adventure in which someone, or some group of people, must act freely according to the dictates of their own judgment. On this account, they had great and grave reasons to fear the sterilising effect of official control in the chemical industry. Progress in experiment always meant incurring a risk of failure, and this could not be undertaken when official sanction must first be sought.

They would not succeed in organising their industry in the best way for the common good unless they perpetually kept before them the question of co-operation from the point of view of efficiency. He was convinced that they had got to go a long way further in this direction. Men of vision like Lord Melchett, Sir Harry McGowan and Sir Max Muspratt had set a monumental example when they formed Imperial Chemical Industries, Ltd. They must make doubly sure that the present system of protective duties did not result in unnecessary duplication of plant with the resulting overproduction, senseless competition and price cutting. It was these which robbed them of opportunity for progress by expenditure on research and improvement in equipment. It was only by co-ordinating their efforts with constant regard to the common good that industry would justify the present system of voluntary control. It would never do so on the basis of pure selfishness, and they had to choose between this and the deadening effects of nationalism unless indeed they were going to fall a victim to the competition of countries where self-determination was fast disappearing. The Association's work in connection with safety, tariffs, trade marks, patents and so forth, brought the members together to work for the common good, and it was a great help to mutual understanding, but they had to look to action independent of the Association for many other steps which led towards the complete rationalisation of their industry.

Letters to the Editor

Proposed Agricultural Bibliography

SIR,—Many of your readers must be interested in agriculture, and would like to know that an attempt is being made to "unlock" the Science Museum Library at the Science Museum, South Kensington, for agriculture generally. This library contains no fewer than one hundred thousand books on agricultural subjects and already takes no fewer than two thousand journals connected with this subject out of a world's output of about four thousand. No other existing library anywhere contains such a collection as this. With this as a basis a service of information has been suggested which will place this country in the forefront in this direction.

The scheme will be in the hands of an independent Agricultural Bibliography Committee, members of which will be appointed by the leading Institutions, etc., supporting it. It will control financial and general operations. There will be a small practical committee to deal with matters concerned with the character of the information supplied to subscribers. When a search indicates that the available information on a special subject is incomplete, information of this will be passed on to our leading Research Stations and Agricultural Colleges, so that further data may be available in due course. The thoroughly practical nature of this bibliography is pointed out; and the fact that it will not interfere with, but supplement, any present activities in the direction covered, as these are carried on already by other organisations, or by research stations for their own special use. Names of intending subscribers and those subscribing to the guarantee fund should be sent to the undersigned.

I shall be pleased to supply further information to anyone interested as this may supplement that given in the June number of the Journal of the Central Chamber of Agriculture and elsewhere.—Yours faithfully,

W. P. DREAPER,
Hon. Secretary, League of Science.
(British Empire Section.)

27 Willow Road, London, N.W.3.

Developments in the China Clay Industry

Success of a New Steam-Drying Process

ALTHOUGH the china clay industry has been passing through the darkest period in its history and many of the old firms of producers have ceased to exist as a trading unit, it is gratifying to know that there are still some left to guide the trade to a more prosperous destiny.

In June of last year Mr. R. J. Varcoe, the managing director of the Greensplat China Clays, Ltd., introduced a new process for drying clay. After close study and experimentation Mr. Varcoe was convinced that the usual method employed in drying clay was both crude and wasteful. To dry clay with heat that had first to penetrate thick tiles varying from five inches to two inches was far from satisfactory from a producer's point of view, and three years ago he commenced an investigation on the new system of drying by means of steam-heated tubes which form the drying floor. At the outset, Mr. Varcoe discovered the remarkable fact that heat was not the main factor in the drying of clay, but contact and conduction, though such was contrary to both engineering practice and theory. Mr. Varcoe found that low pressure saturated steam was the cheapest, quickest and by far the best drying agent he had experienced throughout his association with the industry.

Having solved the problems connected with the action of the steam in producing the heat required, Mr. Varcoe applied himself to the task of discovering the best method of securing contact and conduction. Having decided on a brass tube triangular in shape of three inches each side, these were laid longitudinally with the flat side forming the drying floor which was 100 feet by 22 feet wide. The tubes were laid in cinders and sand and between each tube was a 3-inch layer of clay, so that practically the tubes and the clay formed the drying floor, thus securing direct contact with and conduction to the clay instead of heat.

A Cheaper Process

The heat was distributed over the whole floor and the clay placed on the floor was dried from end to end in the space of 24 hours, whereas with the old method only the part nearest the furnace is dried in 24 hours the rest of the kiln occupying from two to five days more. Apart from the cheapening of the process of drying, Mr. Varcoe had proved that the dried clay retained its chief qualities of body and plasticity to a greater degree than in the old way. The new floor is fed from a filter press which delivers $3\frac{1}{2}$ tons at a time, and the clay runs down to the dry at Trenance Siding by gravitation.

This has proved so successful that Mr. Varcoe has installed the Hensbarrow Clay Dry, close to Par Docks, which he has acquired for the Goouvean China Clay and Stone Co., Ltd., with a much bigger process. Here the old coal furnace with its brick and tile flues has been replaced by the new drying floor, 200 feet long. A Lancashire boiler has been placed in the centre and this feeds the brass steam tubes on either side, and it is in connection with this that Mr. Varcoe has further improved his system. In addition to this, Mr. Varcoe's enterprise and confidence in the industry has encouraged him to extend the new process to far more important stages than those mentioned.

Being the leading spirit of his firm, the Goouvean China Clay and Stone Co., Ltd., and having secured the Bodelva China Clay Works, Mr. Varcoe has erected a new dry on the docks at Par which will be supplied with clay from the Bodelva Works. The new dry is well designed, and not only equipped with the new drying process but illustrates a master mind and a dynamic spirit behind this wonderful enterprise.

For the first time a filter press has been installed on a movable principle and is fitted to a travelling bridge which can be moved over the whole drying floor, and this press is hose-fed from the pipe-line to the works at Bodelva some two miles distant. The drying floor is raised 20 feet from the ground and occupies a space of 100 feet by 22, allowing storage for clay on either side up to nearly 3,000 tons. Underneath, there is a large general store and an archway with rails laid in cement with a circular tram-line under the storage cellars to facilitate loading. At the end of the dry there is a weighbridge erected with a mechanical recorder and the clay is then tipped into a bin. On the docks' edge a large electrically-driven derrick crane has been constructed and a 65 feet jib fitted with a self-acting grab which takes up the clay, $1\frac{1}{2}$ tons each operation, and places it into the hold of the ship.

This is certainly a remarkable advance in the process of china clay production and a great achievement in the present condition of the trade, and Mr. Varcoe and the Goouvean China Clay Co. surely deserve high praise for such astonishing enterprise.

Death of Mr. T. Whitaker

Original Member of Three Chemical Organisations

THE death occurred last week at the age of 82, at his home in Pemberton Drive, Bradford, of Mr. Thorp Whitaker, who was last year's president of the Society of Dyers and Colourists. Mr. Whitaker was a director of the Bradford Dyers' Association, and although he retired from active service in 1927 he had continued in close touch with the Association and he visited the offices and laboratories less than a week before he died. He was one of the few surviving founder members of the Society of Dyers and Colourists, an original member of the Society of Chemical Industry, which was founded in 1881 and a member of the Colour Users' Association from its formation until the end of his life. He was also a member of the Worshipful Company of Dyers.

Mr. Thorp Whitaker was born in 1852, the son of a Bradford gas engineer, and as a boy he commenced his business career with Edward Ripley and Sons, of Bowling Dyeworks. In 1874 he won a scholarship in chemistry at the Royal College of Science and Technology, London, and he studied under Professor Edward Frankland, F.R.S. He was offered an academic appointment, but he declined it in favour of a business career, and became chemist to the Barnsley Gas Co. Later he proceeded to Leeds University, where he studied under Professor T. E. Thorpe, F.R.S., and attended a series of weekly lectures on dyeing given by Professor Schorlemmer at Owen's College, Manchester.

In 1877 Mr. Whitaker became works chemist for Edward Ripley and Sons, with whom he had commenced his career. At that time the firm were the largest piece dyers in England and they manufactured for themselves many of the acids and mordants required. Mr. Whitaker superintended the production of sulphuric, nitric and hydrochloric acids, salts of those acids, and soap. He also supervised the preparation of various natural dyes and tannins for use. Shortly before Mr. Whitaker became dyeworks chemist a few coal tar colours, such as magenta, Bismarck brown and the soluble blues, were in use and others had just been placed on the market. Chrysoidine, safranine, the acid oranges and the methyl violets were among these. Mr. Whitaker was one of the first colour chemists to deal with coal tar colours on a growing scale.

On the formation of the Bradford Dyers' Association, Mr. Whitaker was appointed chief chemist, and he built and ran the central laboratory. He was also in charge of the Low Moor Chemical Co., making picric acid (lyddite) for use during the Boer War and the Great War. Amongst many other offices, Mr. Whitaker had been chairman of the chemical section of the Bradford Chamber of Commerce.

ARGENTINE imports of soda ash during the first half of 1934, according to unofficial statistics compiled from ships' manifests, totalled 14,723 metric tons. Shipments originated as follows: United Kingdom, 9,375 tons; United States, 2,617 tons; Japan, 1,565 tons; Kenya, 448 tons; Uruguay (probably re-exports of Russian ash), 431 tons; and Russia, 287 tons.

Personal Notes

MR. H. E. MIDGLEY has joined the board of the Brush Electrical Engineering Co., Ltd.

Dr. Leslie Burgin, M.P., Parliamentary Secretary to the Board of Trade, has appointed MR. R. C. BRYANT to be his private secretary, in place of Mr. W. G. Weston, promoted.

MR. JAMES LOMAX, of Bolton, who was director of the microscopical section of the Lancashire and Cheshire Coal Research Association, died on Monday, aged 75.

DR. W. R. FEARON, author of a new play "Parnell of Avondale" which deals with the famous Irish leader, Charles Stewart Parnell, is a professor of bio-chemistry in Dublin University.

MR. ROBERT GRIEVE NEILL, formerly partner of Neill, Dempster and Neill, sugar refiners, Greenock, who died aboard his yacht *Fitheach Ban* while cruising, on July 5, left moveable estate in Great Britain valued at £114,836.

MR. L. D. GALLOWAY, since 1927 mycologist to the British Cotton Industry Research Association, where his work has been on mildew and related problems, has just been appointed to the post of Imperial Mycologist, Agricultural Research Institute, Pusa, India.

PROFESSOR SIR ARTHUR SCHUSTER, for twenty years professor of physics at Manchester University and president of the British Association in 1915, died at his home at Twyford, Berkshire, on October 14. He was eighty-three, and had been ill for over a year. A brother of Sir Felix Schuster (a director of the National Provincial Bank), he came of a prominent banking house, that of Schuster, Son and Co.

MR. JOSEPH ROGERS, J.P., who died at Falmouth, is another distinguished china clay producer in the Duchy of Cornwall. He was in his 80th year. For 40 years he was keenly interested in the municipal life of Truro and in 1880 was chosen Mayor of the City. Mr. Rogers was associated with the late Mr. John James, a former Mayor of Truro, in numerous industrial undertakings, principally china clay works and china stone quarries, under the trading title of J. Rogers and Co., of Newquay, which included the great Wheal Remfry China Clay Works, near S. Dennis, since acquired by H. D. Pochin and Co., Ltd., and now absorbed in the English Clays, Lovering Pochin and Co., Ltd.

The death is announced of MR. EDMUND HOWL (86), The Quarries, Sedgley, who, in a varied and active career, made a great contribution to the industrial development and well being of the Black Country. He was a mining and mechanical engineer, general manager of the South Staffordshire Mines Drainage Commission, chairman of Lee, Howl and Co., Ltd., Tipton, a director of the South Staffordshire Mond Gas Co. and a member of the Chemical Society. Mr. Howl was among the first to urge the use of gas for commercial purposes and was associated with Dr. Ludwig Mond, father of the first Lord Melchett, in establishing the South Staffordshire Mond Gas Co., an undertaking for the production and distribution of power gas for industrial purposes. He was also a pioneer advocate of the application of electricity to industry in connection with the undertaking now known as the Midland Electric Corporation for Power Distribution, Ltd.

The Onyx Oil and Chemical Co., Jersey City, N.J., has founded an industrial fellowship in the Mellon Institute of Industrial Research. This fellowship, whose incumbent is DR. ROBERT N. WENZEL, is concerned with the scientific investigation of problems in textile processing and finishing. Dr. Wenzel has been an industrial fellow of the Mellon Institute since 1927. He received his A.B. at Stanford University in 1916 and his Ch.E. the following year; subsequently, in 1928, after serving as a research chemist at the Monsanto Chemical Works (1918-1922) and after five years of teaching at Stanford, he was awarded the degree of Ph.D. by that university. He is a specialist in organic chemistry and best known professionally for his studies of fatty acids and related compounds. In his investigations for the Onyx Oil and Chemical Co., Dr. Wenzel will have the close co-operation of the textile specialists on the Institute's research staff. At present the Institute has five different fellowships in the field of textile technology.

LIEUT-COLONEL WILLIAM THOMAS COX, managing director of Ellerman Property Trust, has joined the board of the Rubber Regenerating Co.

MR. ARTHUR ASHWORTH (76), of Dunster's House, Elton, Bury, governing director of Arthur Ashworth, Ltd., manufacturing chemists, Fernhill Chemical Works, left £66,933 (net personalty £65,091).

At a general court of the Dyers' Company, held on October 10 to elect wardens for the coming year, MR. ROBERT HAROLD GOODSALL, F.R.I.B.A., was elected Prime Warden and DR. GERALD TATTERSALL MOODY, Renter Warden.

MR. J. W. TANGYE, assistant managing director of Tangyes, Ltd., has left England for a business tour of the world, and is first of all proceeding across Europe to the Near and Far East, and after calling at New Zealand, will travel to South America and other parts. It is expected Mr. Tangye will be so occupied for a period of about fifteen months.

At the opening meeting of the Session of the Oil and Colour Chemists Association on October 11, MR. M. E. DOUGHERTY, a member of Council, was presented with a gold cigarette case as a recognition of the work he has done for the Association. The case bore the inscription "To M. E. Dougherty from his colleagues on the Council of the Oil and Colour Chemists Association, 1930-1933, as a token of appreciation." The presentation was made by Mr. J. A. Frome Wilkinson, immediate past-president.

Almost a year ago the O. Hommel Co., of Pittsburgh, founded an industrial fellowship in the Mellon Institute for the purpose of investigating scientifically problems of importance in enamel technology. Mr. Jack H. Waggoner was appointed to this fellowship, and he has been studying broadly the applications of the frits produced by the O. Hommel Co. and has also been giving research attention to problems encountered in the industrial use of these products. Recently the Hommel Co. authorised the Mellon Institute to add another specialist to this fellowship, and MR. WILLIAM J. BALDWIN has been appointed to this post. Mr. Baldwin is a ceramic chemist educated professionally at the University of Buffalo (B.S., 1926) and was in the employ of the American Radiator Co. at Buffalo from 1926 until he joined the Institute on October 1. During his eight-year connection with the American Radiator Co., Mr. Baldwin became acquainted with the problems of vitreous enamel. He gained experience in the analysis of raw materials and the utilisation of various chemicals in frit making. In addition to laboratory research work on vitreous enamels he has had practical experience in the wet-process enamelling field. Mr. Baldwin will devote most of his time to investigations in plants. His services will be available to companies confronted with problems relating to frits and their industrial use.

A Highly Concentrated Deodoriser

BY using "Vioflor" special deodorising compound, which is supplied by Crepin and Doumin, Ltd., manufacturers of distempers, printing inks, etc., and refiners of white spirit, turpentine substitutes, can remove any objectionable odour from their products, without in any way impairing the quality or the suitability of such products for intended industrial uses. Vioflor is a most highly concentrated standard deodoriser, which never varies. It embodies an entirely new principle, for whereas essential oils used as deodorisers are highly volatile, and their effect is consequently evanescent, the efficacy of Vioflor remains unimpaired. Crepin and Doumin, Ltd., are at all times ready to give the benefit of their experience, for meeting special requirements, or producing an effective deodorant adapted for materials other than those above indicated.

THE improved agricultural situation in Spain this year is reflected in the sales of fertilisers, especially of superphosphates but also of potassium salts. The consumption of fertilisers in May amounted to almost 50,000 tons, compared with only 33,000 tons during the preceding May.

British Overseas Chemical Trade in September

Slightly Lower Export Figures

THE Board of Trade returns for the month ended September 30 show that exports of chemicals, drugs, dyes and colours, were valued at £1,572,547, as compared with £1,614,802 for September, 1933, a decrease of £42,255. Imports were valued at £986,196, as compared with £830,174; re-exports were £37,920.

Imports

	Quantities. Month ended September 30, 1933.	Quantities. Month ended September 30, 1934.	Value. Month ended September 30, 1933. £	Value. Month ended September 30, 1934. £
Acids—				
Acetic .. .. cwt.	13,409	14,970	21,673	24,471
Boric (boracic) ,,	3,115	4,910	2,873	4,626
Citric .. .. ,,	220	341	671	917
Tartaric .. ,,	2,768	1,345	10,391	5,831
All other sorts .. value	—	—	7,595	7,159
Calcium carbide .. cwt.	87,147	83,677	49,074	53,550
Potassium compounds—				
Caustic and lyes ,,	89,596	9,174	10,578	11,163
Chloride (muriate) ,,	130,196	230,958	53,039	67,936
Kainite and other mineral potassium fertiliser salts .. cwt.	190,617	361,976	36,304	61,053
Nitrate (saltpetre) ,,	10,244	29,999	9,161	12,047
Sulphate .. ,,	78,136	278,869	37,254	97,342
All other compounds ,,	7,790	8,900	12,998	15,425
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	9,151	262	2,724	189
Chromate and bichromate .. .. cwt.	1,495	2,468	2,195	3,528
Cyanide .. ,,	2,000	800	4,789	1,831
Nitrate .. .. ,,	—	30,295	—	6,220
All other compounds ,,	30,237	15,291	19,886	11,192
Other chemical manufactures .. .. value	—	—	202,019	211,675
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	177,688	114,728	13,377	9,661
Medicinal oils .. cwt.	2,604	1,470	5,913	7,531
Ointments and liniments cwt.	27	2	665	183
Proprietary medicines value	—	—	25,016	63,104
All other sorts .. ,,	—	—	30,999	21,441
Raw or simply prepared value	—	—	35,169	41,552
Finished dyestuffs (coal tar) .. .. cwt.	2,965	2,816	68,307	75,587
Extracts for tanning—				
Chestnut .. cwt.	34,110	14,658	23,699	10,325
Quebracho .. ,,	16,999	30,231	10,483	17,743
All other sorts .. ,,	22,004	20,903	10,713	14,220
All other dyes and dyestuffs, etc. .. cwt.	4,402	3,538	9,587	15,366
Painters' colours and materials—				
White lead, basic carbonate .. cwt.	7,462	6,855	8,876	8,089
Lithopone .. ,,	19,251	15,370	13,043	10,090
Ochres and earth colours cwt.	24,756	22,298	9,570	8,127
Bronze powders ,,	3,304	1,117	11,082	7,956
Carbon blacks .. ,,	53,451	27,175	49,272	41,982
Other pigments and extenders, dry .. ,,	21,665	23,333	6,490	7,370
All other descriptions ,,	6,653	15,674	17,089	29,714
Total .. .. value	—	—	839,174	986,196

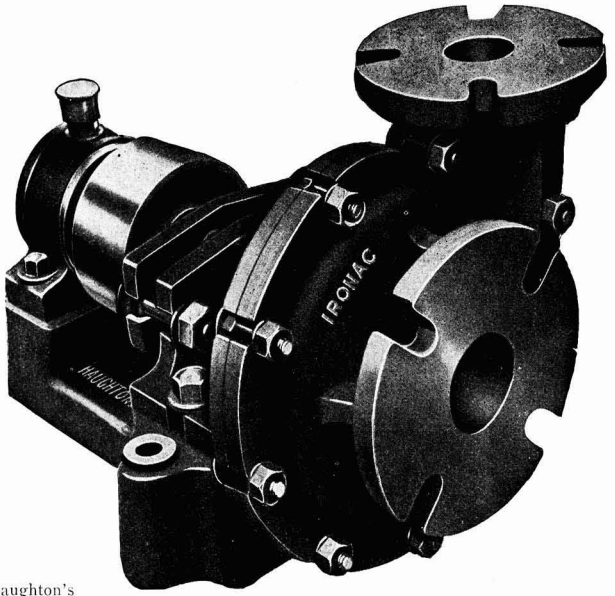
Exports

	Quantities. Month ended September 30, 1933.	Quantities. Month ended September 30, 1934.	Value. Month ended September 30, 1933. £	Value. Month ended September 30, 1934. £
Acids—				
Citric .. .. cwt.	2,310	3,143	8,248	10,731
All other sorts .. value	—	—	26,836	19,166
Aluminium compounds tons	1,467	1,005	8,255	5,304
Ammonium sulphate ,,	40,422	19,591	253,414	114,998
Other ammonium compounds .. tons	605	958	11,379	14,504
Bleaching powder (chloride of lime) .. cwt.	48,675	42,903	13,800	12,418
Tar oil, creosote oil, etc. gal.	1,373,584	3,105,003	21,059	59,568
Other coal tar products value	—	—	30,470	26,408
Copper, sulphate of tons	591	331	9,174	4,254
Disinfectants, Insecticides cwt.	45,308	36,340	107,899	73,609
Glycerine .. .. ,,	15,829	12,234	30,778	28,710
Lead compounds .. ,,	10,944	13,539	13,204	17,252
Magnesium compounds tons	437	433	9,620	10,300
Potassium compounds cwt.	5,875	6,385	13,725	15,445
Salt (sodium chloride) tons	24,870	22,089	65,829	56,457
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	251,358	327,427	73,558	83,059
Caustic .. .. ,,	97,664	172,203	66,872	94,110
All other sorts .. ,,	103,200	104,229	76,629	93,438
Zinc oxide .. tons	1,078	986	21,972	18,810
All other descriptions value	—	—	179,798	214,460
Drugs, medicines—				
Quinine and quinine salts oz.	132,804	125,097	13,518	14,079
Proprietary medicines value	—	—	97,910	112,444
All other descriptions ,,	—	—	119,758	121,446
Finished dyestuffs (coal tar)—				
Alizarine and indigo (synthetic) .. cwt.	937	1,446	7,707	9,617
Other sorts .. ,,	5,635	5,994	70,680	84,709
All other descriptions ,,	18,977	28,428	22,757	32,281
Painters' colours and materials—				
Ochres and earth colours cwt.	18,012	15,365	20,262	13,970
Other descriptions ,,	17,205	20,054	16,999	23,971
White lead .. ,,	5,310	6,745	9,776	12,200
Paints and painters' enamels, prepared cwt.	33,396	34,598	88,765	88,260
Varnish and lacquer gal.	61,186	61,958	25,646	24,619
All other descriptions cwt.	38,046	27,713	78,505	61,950
Total .. .. value	—	—	1,614,802	1,572,547

Re-Exports

Chemical manufactures and products .. value	—	—	14,837	10,964
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	41,152	11,751
Raw or simply prepared value	—	—	7,199	13,369
Dyes and dyestuffs cwt.	1,095	700	2,057	1,145
Painters' colours and materials .. .. cwt.	698	261	872	691
Total .. .. value	—	—	66,117	37,920

Works Equipment News

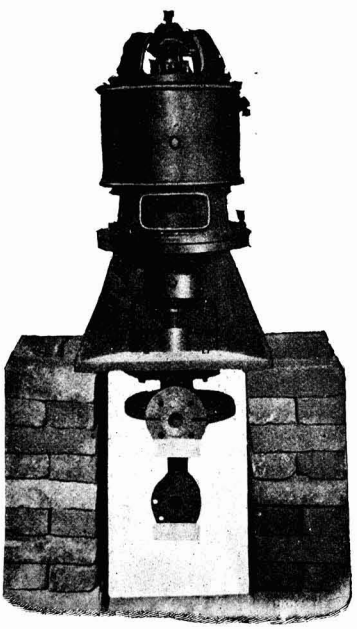


Ironac Centrifugal Acid Pump for Nitric Acid, fitted with pulley and with outside ball bearing, suitable for Explosive Works etc.

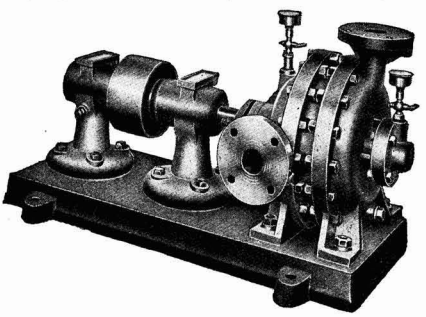
A Choice of Acid Pumps

REGULUS metal pumps are supplied by Haughton's Metallic Co., Ltd., and used with success in vitriol works, superphosphate works, and for general purposes, where it is required to pump sulphuric acid. They are suitable for lifting sulphuric acid for all purposes up to 40 feet. As there are no valves and no parts to get out of order they are reliable for filling and emptying tanks and vessels, and are considerably more efficient than compressed air and acid eggs. They are suitable for Glover towers and Gay-Lussac towers not requiring a greater lift than 40 feet.

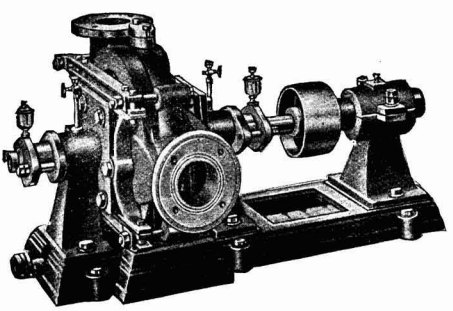
In the Haughton two-stage high-lift acid pump it will be observed that there is only one gland to the pump; this being on the suction side is subject to atmospheric pressure only, and therefore never gives trouble as regards leakage. There is no gland on the pump subjected to the pressure of acid. By the multiple stage construction pumps can be arranged for lifting to great heights whilst working at a comparatively moderate speed. These pumps are suitable for driving from electric motors, and steam can be dispensed with entirely. These pumps are also extensively used for supplying Glover



Combined Electric Driven Vertical Centrifugal Pump for Acid, coupled direct to Electric Motor.



Two-Stage High-Lift Acid Pump.



Regulus Metal Acid Pump for Sulphuric Acid.

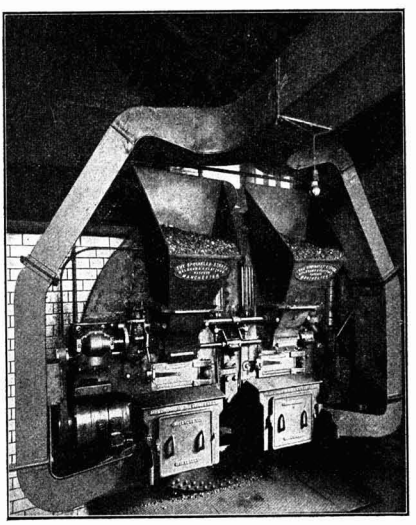
and Gay-Lussac towers with acid in sulphuric acid works. It is admitted that a great economy can be obtained with pumps of this description as compared with acid eggs and compressed air, and such pumps are now extensively in use both in Great Britain and abroad. The cost of such pumps is much less than air compressors with acid eggs and boilers, and the efficiency under continuous working is very considerably greater and in favour of multiple stage pumps.

Haughton's "Ironac" centrifugal pump for nitric acid manufacturers, aniline works, explosive works, celluloid industries, dye works, etc., has supplied a long-felt want for a reliable and efficient nitric acid pump made entirely of metal. The expense and inefficiency of acid eggs, compressed air and so-called automatic devices for lifting nitric acid, have proved over and over again defective; whilst pumps of earthenware are notoriously troublesome and always to be avoided. These "Ironac" centrifugal pumps, however, are now greatly in demand, as "Ironac" absolutely resists the corrosive action of nitric and sulphuric acids and is extremely durable. These pumps are fitted with driving pulley and with outside ball bearings. All parts in contact with acid are made of acid-resisting iron and are therefore non-corrosive, and special arrangements are provided to avoid leakage at the gland. Direct-driven electrical pumping sets are supplied for acid towers. An illustration on page 359 shows one of these vertical centrifugal pumps coupled direct to an electric motor. It will be seen that this arrangement for pumping sulphuric or nitric acid possesses very distinct advantages. The pump is suspended in a pit below ground, and is supplied complete with electric motor and distance piece superposed as shown. In the event of any leakage from the pump, this can easily be dealt with. The direct-driven pump can be run at high speed from the electric motor, and the sets are supplied for a capacity of 5, 10, 15, 20 or 25 tons of sulphuric acid per hour. The pumps have a regulus metal body and connections, and are fitted with an "Ironac" impellor and shaft.

Steam Raising Developments in 1934

THE policy of having ample boiler capacity to give easy steam raising under natural draught conditions is gradually giving place to that of getting the last ounce of steam from new or existing boilers and to increase their steaming abilities to the highest degree.

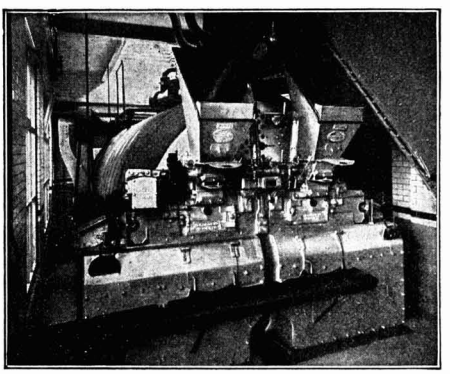
The very latest system to achieve this is the new "Meldrum" fan forced draught mechanical stoker. One of the accompanying illustrations shows an installation at a carpet factory in Yorkshire. This unit is entirely independent of the main factory drive or overhead shafting, and is by means of an integral motor drive built on to the stoker front so that the boiler can be quickly brought to full steaming capacity in the minimum of time and maintained there irrespective of whether the main drive is stopped or not. The fan draught is also maintained by electric motor and this maintains the furnace efficiency irrespective of the boiler steam pressure—an important feature when the boiler has been loaded to full capacity, and sometimes a little over at peak load times.



Installation of "Meldrum" Fan Forced Draught Mechanical Stokers at a carpet factory in Yorkshire.

A further important feature now that smoke abatement is imperative is that this stoker is unique in its construction in that it is the only type employing a stoker front of hollow construction, that is, with double walls; this is for the purpose of admitting a portion of the fan draught as secondary air into the furnace. This secondary air is taken by branch duct from the main duct and admitted into the hollow stoker front at points behind the hoppers, circulates inside the hollow front (absorbing further heat) and is admitted into the furnace through perforated side baffles; it is under fine control by dampers, as is also the air for combustion under the grates. Incidentally, it keeps the stokers cool and thereby gives lengthened life.

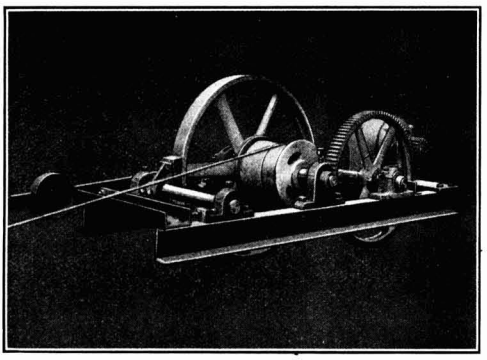
A further step in high boiler efficiencies has been the introduction of the Daniel Adamson patent super Lancashire boiler, wherein the functions of the economiser and air heater are carried out in the boiler setting itself. Incidentally, the Meldrum stoker, already described, has been specified and supplied to the order of Daniel Adamson and Co., Ltd., for all their new boilers with one or two exceptions. This stoker is being largely installed with the well-known Meldrum forced draught by steam jets; also for their hand-fired forced draught furnace which is adaptable to all kinds of steam boilers, coppers, kilns, and heating furnaces.



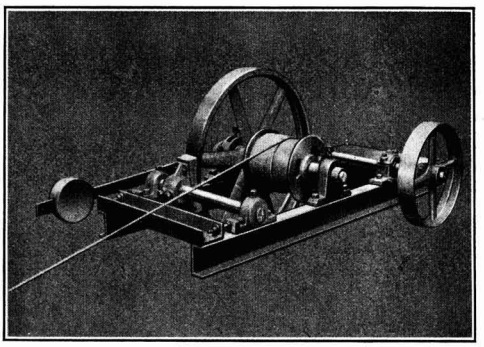
The "Meldrum" Sprinkler Stoker with direct Motor Drive, fitted to an Adamson Super-Lancashire Boiler with Air Heater, at a Yorkshire woollen mill. This installation shows an efficiency of 84 per cent.

Useful Friction Cranes

THE friction cranes and hoists made by Crofts (Engineers), Ltd., are of exceptionally sturdy design, suitable for continuous working and simple and easy to control, with high lifting and lowering speeds. The brake is applied automatically in any position, when the control rope is released. Lifting speeds are high and the crane hoist can be accepted



Motor-driven Friction Crane, showing complete assembly without Jib, ready for mounting in position. Hoisting and lowering is controlled by handrope. Motor can be started by switch or push-button.

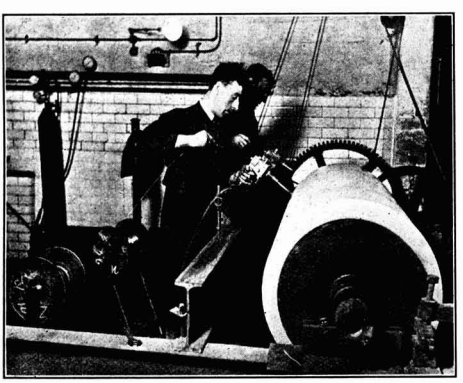


Pulley-driven Friction Crane, showing complete assembly without Jib. The drive is taken by belt from line or counter-shaft. Hoisting and lowering is controlled by handrope from any convenient position.

as being thoroughly reliable and suitable in every respect for the handling of goods up to the rated capacity. Many hundreds of these cranes are in operation in factories and warehouses for the handling of all classes of goods. Crane hoists are supplied either as self-contained units including electric motor, fitted with pulley to be driven from lineshafting, or with petrol-driven engine with gear or chain drive to hoisting mechanism. Standard sizes range from 5 to 20 cwts. Hoisting, lowering, etc., is hand-controlled from either local or remote positions. The lifting or pulling rope can be used in any direction.

Metal Coatings by Spraying

THE accompanying photograph shows one of two steam-heated evaporating rollers, each 28 in. diameter by 5 ft. long, which are being sprayed with electrolytically pure nickel to a thickness of 1/16 in. These rollers are for the evaporation and crystallisation of medicinal salts. When first installed, this evaporating machine was equipped with polished cast



Steam Heated Evaporating Roller being sprayed with electrolytically pure nickel to a thickness of one-sixteenth of an inch.

iron rollers, but unfortunately the process proved unsatisfactory for medicinal usage. After considerable research it was found that nickel was the only satisfactory metal to meet the users' needs, but owing to their size it was impossible to cast these rollers in nickel, and covering with sheets was not permissible owing to the joints. Metal spraying by the "Schoop" process was then found to be the only one that could be adopted, and the firm of Sprametals Manchester were entrusted with the contract. After being sprayed the rollers were ground up and polished very carefully by the makers, Bertrams, Ltd., and are now in satisfactory operation. The same company have since placed contracts for spraying internally with nickel large mild steel storage tanks used for the storage of the salt solutions, but in these cases the surface was well brushed up after spraying as grinding was not practicable.

In addition to nickel coatings, any metal that can be drawn into wire form can be sprayed on to any other metal or fabric, lead, zinc, cadmium, tin, aluminium, copper, brass, iron and stainless steel being successfully applied. For resistance to the action of acids on wrought iron or steel, lead has been generally accepted as most suitable. The usual method of coating with lead has been by covering with sheet lead strips and burning up the joints, in which process it is always difficult to ensure adhesion to the base metal, whereas the spraying process, when properly applied, ensures perfect adhesion and no air pockets.

Practically any chemical action can be met and counteracted by some metal coating and the spray process makes this possible at a cost much below making the necessary articles from the natural metals. In the dyeing and finishing of textiles many chemicals are employed which affect iron and steel portions of plant; this action may be overcome in a large number of cases with a suitable metal coating. The great advantage of the process is that there is no heat from the spray to cause any distortion of the object being coated, in fact, it can be applied to paper and even to the finest of silk net without any scorching or damage to the fabric. In addition, there is no limit to the thickness of coating, any depths from one thousandth of an inch upwards can be applied.

Wool Bleaching Plant

MONEL metal equipment has proved very satisfactory for bleaching wool in alkaline solutions containing hydrogen peroxide. It has the particular advantage that it does not act as a catalyst in this type of bleaching solution. No special care is required in use with peroxide bleaching solutions, although care must be taken in the preparation of a bleaching solution using sodium peroxide and sulphuric acid. The common method of using sodium peroxide is to add to a bath a required amount of sulphuric acid and then to add ammonia or sodium silicate to adjust the alkalinity of the solution to the proper value. If this process were carried out in a Monel metal vessel a small quantity of metal would be taken into the solution by the strongly oxidising acid solution resulting from the addition of sodium peroxide to the acid bath. While the vessel itself would not be affected to any great extent, the bath itself would suffer some loss of bleaching power and the addition of alkali would tend to produce an insoluble precipitate. If, however, the sodium peroxide is first dissolved in water and put into the Monel metal equipment, acid can be added to the point of neutrality followed by the addition of ammonia or sodium silicate to the desired alkalinity. In this way the oxidising acid is not formed and no corrosion of the metal is likely to take place.

Notes and Reports from the Societies

Leather Trades' Chemists

British Section Meets at Shoe and Leather Fair

A MEETING of the British Section of the International Society of Leather Trades' Chemists was held at the Shoe and Leather Fair, Royal Agricultural Hall, Islington, on October 11, the president of the Section, Dr. A. Turnbull, in the chair.

Dr. C. H. Spiers reported on the progress made in connection with the forthcoming conference on "Technical Aspects of Emulsions" and a special vote of thanks to Dr. W. Clayton was passed for his invaluable help in the organisation of what promises to be an exceptionally successful conference. It was remarked that the papers read would not be published in the Journal of the Society, but in the form of a separate bound volume at a cost of 5s. 6d.

Mr. A. B. Craven then reported on the British Standards Institution and indicated that sub-committees had been formed upon which the Society had full representation.

Tannin Analysis

Mr. F. C. Thompson, of the British Advisory Committee on Tannin Analysis, mentioned several items which had been considered by the committee. In the first place, the difficulty in connection with a suitable kaolin was discussed, and it was stated that a satisfactory product had been prepared by British Drug Houses, Ltd., who would keep in stock a supply of tested kaolin. The second, a very important point, was in connection with the analysis of such materials as valonia, which, according to the official method, had to be heated for 1 hr. between 100-105° C. prior to extraction. It has been found that differences had been observed between samples which had been heated to 100° C. and 105° C. respectively. The difference was even apparent in the appearance of the extract obtained, while heating at the higher temperature resulted in a higher figure for the total solubles and tannin. It was strongly suggested that such materials as valonia be heated at 105° C. for exactly one hour prior to extraction and with no tolerance of 5° C. as at present permissible.

Indicators and Organic Acids

Unfamiliar properties of indicators and organic acids were the subject of a paper by Dr. G. M. Richardson. He said the use of indicators for acidimetric titrations is an old device. At the same time, the recent adoption of the pH notation has permitted a more precise description of the principles involved. Complete titration of an acidic or basic group requires that the indicator endpoint shall be at least 2, and preferably 3 pH units removed from the pK of the group titrated. This requirement makes it impossible to accomplish many titrations otherwise desirable (*e.g.*, acid titration of the salts of carboxylic acids). Effects, hitherto dismissed as "indicator errors," are now utilised to increase the scope possible to titration methods. These effects (1) of miscible organic solvents, (2) of inert salts, and (3) of temperature, have quite different magnitudes and are also characteristically different with acids and bases. Because indicators are themselves acids and bases, these effects may give rise to the relative shifts of acid and basic strength which become visible as the so-called errors. The largest and most useful of the three effects is the miscible solvent effect as, *e.g.*, addition of ten volumes of acetone will weaken the acidity of all acids (and acid indicators) other than strong inorganic acids by 3-4 pH units, bases being comparatively unchanged in strength. This allows the titration of salts of organic acids and also the differential titration of strong acids in presence of organic acids, as described by Richardson ("Proc. Roy. Soc.," 1934, B.115, *170*, 115) and applied to leather extracts by Innes ("J.I.S.L.T.C.," 1934, *18*, 457).

Dealing with the discolouration of vegetable tanned leather by iron impurities, Dr. M. P. Balfe said iron staining is due to the conversion of soluble iron impurities in tan liquors into a colloidal basic ferric tannate. The basic ferric tannate is precipitated at pH 2.7. Basic ferrous tannates are precipitated at pH 5.7. When tan liquors contain sulphites or sulphurous acid, the iron is kept in the ferrous form which is soluble at the pH values of the liquors. If such liquors lose their sulphur dioxide content, the iron passes into the ferric form, which causes staining if the pH value of the liquor is above 2.7. Iron staining in suspender liquors is due to the increase in pH value of the liquors caused by the introduction of lime with the hides. It is usually observed in suspender liquors which have low pH values because the colloidal form of the basic ferric tannate is most stable at low pH values, and is precipitated on addition of alkali. It is thus deposited on the limed hides. If suspender liquors are kept at pH values above 4.0, the iron is rapidly precipitated from the liquors and forms a harmless sludge.

Society of Chemical Industry

Road and Building Materials Group: Asphalt, Bitumen and Tar

AT the present time when so many conflicting claims are made for the materials used in the surfacing of road, it is interesting to note that a paper giving detailed consideration to asphalt, bitumen and tar was read on October 11, by Major D. M. Wilson, before a joint meeting of the Bristol Section of the Society of Chemical Industry and the Road and Building Materials Group.

Asphalt, said Major Wilson, occurred in natural state in France, Switzerland, Italy, Germany, and other countries, in the form of asphalt rock, which was a limestone naturally impregnated with bitumen. Asphaltic bitumen was a very complex mixture of hydrocarbons together with sulphur and nitrogen derivatives. Very little was known about its constitution, but it was thought to consist of colloidal carbon dispersed in a heavy oil. Different asphaltic crudes yielded bitumens of different properties; they could be prepared to have the same penetration, but their properties, especially the viscosity, varied widely. Efforts were being made to further the use of soft pitch with a view to replacing bitumen made from imported crude oils, and it was of interest to see how the properties of the two materials compared. In general, figures showed that the bitumen and pitch differed widely in their properties, and therefore could not be expected to replace each other in the manufacture of road constructional materials. For some purposes bitumen was to be preferred and for others the coal-tar product was the more suitable.

Improved Properties for Tarmacadam

Asphalt being by definition either a natural or a mechanical mixture, in practice there were road materials made from natural asphalt, either alone or in conjunction with other materials, and on the other hand purely artificial mixtures of asphaltic bitumen with mineral matter.

Apart from surface dressing the principle use of tar was for the manufacture of tarmacadam, for which purpose it had many desirable properties, particularly if slag was the aggregrate employed. Efforts were being made to improve the properties of tarmacadam as commonly supplied, and there was no doubt that if a technique similar to that adopted for asphalt were to be more generally applied a better product would result. Attempts had been made to construct surfacing mixtures of the asphalt type by using soft pitch in place of bitumen in hot process tarmacadam. Pitch was dearer than bitumen and so far the results had shown that it was more susceptible to temperature changes and was much less viscous than bitumen of the same penetration. Mixtures of pitch and tar had, however, been employed with some success in the "binder" course under asphalt carpets where they had been protected to some extent from extremes of temperature by the layer of asphalt.

The latter half of Major Wilson's paper dealt with the analysis and identification of road materials. It was pointed out that engineers and surveyors would do well to insist that samples of the raw materials it was proposed to use in road-surfacing mixtures should be submitted by the contractors before the work commenced.

AN important paper "Asphaltic Bitumen Emulsions for Road Purposes" will be read by Dr. F. H. Garner before a joint meeting of the Leeds Section of the Society of Chemical Industry and the Road and Building Materials Group, on Monday, October 29, in Leeds. The paper will give a brief account of the development of bituminous emulsions for road use, together with the general characteristics of commercial bituminous emulsions, and some account of the mechanism of the breakdown of emulsion on the road.

British Association of Refrigeration

Presidential Address

FOOD to the total of 2,500,000 tons, representing a value of over £87,000,000, which it would not have been possible to bring to the United Kingdom without refrigeration, had been imported during 1933, said Mr. R. S. Forsyth, in his presidential address to the British Association of Refrigeration at the Hall of the Institute of Marine Engineers, London, on October 16. This food consisted principally of meat, dairy produce, fruit, eggs and fish, and such figures made one realise the great dependence of Great Britain upon refrigeration for a large proportion of its daily food. Refrigeration could claim to have been one of the greatest factors in the development of the overseas portions of the Empire. Mr. Forsyth added that there was room for educating the public in the unlimited possibilities of refrigeration, and suggested that the time could not be far distant when broadcasting would be used for frequent and periodic communications on the great rôle which temperature control played in every department of the life of every citizen.

Oil and Colour Chemists

Manchester Section : Phenolic Resins in Oil Varnishes

THE new types of phenolic resins used for oil varnishes were described by Mr. George Dring, B.Sc., F.I.C., in a paper read before the Manchester Section of the Oil and Colour Chemists' Association, at the Manchester College of Technology, on October 12.

Phenol formaldehyde resins, said Mr. Dring, are the condensation products of phenol and formaldehyde and are known for their properties of becoming polymerised by the application of heat and pressure producing insoluble and infusible products. There is a very varied range of these resins which can be made from the various homologues and derivatites of phenol and also by the use of alkaline or acid catalysts. Phenolic resins are spirit soluble and as such have a limited use as varnish materials. The earlier types were not oil soluble, but efforts were put forward to produce this type of material which could be made up into an air-drying varnish.

Early efforts followed the lines of finding a material solvent for the resin and the oil. This resulted in the use of mixtures of phenolic resin and ester gum. Later a liquid resin was produced but further research resulted in an oil-soluble resin which was offered to the varnish-making trade. This latter resin in conjunction with oil produces varnishes with noteworthy properties of increased hardness, elasticity, resistance to abrasion and immunity against chemical attack. Some faults which these resins showed were notably their tendency to turn yellow by the action of light and also for finished varnishes to skin badly, due to active assistance in polymerisation of the oil. This latter fault has now been largely overcome. New qualities of resins now under test show freedom from yellowing, but these are not yet available to the industry.

A feature of phenolic resins is that they demand a rather different treatment from natural gums and ester gums in manufacture owing to their being heat reactive and so requiring much lower temperature treatment. Further, the driers needed are less than in the older type of varnish. Phenolic resins used in conjunction with ester gums impart to the finished varnishes properties of increased hardness and durability proportional to the percentage of phenolic resin used. In this connection it is found that the increased hardness does not detract from the elasticity of the varnish, but is an additional advantage. Similarly the resistance to alkali and chemical attack of a varnish is increased by the incorporation of phenolic resin. Phenolic resin may show an acid number of 90, by titration, but the actual pH is near to neutrality. This gives the resins the advantage of being suitable for varnishes to use in conjunction with zinc oxide and other basic pigments without fear of thickening.

The cooking of these resins in varnish manufacture departs from the normal procedure and requires a guide. This is supplied by the spirit dilution test which, when carried out at intervals, shows a fairly definite end-point at which the desirable state has been reached by the amount of precipitate obtained. In cooking, it is found preferable to cook the resin with an equal weight of tung oil and add the main bulk of the oil later, avoiding cooking too long when skimming and poor adhesion result.

Society of Public Analysts

Determination of Lead in Bone

THE determination of lead in biological material, with special reference to bone, was the subject of a joint paper presented by Drs. G. Roche Lynch, R. H. Slater, and T. G. Osler, at a meeting of the Society of Public Analysts on October 3. Risk of loss of lead by volatilisation during the ashing of bone is overcome by a method of wet oxidation with nitric and sulphuric acids, which leaves a precipitate of calcium sulphate and a solution of phosphoric acid. These are treated in a refrigerator with rectified spirit, and the calcium sulphate is filtered off and heated with potassium carbonate solution, the resulting calcium carbonate being dissolved in acetic acid. Finally the lead in the calcium acetate solution and the filtrates from the previous operations is determined by the diphenylcarbazone method. By this method amounts of lead ranging from 25 to 232 parts per million of ashed bone were found; teeth contained from 71 to 370 p.p.m.; and urine (in a case of plumbism) 0.27 p.p.m. (on the ashed substance). A high lead content in bone is no evidence that lead was a contributory cause of death, but indicates exposure to lead at some stage. Storage of lead in the bone explains the failure to find lead in certain tissues in which there is chemical evidence of lead poisoning.

Discussing the determination of "ethyl" vanillin (ethyl protocatechuic aldehyde), Mr. H. C. Lockwood, B.Sc., A.I.C., said the adulteration of "ethyl" vanillin with vanillin can now be detected by means of a bromine test, the former giving a yellow colour with no precipitation or turbidity, whilst the latter gives a red colour and finally a red-brown precipitate.

The detection and identification of metallic particles in manufactured products was the subject of a further paper by Mr. H. C. Lockwood, who pointed out that the method of Ward for the detection of metallic fragments by the formation of silver "trees" has been extended so as to include the identification of the metals. Confirmatory reactions have been devised for iron, nickel, zinc, tin, aluminium, copper and brass, lead and solder.

Institution of Chemical Engineers

Texture and Chemical Resistance

A PUBLIC lecture is to be delivered before the Institution of Chemical Engineers by Professor C. H. Desch, D.Sc., F.R.S., on "The influence of texture on the chemical resistance of materials." The lecture will be given in the lecture theatre of the institution of Civil Engineers, Great George Street, Westminster, S.W.1, on Friday, October 26, at 6.30 p.m., when the President, Mr. W. Macnab, will preside. Professor Desch is the Superintendent of the Department of Metallurgy and Metallurgical Chemistry at the National Physical Laboratory, and has for many years been engaged in investigations on the properties of metals. Non-members of the Institute will be welcome; tickets may be obtained on application to the Assistant Secretary.

News from the Allied Industries

Plastics

ON THE PETITION of the Beetle Products Co., of Oldbury, Mr. Justice Eve, in the Chancery Division, has made an order for the compulsory winding-up of English Mouldings, Ltd. Mr. Heckscher (for the petitioners) said they were creditors for £235 and they were supported by creditors for £200.

Fertilisers

THE EXISTING INTERESTS of Fison, Packard and Prentice, Ltd., fertiliser manufacturers and maltsters, Ipswich, and the Imperial Smelting Corporation in the manufacture and distribution of fertilisers in the West of England, will in future be carried on jointly through the medium of a new private company.

Paint and Varnish

IT IS UNDERSTOOD from "The Financial News" that a line of 6 per cent. cumulative pre-preference shares of 5s. each of Jenson and Nicholson, makers of "Robbialac," have been placed privately. This represents the balance of the unissued shares of this category, the total amount of pre-preference shares authorised and issued being £200,000.

China Clay

THE MONTHLY RECORD OF SHIPMENTS of china clay and stone for September were slightly below the previous month of August, but notwithstanding the volume dealt with was considerably above the corresponding month of last year. The details for September are as follows: Fowey—31,533 tons of china clay; 1,623 tons of china stone; 2,407 tons of ball clay. Par—8,465 tons of china clay; 817 tons of china stone. Charlestown—5,797 tons of china clay; 747 tons of china stone. Padstow—1,227 tons of china clay. Plymouth—276 tons of china clay. Penzance—271 tons of china clay. Newham—81 tons of china clay. Sent by rail to destination, 5,099 tons of china clay; making a total of 52,749 tons of china clay; 3,187 tons of china stone; and 2,407 tons of ball clay, compared with 54,816 tons of china clay, 2,451 tons of china stone, and 952 tons of ball clay in August. The aggregate tonnage in September being 58,343, and the aggregate tonnage for August was 58,219. The figures for August, 1933, were 51,522 tons of china clay, 2,729 tons of china stone, 2,182 tons of ball clay; an aggregate tonnage of 56,433, and that was 11,000 tons above August, 1932, therefore it can be confidently said that the china clay industry is gradually recovering.

Mineral Oil

THE FIRST DROPS OF IRAK OIL arrived at Haifa, Palestine, on October 14, by the new pipeline, which leads direct from the Mosul oilfields, in the north of Irak, more than 600 miles away. The oil is being stored for early shipment.

Non-Ferrous Metals

IMPORTANT DECISIONS WERE MADE at the International Aluminium Conference held in Paris at the end of September, at which all producers united in the Alliance Aluminium Cie., of Basle, Switzerland, among them the British Aluminium Corporation were represented. A feature was the consent of the cartel to the increase of the quota of the German aluminium producers in the cartel to 55,000 metric tons a year. Germany's consumption of aluminium during the first six months of 1934 was 22,000 tons, against 27,500 in the whole of 1933, and is expected to advance to more than 40,000 for the whole year.

Cement

POSSIBILITIES OF DEVELOPING the cement industry in Southern India and especially in the State of Cochin are under consideration. Most of the factories are located in North India; the only factory which will be soon completed in South India is at Coimbatore. The potentialities of Cochin are therefore being investigated. The backwaters of Cochin abound in oysters and sea shells, which form at present the only source of lime for purposes of building in these parts. If systematic methods of dredging are employed, it is possible to obtain an increasing supply for a factory to be continuously working throughout the year.

THE CENTRAL PORTLAND CEMENT CO., LTD., is to increase its capital from £275,000 to £325,000 by the creation of 250,000 new ordinary shares of 4s. each. These new shares, together with the 25,000 unissued £1 preference shares, will be offered to shareholders, the former at 4s. 3d. and the latter at 22s. 6d. per share. In a circular to shareholders the directors say they have for some time past had under consideration the advisability of extending the company's plant by the erection of a new kiln with a capacity of 60,000 tons, but they have not felt until now that the general industrial situation in the country and the internal conditions prevailing in the cement industry justified such a step. The extraordinary meeting to consider a resolution to increase the capital will be held at Winchester House, London, E.C., on October 30, at 12.30 p.m.

Continental Chemical Notes

Austria

PRODUCTION HAS STARTED at the new lithopone works erected by the Bleiberger Bergwerks-Union at Gailitz, in Carinthia.

Czecho-Slovakia

THE ODERBERG CHEMISCHE WERKE are taking up the manufacture of salicylic acid pharmaceuticals and will secure raw material from the Mährisch-Ostrauer Chemische Werke.

Hungary

CHROME ALUM AND OTHER CHROMIUM SALTS are to be produced at the Nagytetenyer works of the Metallhandels-Gesellschaft, of Budapest.

Germany

THE VEREINIGTE ULTRAMARINFABRIKEN A.G., of Cologne, has declared dividends of 6 per cent. on the preference and 5 per cent. on the ordinary shares. Increased home demand for ultramarine accounted for a slight increase in gross turnover but a falling-off occurred in the export trade.

IRON HAMMER SCALE, a waste product of annealing furnaces in iron smelting works, has been recommended as a substitute for red iron oxide in anti-rust paints. According to A. Schneider ("Chemiker-Zeitung," October 10), exceptionally favourable results have been obtained in admixture with red lead.

Italy

NEW MANUFACTURERS approved by the Ministry of Corporations include cyanides (Soc. Nazionale Chimica, Milan); liquid soaps (S.A. Triebolit, Turin); chlorine, caustic soda and trichlorethylene (S.A. Elettrochimica Ligure, Ovada); sodium hypochlorite (Guiseppe Bellora, Fugnano Olona).

Russia

A LAMENTABLE SHORTAGE OF PHARMACEUTICAL CHEMICALS including potassium permanganate, antipyrin, tannin, opium alkaloids and acet-para-phenetidine, is reported by "Sa Industrialisazyu."

SUCCESSFUL RESULTS HAVE FOLLOWED the experimental cultivation of cinchona trees in the warmest regions of the Transcaucasian Black Sea coast. It is hoped to produce 25 kilos of pure quinine per hectare.

PEAT TAR AS A RAW MATERIAL for liquid fuel has been investigated at the Leningrad Industrial Institute. In addition to a 35 per cent. yield of liquid hydrocarbons, the method adopted yields 30 per cent. pitch and about 10 per cent. phenol.

THE MANUFACTURE OF SYNTHETIC RUBBER, utilising calcium carbide as a raw material (in contrast to existing processes commencing from alcohol), will be started shortly in Leningrad. The new method may possibly resemble that developed in the United States on the basis of vinyl acetylene.

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.

Fatty Glycerines

FATTY esters containing unesterfied hydroxyl groups are prepared by reacting the triglyceride in a fat or fatty oil with a polyhydric alcohol in the presence of a catalyst comprising a soap of a metal of valence not greater than two. The soap may be added as such or formed *in situ* by partial saponification of the fat with an alakaline compound such as trisodium phosphate, sodium carbonate, sodium bicarbonate or a caustic alkali. In examples coco nut oil, cotton seed oil or a completely hydrogenated castor oil and glycerin are reacted in the presence of a sodium soap and completely hydrogenated cottonseed oil is heated with a solution of sodium hydroxide in glycerin. (See Specification 412,766 of Procter and Gamble Co.)

Complete Specifications Open to Public Inspection

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 3, 1933. 9416/34.

PURIFYING GAS containing hydrogen sulphide from hydrogen sulphide, processes.—G. H. Hultman and C.-W. Pilo. April 7, 1933. 10012/34.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 4, 1933. 10056/34.

HYDROCARBON COMPOUNDS.—British Thomson-Houston Co., Ltd. April 4, 1933. 10235-7/34.

DYESTUFFS of the gallocyanine series, manufacture.—I. G. Farbenindustrie. April 5, 1933. 10273/34.

PREPARATIONS FOR IMPROVING TEXTILES, manufacture.—Soc. of Chemical Industry in Basle. April 5, 1933. 10325/34.

MAGNESIUM VAPOURS, condensation.—Oesterreichisch Amerikanische Magnesit A.-G. April 7, 1933. 10555/34.

ISATIN-α-HALIDES, halogenated in the nucleus, manufacture.—Soc. of Chemical Industry in Basle. April 8, 1933. 10667/34.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 8, 1933. 10668/34.

AMMONIUM NITRATE EXPLOSIVES.—Imperial Chemical Industries Ltd. April 7, 1933. 10736/34.

MAKING CRYSTALLINE SUGAR from wood sugar solutions.—Holzhydrolyse A.-G. April 7, 1933. 10737/34.

SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS.—I. G. Farbenindustrie. Dec. 17, 1932. 28561/34.

Specifications Accepted with Dates of Application

DYESTUFF INTERMEDIATES and azo dyes therefrom.—Imperial Chemical Industries, Ltd., and M. Mendoza. Feb. 22, 1933. 417,252.

REMOVAL OF WEAK GASEOUS ACIDS from gases.—J. Y. Johnson (I. G. Farbenindustrie). Feb. 27, 1933. 417,379.

DYESTUFF INTERMEDIATES and azo dyes therefrom.—Imperial Chemical Industries, Ltd., and M. Mendoza. March 23, 1933. 417,258.

ALCOHOLS FROM MARINE ANIMAL WAXES, manufacture.—Imperial Chemical Industries, Ltd., and J. C. Smith. March 27, 1933. 417,383.

DYESTUFFS OF THE AZINE SERIES, manufacture.—I. G. Farbenindustrie. April 1, 1932. 417,388.

POTASSIUM DICHROMATE, process for the manufacture.—I. G. Farbenindustrie. April 4, 1932. 417,331.

SYNTHETIC RESINS and their manufacture.—British Celanese, Ltd. April 4, 1932. 417,519.

PENETRATING, WETTING, EMULSIFYING, dispersing, foaming, cleansing, and like agents, manufacture and utilisation of substances suitable for use.—Deutsche Hydrierwerke A.-G. April 4, 1932. 417,394.

CAUSTIC ALKALIES in a form suitable for packing and transport, production.—I. G. Farbenindustrie. April 5, 1932. 417,465.

CATALYTIC REACTIONS, carrying out.—J. Y. Johnson (I. G. Farbenindustrie). April 8, 1933. 417,527.

SOLS AND HIGHLY-DISPERSED SUSPENSIONS containing oxidic metal compounds, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 18, 1933. 417,340.

COMPOSITIONS COMPRISING CHLORINATED RUBBER and synthetic plasties, production.—Dunlop Rubber Co., Ltd., D. F. Twiss and J. A. Wilson. May 26, 1933. 417,273.

RECOVERY OF SULPHUR from sulphide ores.—S. B. McCluskey. June 21, 1933. 417,276.

REFINING OF LEAD.—G. K. Williams. Nov. 25, 1932. 417,286.

AZO DYESTUFFS, manufacture and production.—I. G. Farbenindustrie. Dec. 16, 1932. 417,489.

ARTIFICIAL PRODUCTS FROM VISCOSE, manufacture.—I. G. Farbenindustrie. Dec. 8, 1932. 417,290.

CYCLOHEXYLPHENOLS and intermediate products, manufacture.—I. G. Farbenindustrie. Dec. 20, 1932. 417,423.

VEGETABLE LECITHIN with or without soya oil, production of stable mixtures containing.—Metallges A. G., and A. Datz. Dec. 18, 1933. 417,552.

PASTEURISING OF LIQUIDS.—Bergedorfer Eisenwerk Akt.-Ges. AstralWerke. Jan. 10, 1933. 417,495.

OXIDATION OF ISOALDEHYDES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Feb. 3, 1933. 417,496.

ALGINIC ACID ESTERS from seaweed, method or production.—T. Gohda. Jan. 22, 1934. 417,556.

ORTHO-AMINO-AZO-COMPOUNDS, manufacture.—I. G. Farbenindustrie. Feb. 1, 1933. 417,497.

DRYING ARTIFICIAL SILK.—I. G. Farbenindustrie. March 14, 1933. 417,307.

DEHYDRATING GASES, process.—I. G. Farbenindustrie. April 13, 1933. 417,309.

REDUCING REFRACTORY OXIDES, methods.—British Thomson-Houston Co., Ltd. April 11, 1933. 417,433.

Applications for Patents

(October 4 to 10 inclusive).

REFINING MINERAL OILS.—Aktiebolaget Separator-Nobel. (France, Oct. 6, '33). 28737. (France, Oct. 12, '33.) 28738.

SEPARATION OF HYDROCARBONS.—Aktiebolaget Separator-Noble and G. H. Anderson. 29004.

DEHALOGENATION of organic halogen derivatives.—H. R. Arnold, W. A. Lazier, and E. I. du Pont de Nemours and Co. 28455.

DERIVATIVES OF F.EZ-BENZOPHENANTHRENE, manufacture.—A. Carpmael (I. G. Farbenindustrie). 28939.

NAPHTHALMIC ACID DERIVATIVES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 28940.

COLOURING CALCIUM-CONTAINING MATERIALS.—D. B. Crossley (J. Finn). 28742.

CERAMIC RAW MATERIALS, preparation.—Doulton and Co., Ltd., 28450.

COATING COMPOSITIONS, etc.—E. I. du Pont de Nemours and Co. 28454.

RUBBER COMPOSITIONS, manufacture.—E. I. du Pont de Nemours and Co. (United States, Oct. 7, '33.) 28616.

STABILISED PREPARATIONS OF DIVINYL ETHERS, manufacture.—L. S. E. Ellis (Merck). 28466.

ALDEHYDIC COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co., and A. T. Larson. 28614, 29017.

NITRO-DERIVATIVES of 1-sulpho-2-hydroxynaphthalene-3-carboxylic acid, manufacture.—W. W. Groves (I. G. Farbenindustrie) 28764.

HYDROCARBON OILS, heating.—Gyro Process Co. (United States, Oct. 9, '33.) 28919.

HARDENING METAL SURFACES.—I. G. Farbenindustrie. (Germany, Oct. 7, '33.) 28761.

AZO DYESTUFFS, manufacturer.—I. G. Farbenindustrie. (Germany, Oct. 10, '33.) 28883.

REACTION PRODUCTS, manufacture.—I. G. Farbenindustrie. (March 2, '33.) (Germany, March 2, '32.) 28945, 29058.

STABLE PREPARATIONS of anæsthetic agents, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 11, '33.) 29026.

CRUDE PHOSPHATES, decomposition of.—J. Y. Johnson (I. G. Farbenindustrie). 28749.

MOTOR FUELS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 28750.

AMMONIUM SULPHATE, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 28751.

DEHYDROGENATION OF HYDROCARBONS, etc.—J. Y. Johnson (I. G. Farbenindustrie). 28752, 28753.

COLOURING HYDROCARBONS.—J. Y. Johnson (I. G. Farbenindustrie). 28754.

VAT DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 28755.

POLYMERISATION PRODUCTS OF ACETYLENE, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 28885.

NITROGEN, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 28886.

CHLORINATED COMPOUNDS of isoalkyl amines, production.—K. Jülicher. 29072.

CHLORO-DERIVATIVES of aromatic isoalkyl hydrocarbons.—K. Jülicher. 29073.

REACTION PRODUCTS of butadiene derivatives.—Marsene Corporation of America. (United States, Dec. 23, '33.) 28682.

SUPHOACIDS, production.—E. A. Mauersberger. (Gemany, Nov. 29, '33.) 28455.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no changes to report in the prices of general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. Unless otherwise stated, the prices given below cover fair quantities, net and naked at sellers' works.

LONDON.—Prices of chemical products remain firm in the London market, and the good general demand continues. The coal tar products market continues firm with no price changes since last week

MANCHESTER. — Apart from one or two sections of the chemical market where values are displaying some degree of easiness, mostly due to outside influences, as, for instance, the weakness in the non-ferrous metals, prices maintain a steady tendency, and on the Manchester market during the past week there was a pronounced disposition to regard this as likely to continue. On the whole, the tone of the market has been reasonably bright and sellers state that the movements of many descriptions of materials, mainly against old contracts has been fairly satisfactory. This continues to be the case with the bread-and-butter lines, especially the alkalies. From the point of view of new business, bookings this week have been mainly in respect of near delivery positions, and consequently the quantities involved have not been heavy as a rule. On the other hand, however, there has been a sprinkling of more substantial orders extending farther ahead. For the most part the demand for export on this centre has been on a restricted scale.

SCOTLAND.—There has been a slight slump in the Scottish heavy chemical market, but forward business shows signs of improving.

Price Changes

Tar Products.—TOLUOL, pure, 2s. 2d. to 2s. 3d. per gal.

Pharmaceutical and Fine Chemicals.—ACID, CITRIC, 10¼d. per lb.; BISMUTH SALTS, carbonate, 6s. 6d. per lb.; citrate, 9s. 8d.; nitrate (cryst.), 4s. 7d.; oxide, 10s. 8d.; salicylate, 7s. 11d.; subchloride, 10s. 5d.; subgallate, 7s. 7d.; subnitrate, 5s. 8d.

All other prices remain unchanged.

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.—10¾d. per lb. less 5%. MANCHESTER : 9½d.

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

ACID, FORMIC.—LONDON : £43 10s. 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°, £23 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 : £48 10s. to £53 ex store.

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

ACID, TARTARIC.—LONDON : 1s. per lb. SCOTLAND : B.P. crystals, 11d., carriage paid. MANCHESTER : 1s. 0¼d.

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°, 2¾d. 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.—£37 to £45 per ton, carriage paid. 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, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. 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, 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. 5d. to 2s. 9d.

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.—3⅞d. to 5d. per lb. LONDON : 4¼d. 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, 3¼d. 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 : £26 per ton. SCOTLAND : 40%, £25 to £28 ex store.

IODINE.—Resumblimed 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, £32.

LEAD, NITRATE.—£28 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 : £37 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. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. . 64 O.P. 1d. extra in all cases. Prices 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.—8¼d. to 8¾d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON : £42 per ton. MANCHESTER : £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON : 5d. per lb. with usual 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 : £38.

POTASSIUM CHROMATE.—6½d. 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: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 9¾d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

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

SODA ASH.—58% spot, £5 15s. 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 10s. 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: £23.

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 lb. net for spot lots and 4d. per lb. with discounts for contract quantities. 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 (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 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, £15.

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.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5s. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¼d.

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 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER. £3 5s.

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 2s. 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, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 to £14 5s. 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, 3s. 11d. to 4s. 1d. 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.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¼d. to 7½d. per lb; crude, 1s. 10d. to 1s. 11d. 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. 6d.; dark, 95/97%, 1s. 3d. 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, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6¼d.

CREOSOTE.—B.S.I. Specification standard, 4d. to 4½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3½d. f.o.r. North; 4d. London. MANCHESTER: 3d. to 4d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¾d. to 4¾d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; 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, 55s. per ton, in mulk, at makers' works. LONDON: £3 per ton f.o.b. East Coast part for next season's delivery.

PYRIDINE.—90/140, 7s. 6d. to 9s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

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

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. 11¾d. 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., 01¼d.

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, 11¾d. 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.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Oct., £6 17s. 6d.; Nov., £6 19s.; Dec., £7; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.

CYANAMIDE.—Oct., £6 17s. 6d.; Nov., £6 18s. 9d.; Dec., £7; Jan., 1935, £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935.

NITRO-CHALK.—£7 5s. per ton to June, 1935.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents.

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

Latest Oil Prices

LONDON, Oct. 17.—LINSEED OIL was steady. Spot, £20 5s. (small quantities 30s. extra); Nov.-Dec., £18 15s.; Jan.-April, £18 17s. 6d.; May-Aug., £19 2s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), Oct.-Nov. shipment, £15 per ton. RAPE OIL was steady. Crude extracted, £27; technical refined £28 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £14 10s.; refined common edible, £17 5s.; and deodorised, £18 15s. naked, ex mill (small lots 30s. extra). TURPENTINE was easier. American, spot, 45s. 9d. per cwt.

HULL.—LINSEED OIL, spot, quoted £19 5s. per ton; Oct. to April, £18 17s. 6d.; May-Aug., £19 2s. 6d., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £15 10s., naked. COTTON OIL.—Egyptian, crude, spot, £15; edible, refined, spot, £16 15s.; technical, spot, £16 15s.; deodorised, £18 15s., naked. GROUNDNUT OIL.—Extracted, spot, £23 10s.; deodorised, £27 10s. RAPE OIL.—Extracted, spot, £26; refined, £27 10s. SOYA OIL.—Extracted, spot, £16; deodorised, £19 per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL.—Pharmaceutical, 36s. 6d.; first, 31s. 6d.; second, 28s. 6d. per cwt. TURPENTINE, American, spot, 47s. 9d. per cwt.

From Week to Week

THE NATIONAL FOOD CANNING COUNCIL will hold its eighth annual Convention at Leicester from November 6 to 8.

AN ORDER WAS MADE in the High Court on October 8 for the winding-up of Alliance Artificial Silk, Ltd., of School Road, Oulton Broad, Lowestoft.

MR. H. E. WHITE, of 14 Clarges Street, W.1, was appointed receiver of Nor-Rust Liquid Lead Co., Ltd., on October 4, under powers contained in a second debenture dated January 30, 1934.

LETTERKENNY, IN COUNTY DONEGAL, is reported to be the site of the third of the industrial alcohol distilleries to be erected in Ireland. Another site will probably be selected in County Donegal for the fourth distillery and the fifth is expected to be in County Cavan.

SIR FRANCIS GOODENOUGH (executive chairman of the British Commercial Gas Association), speaking at a luncheon held at Bury St. Edmunds in celebration of the centenary of the gas supply to that town, said that the sales of gas appliances were beating all records in this year of grace.

A SYMPOSIUM OF PAPERS on "Invention" was read to the North-western branch of the Institution of Mechanical Engineers in Manchester, on October 11. Mr. J. E. Montgomery, introducing the symposium, described the work of the Inventions Advisory Committee of the Institution.

THE BRITISH THERMOSTAT CO., LTD., scientific instrument makers and general engineers, Teddington Works, Sunbury, has increased its nominal capital by the addition of £10,000 beyond the registered capital of £40,000. The additional capital is divided into 10,000 8 per cent. cumulative preference shares of £1 each.

GOSSCHALK AND AUSTIN, solicitors, of Hull, have been instructed to take legal steps with a view of preventing a cod liver oil refinery being erected on the Hessle-Ferriby Road. The application for erection permission was granted by the Hull City Council last week, the proposed site being in their town-planning area.

SUGAR BEET is now being harvested in many parts of the country, particularly in East Anglia, and the Automobile Association reminds motorists that beet inadvertently dropped on the road from lorries may constitute a danger to traffic after dark. The A.A. specially warns motor-cyclists to keep a sharp lookout for beet on the road when passing through agricultural districts.

THE MANCHESTER CORPORATION TOWN-PLANNING COMMITTEE has rejected the plans of the Shirley Institute, Didsbury, for the erection of a large extension and a detached chimney-stack 70 ft. high. The committee has authorised the City Architect to consult with the British Cotton Industry Research Association upon alternative plans.

THE GOVERNMENT has considered a recommendation from the Import Duties Advisory Committee regarding the general *ad valorem* duty on solid insoluble quebracho extract, but having regard to the commercial discussions which are expected to take place with the Government of India in the near future a decision on this recommendation has been deferred.

MR. JOHN LAWSON, chairman of Lovering China Clays, Ltd., who presided at the annual meeting, stated that the accounts, which reveal a loss of £12,312 on the year, covered their first complete financial year as a holding company, following the sale of their operating assets in October, 1932. They, therefore, reflected a gross revenue derived solely from dividends, interest, and property rent.

ALTERATIONS HAVE BEEN MADE in the method of subscription by non-members to the afternoon lectures at the Royal Institution. For the convenience of those who wish to attend one lecture only, single lecture tickets will be sold at three shillings each. The new arrangements apply to all the afternoon lectures except the Christmas lectures. Subscribers to a course of lectures will receive a book containing the appropriate number of single lecture tickets for the course. The rates of subscription will be: For a course of three lectures, 7s. 6d.; for a course of four lectures, 10s. The tickets will be transferable. Season tickets will also be obtainable, at the following rates:—For the season before Christmas (usually four courses), one guinea; for the season after Christmas (usually nine courses), two guineas.

COLLIERY ENGINEERING, LTD., which was recently formed to take over the business relating to equipment for the treatment and preparation of coal and coke for the market, previously carried on by Huntington, Heberlein and Co., Ltd., of London and Newcastle, Dry Washers (Coal and Minerals), Ltd., of Sunderland and Newton, Chambers and Co., Ltd., of Thorncliffe, near Sheffield, has now established central offices at 46 Rutland Park, Sheffield. This amalgamation of interests represents a further step in the general trend for centralising, under one control, equipment required for a particular industry. In this case the aim is to make available to the colliery industry experience and technique embracing practically every phase of the treatment and preparation of coal and coke above ground including wet washing, dry cleaning, de-dusting, screening and conveying.

AS FROM OCTOBER 15 the head office of Murex, Ltd., will be at Thames House, Millbank, S.W.1. Telephone: Victoria 6788. The registered and transfer office will remain at 61 Moorgate, E.C.2.

PROFESSOR HADDING, of Lund University, has recently examined samples of radium ore found at Derome, in Sweden, and declares them to be quite equal to those from the radium deposits in the Belgian Congo.

THE INSTITUTION OF GAS ENGINEERS has published, for presentation at its sixth autumn research meeting in London on November 6 and 7, a "Report on the Use of Coal Tar Oils in Internal Combustion Engines," which has been contributed by H. M. Spiers, and Dr. E. W. Smith. Copies of the report, price 1s. 6d. each, can be obtained from the Secretary, the Institution of Gas Engineers, 28 Grosvenor Gardens, London, S.W.1.

THE RUBBER GROWERS' ASSOCIATION, in collaboration with other interested bodies, is arranging a rubber exhibition at the Science Museum, South Kensington. The exhibition, which will be open for six months from November 2, is to illustrate the story of the industry from the growth of the rubber tree to the many applications of the product. It will cover plantation, manufacturing processes, scientific treatment, applications, and historical exhibits.

A WORKMAN WAS ELECTROCUTED while cleaning out a glue vat at Thompson Bros., Ltd., glue and gelatine manufacturing works, New Chester Road, Lower Tranmere, Birkenhead. He was Andrew Lindsay, aged 27, of Hampden Road, Higher Tranmere, who came in contact with a dynamo. Another workman who went to aid Lindsay, also received a shock and was thrown to the floor, but was not injured.

THE FACT THAT THE PRICE OF IODINE has slumped so sharply during the past year is leading the Irish Free State Government to look for new uses for seaweed. It is understood that the matter has been referred to the Free State Industrial Research Council, whose attention is specially to be directed to the methods of producing artificial manure from the seaweed and also the production of size.

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).

British India.—H.M. Trade Commissioner at Calcutta has forwarded to the Department of Overseas Trade information concerning invitations to tender issued by the Indian Stores Department as under:—(a) Order No. M-4915 being a rate contract for the supply of metal polish, during the period March 1, 1935, to February 29, 1936; (b) Order No. M-4912 being running and rate contracts for the supply of turpentine, white spirit and rosin, during the period March 1, 1935, to February 29, 1936; (c) Order No. M-4911 being running and rate contracts for the supply of raw linseed oil and double-boiled linseed oil, during the period March 1, 1935, to February 29, 1936; (d) Order No. M-4913 being a rate contract for the supply of methylated spirit, during the period March 1, 1935, to February 29, 1936. Tenders are due to be received at the Indian Stores Department, Miscellaneous Branch, New Delhi, by the following dates: (a) October 31, 1934; (b) October 31, 1934; (c) November 6, 1934; (d) November 7, 1934. (Ref. B.O.T. 22516, 1934).

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the Rand Water Board is calling for tenders, to be presented in Johannesburg by November 6, 1934, for the supply of a water-softening plant for the treatment of 2,500 gallons per hour of boiler feed water. (Ref. G.Y. 14399.)

Belgium.—An agent established at Liége wishes to obtain the exclusive representation, preferably on a commission basis, of United Kingdom manufacturers of industrial raw materials, special sands, ores and coal, special refractory products and metallurgical products. He would also undertake sales on a consignment basis. (Ref. No. 352.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Ministry of Public Works is calling for tenders, to be presented in Egypt by November 14, 1934, for the supply of 500 gallons of bituminous paint required for painting steel towers of the North Delta transmission lines. (Ref. B.Y. 7999.)

Latin America.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields Directorate are calling for tenders, to be presented in Buenos Aires by November 9, 1934, for the supply of about 2,500 iron, steel and brass valves of various kinds comprising sluice valves, globe valves, angle valves, needle valves and check valves, also cocks and faucets. (Ref. G.Y. 14396.)

Forthcoming Events

Oct. 22.—Institute of Chemistry, Society of Chemical Industry and Chemical Society (Edinburgh and East of Scotland Sections). "The Molecular Structure of the Carbohydrates." Dr. W. N. Haworth. 7.30 p.m. North British Station Hotel, Edinburgh.

Oct. 24.—Institute of Fuel (N. Western Section). Inaugural address by Major Vivian Gloag. 7 p.m. Engineers' Club, Albert Square, Manchester.

Oct. 24.—British Association of Chemists (Manchester Section). Smoking concert. 7.30 p.m. Grand Hotel, Aytoun Street, Manchester.

Oct. 24.—The Alchemists' Club. "This Research Business." R. Wright. 7.30 p.m. Westerlands, Glasgow.

Oct. 24.—Institution of the Rubber Industry (Scottish Section). "The Laboratory; Nerve Centre of the Modern Tyre Factory." A. S. Craig. "Difficulties in Modern Proofing." C. W. Anderson. "The Choice of an Accelerator for Cable Insulation." D. McQuarrie. Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow.

Oct. 24.—Institution of the Rubber Industry (Leicester Sub-Section). "A Talk on Compounding Ingredients." Dr. S. S. Pickles. College of Technology, Leicester.

Oct. 24.—Institute of Vitreous Enamellers (Southern Section). "Enamelling Iron." N. H. Oakley-Evans. 8 p.m. British Industries House, Oxford Street, London.

Oct. 25.—Society of Dyers and Colourists (West Riding Section). Presidential address. Professor Arthur G. Green.

Oct. 25.—Conversazione by invitation of the Chairman of the Libraries, Museums and Arts Committee, Liverpool University. 7—10 p.m. Walker Art Gallery, William Brown Street, Liverpool.

Oct. 25.—Coke Oven Managers' Association. Annual Dinner. Hotel Victoria, Northumberland Avenue, London. 7.15 p.m.

Oct. 25.—Institution of the Rubber Industry (Midland Section). "Development in Modern Rubber Machinery." F. Siddall. Victoria Hotel, Wolverhampton.

Oct. 25.—Midland Metallurgical Societies. "The Production of Brass Ingots." Discussion. 7 p.m. James Watt Memorial Institute, Great Charles Street, Birmingham.

Oct. 25.—Institute of Vitreous Enamellers (Midland Section). "Enamelling Iron." N. H. Oakley-Evans. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Oct. 26.—Society of Dyers and Colourists (Scottish Section). "Rayon Manufacture." A. V. Pitter.

Oct. 26.—Society of Chemical Industry (Liverpool Section). "The Blast-Furnace as a Chemical Plant." Professor C. O. Bannister. 6 p.m. University, Liverpool.

Oct. 26.—Society of Dyers and Colourists (Scottish Section). 7.15 p.m. George Hotel, Buchanan Street, Glasgow.

Oct. 26.—Manchester Literary and Philosophical Society (Chemical Section). "Beer." Major Peer-Groves. 36 George Street, Manchester.

Oct. 26.—Bedson Lecture. "Some Aspects of Photochemical Change." Professor A. J. Allmand. 6.30. Armstrong College, Newcastle-on-Tyne.

Oct. 26.—Institution of Chemical Engineers. "The Influence of Texture on the Chemical Resistance of Materials." Professor C. H. Desch. 6.30 p.m. Institution of Civil Engineers, Westminster, London.

Oct. 26.—Institute of Vitreous Enamellers (Northern Section). "Enamelling Iron." N. H. Oakley-Evans. 7.30 p.m. Queen's Hotel, Manchester.

Company News

Fison, Packard and Prentice.—The directors have decided to declare a dividend of 7½ per cent. on the ordinary shares for the year to June 30 last. The previous dividend was 5 per cent. for ten months.

Electrolytic Zinc Co. of Australasia.—A preliminary statement of accounts shows a net profit of £234,797, after providing £145,000 for amortisation and depreciation, and £32,337 for taxation. The net profit for the preceding period was £223,093, when a similar amount was provided for depreciation, etc., and £49,706 for tax.

Eastwoods Lewes Cement.—The report for the year to June 30, 1934, shows a net profit of £5,052, against £7,644; to this is added amount brought in £3,354, making £8,407. Final dividends of 4 per cent., making 5 per cent. for the year are to be paid on the ordinary and founders' shares, leaving to be carried forward £3,031.

Babcock and Wilcox.—An interim dividend of 4 per cent., less tax, has been declared, which compares with 3 per cent. a year ago. A total dividend of 6 per cent. was paid for last year, to which it was lowered from 7½ per cent. for the previous year and 14 per cent. for 1931.

Sadler and Co.—The report for the year to June 30 shows a profit of £7,764, to which is added £4,846 brought in, £2,447 refund of tax, and £8,125 interest. The directors' remuneration takes £1,380, interest, etc., £1,131, tax £1,164, depreciation £5,000, and £2,800 has been written off investments, leaving £11,726. The amount carried forward is £3,865.

Bryant and May, Ltd.—An interim dividend of 6 per cent., tax free, has been declared on the ordinary shares. This is at the same rate as a year ago. The partnership shares are to receive an interim of 5 per cent., tax free, the same as a year ago, and a 7 per cent. dividend, less tax, on the 14 per cent. preference shares for the half-year to September 30, 1934, is also to be paid. All the dividends are payable on October 31.

APPOINTMENTS VACANT

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

AUTHORITATIVE TRAINING
FOR CHEMICAL ENGINEERS

THE T.I.G.B., the premier establishment for engineering training by correspondence, will train you until successful for the one fee for the

Examinations of the Institution of Chemical Engineers (A.M.I.Chem.E.), A.M.I.Mech.E., A.M.I.E.E., B.Sc.(Eng.) Lond. Univ., etc.

WRITE TO-DAY, stating branch, post or qualification that interests you, for "The Engineers' Guide to Success"—152 pages Free—containing the widest selection of engineering courses in the world.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
(Founded 1917. 19,000 Successes.)
219 Temple Bar House, London, E.C.4.

FOR SALE

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3633 East.

CLEAN WHITE SAWDUST, loose or filled into buyers' sacks, 10s. ton F.O.R. West Hartlepool. Chippings from Planing Machine free on truck. Apply GEO. WILLSON AND SONS (WEST HARTLEPOOL), LIMITED, Milton Sawmills, West Hartlepool.

FILTER PRESS, Dehne, 17 C.I. Plates 24 in. x 24 in. and Frames, with Pump 2½ in. plunger, nearly new condition. C. F. DAVIS, LTD., Hatcham Road, Old Kent Road, S.E.15. New Cross 1147.

HYDRAULIC PRESSES AND PUMPS. Large stock in London. Price quoted for adapting and erecting.—THOMPSON AND SON, Maria Street, Millwall.

TANKS for oils, water, petrol, etc. JACKETTED PANS, DIGESTERS, etc.
ROBERTS, LTD., Waterloo Street, Leeds, 10.

200 TONS RIVETED STEEL FLANGED PIPING at Glasgow. Suitable for Process Piping at Chemical Works. Diameters, 18 in., 22 in., 24 in., 27 in., 28 in., 30 in., 34 in., 36 in., 42 in., 48 in., 54 in., 58 in., 66 in. Long lengths. MADEN AND MCKEE, LTD., 317 Prescot Road, Liverpool.

WANTED

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3633 East.

EDWARD RUSHTON, SON AND KENYON (Established 1855).
Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY.
York House, 12 York Street, Manchester.
Telephone: 2517 and 2518 Central, Manchester.
Telegrams: "Russonken, Manchester."
And Bardon Chambers, 13 Infirmary Street, Leeds 1.
Telephone: 26154.

PATENTS & TRADE MARKS

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

KINGS PATENT AGENCY, LTD. (B. T. King, Registered Patent Agent, G.B., U.S., and Can.), 146a Queen Victoria Street, London, E.C.4. "Advice Handbook," and Cons. free; 49 years' ref. 'Phone: City 6161.

PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO. (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London. W.C.2. Telephone: Holborn 1525. Established 1905.

REGINALD W. BARKER & CO. (Estab. 1886.) Patent and Trade Mark Agents, 56 Ludgate Hill, London, E.C.4. Booklets sent gratis. Phone: City 5140.

WORKING NOTICES

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

"A PROCESS for the Production of Citric Acid by Fermentation." The Proprietors of British Patent No. 302,338 desire to arrange for the commercial working of this patent by sale outright or by licences granted on participating and reasonable terms. Particulars obtainable from TECHNICAL RECORDS, LIMITED, 59-60 Lincoln's Inn Fields, London, W.C.2.

IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 275,044, which relates to "Manufacture of Caustic Alkalies" either by way of sale or the grant of Licences on reasonable terms. For particulars apply:—Phillips's, 70 Chancery Lane, London, W.C.2.

"IMPROVEMENTS in a Process for Producing Formates of Alkaline Earth Metals." The Proprietors of British Patent No. 363,788 desire to arrange for the commercial working of this patent by sale outright or by licences granted on participating and reasonable terms. Particulars obtainable from TECHNICAL RECORDS, LIMITED, 59-60 Lincoln's Inn Fields, London, W.C.2.

THE Owner of Patent No. 355,445 is desirous of arranging by way of licence or otherwise on reasonable terms for the commercial development in Great Britain of this invention which concerns improvements in the extraction of phenol, phenol homologues and other hydroxy aromatic compounds from tar oils and mineral oils. For particulars address H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.