The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXII. April 20, 1935 No. 825

Notes and Comments

The Chemist as Statesman

THE " Chemical Practitioner " rarely fails to yield topics of interest, and even of controversy, a circumstance which should be heartening to the British Association of Chemists as evidence of virility; in a world of changed and changing values orthodoxy may lead to stagnation and, throug it, to disaster. The formation of the B.A.C. was, in itself, the negation of orthodoxy. In the current issue is a report of a paper, delivered in that town which is reputed to think a day in advance of the rest of England, by Mr. R. Brightman upon the text that chemists and all professional men should always have before them the social implications of their work so that they who have brought about the scientific revolution should go one step farther and teach the world how to solve the problems thereby introduced. There is, of course, a pertinent proverb about the cobbler and his last; but that need not detain us as a serious argument, for proverbs were all written before the rise of modern industry. It must also be remembered that the chemist is not the only man who has had a hand in bringing a new order into being—it is more a mechanical revolution than a chemical revolution.

Mr. Brightman appears to realise this, for he studiously refers to the " professional " man, and not to the chemist alone. He notes that the activities of man have, in themselves, undergone a very fundamental change due to the displacement of custom by intelligence, the professions being essentially the source of intelligence in the world. That is one important point. Another is that although the professions practise within their own nation " their sources of life are world-wide " —they are the internationals of the world, and in a cosmos where science has done so much to obliterate space, internationalism must be one of the really important forces at work in the world, not merely aesthetically but also in trade improvement.

Representatives of a Great Profession

PROFESSIONAL men are in an increasingly important and ultimately unique position. It is suggested that professional men should, therefore, co-operate to make others, the general mass of the nations of the world, co-operate. No revolution is here needed, and many will agree with Mr. Brightman when he says that: " They (*i.e.*, professional men) should consider themselves representatives of a great profession and be prepared to regard all organisation critically, considering it as their instrument and not their master." The idea is not unlike that of H. G. Wells who in his book " A Short History of the World " states that " the drift of thought seems now to be in the direction of a number of special committees or organisations, with world-wide powers, delegated to them by existing governments in this group of matters or that, bodies concerned with the waste or development of natural wealth, with the equalisation of labour conditions, with world peace, with currency, population and health, and so forth." It is significant that Wells, whose talents have lately been directed to semi-popular reviews of world history, notes that this movement is now in being —not some future possibility.

There is an important inference from this, whether we agree that industrial chemists and engineers should bother their heads about politics or not. It is that professional men, in-so-far as they are in the world and of the world and not isolated, are in the mass the educated portion of the human race and in the mass they are disinterested. It is important that they should take their place in the councils of those who are bringing this world order into being. There is to-day still too much power given to the purely " business man " whose only claim to knowledge is his ability to manipulate currency to gain something for himself.

Modesty and Self Effacement

WE often recollect the anecdote of a famous chemist now living who, in his youth, was refused admission to the board of a company of no small importance on the ground that he would know so much more than his co-directors that he would carry his point every time. Are the governments and business men of the world not still a little of the same mind? Some are chary of the professional man on the ground that he has his head too far in the air to understand mundane matters—again an exploded fallacy. In these councils which are in being or will shortly be so, is the professional man to be fully represented? If so some measure of unity among his own species must first be sought. Those who do the world's creative work, the staffs and educated directors of businesses, they who *know*, must see to it that world planning is not left to statesmen and politicians put into office by their own machinations or by the votes of the ignorami. The statesmen and politicians, to judge by current events, seem capable only of thinking in terms of armament and might.

For a prosperous future a planning of a very different type is essential. This discussion is not purely academic and unreal, but touches closely the future of industry and science. Technical and professional organisations must co-operate with those in power and if they are not asked to do so, they should be strong enough, or make

themselves strong enough, to insist on recognition. It it possible to ruin the reputation of half a century by a single act; it is possible to ruin the prosperity of many generations by a false step. The professional man must lay aside his modesty and with it the self-effacement that has caused him to be overlooked in the past.

The Budget

MR. CHAMBERLAIN'S Budget, taken as a whole, is something in which the business community can take legitimate pride. If the Government continues to spend money at a far higher rate than the strict economist can condone, and if the changes in taxation fail to give universal satisfaction, it is still true that the Budget has been balanced on the soundest principles of orthodox finance. The tax burdens on British industry continue to be extremely severe, but the restoration of confidence which the National Government has achieved in its four years of office has induced a sense of security which is substantially in advance of that enjoyed by the trade competitors of Great Britain in any other part of the world.

From the point of view of the British trader, the most important part of the Budget speech was Mr. Chamberlain's optimistic view of the progress that had been made in the financial year just ended. He gave several indications of the substantial advance which had been made towards national recovery. Industrial output had increased by about 12 per cent. Manufacturing production had established a new record. Exports were up by £30,000,000 There had been a great increase in the volume of capital works and particularly new building. The output of steel had increased by 30 per cent. and of pig-iron by 50 per cent. The rayon industry had established a new record for output. On the human side, it was gratifying to hear that the time lost in trade disputes had been lower than ever before. The period of heavy contraction which set in with the financial crisis of 1931 has given place to a period of gradual and steady expansion. The figures of private spending and consumption are going up and up, but the nation has not yet returned to the period of comparative prosperity which it was enjoying five or six years ago. Mr. Chamberlain calculated that, broadly speaking, this country had recovered 80 per cent. of its prosperity. In all the circumstances, taking more particularly into account the progressive deterioration in the international situation, that is an astonishing achievement, reflecting enormous credit on the grit, no less than the business ability, of the British people as a whole. The task ahead is to win back the remaining 20 per cent. of the old prosperity, and Mr. Chamberlain made his contribution to that end in the form of lower taxes for the small man.

Income Tax Concessions

FROM the point of view of the manufacturing and commercial interests as a whole, the best stimulant would undoubtedly have been a reduction in the standard rate of income tax. This tax remains oppressively high at 4s. 6d. in the pound, and the position can never be regarded as satisfactory until it has been reduced at least to 3s. in the pound. Unfortunately Mr. Chamberlain had an insufficient surplus in prospect to enable him to make a clean cut into the most serious of all the burdens on industry. What he actually did was to approach the income tax problem from another angle. He made substantial reductions in the amount of tax to be paid on smaller incomes by readjusting several of the allowances. Over 2,000,000 taxpayers, that is about 70 per cent. of the whole body, will obtain relief under his scheme, and in a full year £10,000,000 less than before will go into the Exchequer. What this means to the business community is that there will be £10,000,000 more available to be spent on goods and services. The same revivifying process cannot fail to be encouraged by the restoration of the second half of the cuts in remuneration throughout the public service, which were made at the height of the crisis in 1931. This will mean in a full year a sum of over £5,000,000, and again the British manufacturer and trader should directly benefit from the concession.

As far as Mr. Chamberlain reduced taxation and brought forward measures for increasing the spending power of the people, he earned general applause. The only criticism that can be fairly made of his constructive proposals was the only case in which he announced an addition to taxation. This was an increase in the tax on heavy oils from 1d. to 8d. a gallon. This was aimed specially at road vehicles equipped with Diesel engines, which had before enjoyed a great advantage over petrol-driven vehicles. It has been freely urged that this is an odd way of encouraging inventive ability, and that it would have been far sounder to reduce the duty on petrol and in that way to bring competing types of road vehicles into a better taxable adjustment. This, however, is a relatively minor point in a Budget which at once achieved popularity, fortunately not for any spectacular benefits. It is a good, honest Budget, which should continue the process of national recovery.

The Keynote of Successful Business

THE outlet for sulphuric acid in the sulphate of ammonia industry has decreased noticeably and there is the possibility that the manufacture of sulphuric acid may in turn be relegated to a minor branch of the chemical industry. It is unnecessary to follow the changes that are taking place and have taken place in the chemical industry further; it is clear, however, that those same discoveries of science which are causing the world in general so much concern are equally affecting the chemical industry itself. Manufacturers only exist by keeping abreast of the times and by suiting their policy to the manufacturing possibilities that open to them. It is too much to suggest that one day the world in general and the financial pundits and economists in particular will learn how to do the same thing; they will watch for the advances that science is about to put at their disposal and will regulate the economic policy of the world accordingly. Until they can do this, economists, bankers and political economists cannot logically escape their responsibilities by claiming that the pace set by the scientist is too hot. The fault lies with the world, and not with the scientist. History shows " the extraordinary difficulty with which men's minds adapt themselves to shifting circumstances, with what tenacity thought clings to ideas that have lost their practical force, and by what ingenious compromise they are somehow introduced into an alien environment." Therein lies the danger in a world of shifting values, not only to the human race as a whole but to any individual manufacturer and business.

Modern Methods of Oil Refining

MODERN methods of oil refining, with special reference to varnish oils, were discussed in a paper which Mr. C. W. A. Mundy read at a meeting of the Oil and Colour Chemists' Association, on April 11. He pointed out that among the drying oils used in the paint and varnish industry, and no less in the printing industry, linseed oil is by far the most important. No single method of refining was able, in itself, to furnish a finished article in the modern sense of the term. A sequence of methods was used generally preceded by sorting the raw oil into types most suited for individual means of refining, for it was well recognised that some oil is much more amenable to refining by one means than another. The sorting of oils most suited to the manufacture of varnish oils was accomplished largely by rule of thumb methods, but it was considerably influenced by their behaviour on heating.

Bleaching of Linseed Oil

Of great importance was the property of linseed oil to bleach to a pale colour on heating to a temperature of about 600° F. Some oils, said Mr. Munday, possessed this to a greater degree than others and it did not necessarily bear any relationship to the initial colour of the oil. The initial colour of a varnish oil likewise was not necessarily a criterion of its behaviour on heating; in fact, quite often it was to the contrary, as unsuitable means of refining might be reflected in a tendency to progressive darkening during the long period of time in which the oil was cooked. Generally, this was due to the presence of traces of chemical substances used in the refining process, or to oxidation of the oil. The ability of a varnish oil to preserve its colour under these conditions, *i.e.*, of prolonged heating, was the only reliable criterion by which it should be judged. It had been suggested that viewing in ultra-violet light offered a ready means of selection, those oils showing little or no fluorescence being the most useful, but that method had been found of no general ability since all raw linseed oil of commerce shows pronounced fluorescence and the fluorescence is accentuated in most cases on refining.

Referring to methods of refining, Mr. Mundy pointed out that in the past the preparation of varnish oils was solely concerned with the production of an oil which did not "break" on heating. Modern methods, however, make use of acid refining and the use of sulphuric acid is still considerable. Nevertheless, with one interesting and important exception, it no longer finds any use in a varnish oil, and other acids, such as phosphoric and citric acids, are used for refining vegetable oils, especially on the Continent, though seldom for linseed oil. Acid-refined linseed oil is characterised by its very pale colour and high acid value. Acid refining is an art which requires the exercise of a considerable degree of skill on the part of the refiner. The determination of the amount of acid to add is entirely a matter of experience, the quantity necessary in individual cases varying very widely. Too much acid burns the oil and it is impossible to remove the resulting reddish-brown colour. An acid-refined varnish oil, however, is unsuitable because its acid value is too high and, furthermore, it darkens considerably on heating, producing a darker coloured product than an unrefined oil.

"Break" Formation

It was a consideration of the cute sensitivity of raw linseed oil to water that led to an investigation of the part it played in the phenomenon of "break" formation and to the development of a process for the production of varnish oil of considerable technical interest. In brief, it was found that water vapour precipitated the "break" at the comparatively low temperature of 370° F. This temperature is reached in less than half an hour and the varnish oil produced by this means, as would be predicted from theoretical considerations, has been found to be highly satisfactory in use. It suffers no discolouration whatever when subject to cooking for a long period, as it contains no trace of chemical substances, the presence of which is generally reflected in this particular. It is also interesting to note that if the superheated steam treatment—as it has now been developed into—is continued for a length of time beyond that necessary to reach the temperature of reaction, the oil may be bleached to a very pale colour. The amount of bleaching achieved is exactly the same as would be obtained when the oil is raised to 600° F. in the usual manner, which means, of course, that no further bleaching is observed on heating oil so treated. It is further possible, by raising the temperature to 400° F., or thereabouts, and increasing the vacuum to as high a degree as possible, to distil off free fatty acids.

Oils Which Give Durable and Continuous Films with Preservation of Colour

The most important method for the removal of acidity and for the production of varnish oil is that of alkali refining, and by far the greater proportion of oil, even if the break has been removed by any of the methods previously mentioned, is treated in this manner. Alkali refining is effective in removing, besides free fatty acidity, both "break" and, in some measure, colour, and caustic soda is invariably employed.

A special technique has been developed whereby it is possible to bleach linseed oil by passing through it a current of air—the air-bleached oil of commerce. In practice, varnish oils are bleached by the use of fuller's earth and, more particularly, activated earths, and in almost every case it is found that the most effective earths have a *p*H value of 6 or less, a fact which serves as a possible sorting test. Considerable advantages accrue from pre-heating the oil before bleaching and it is claimed that heat-treated pre-oxidised linseed oil possesses some of the quick-drying and other properties of tung-oil products, such as great durability and enhanced water resistance. The water absorption of two comparable stand oils, made from varnish linseed oil and pre-oxidised oil respectively, were found to be 37.5 per cent. and 15.1 per cent. In a like manner, the speed of polymerisation is much accelerated. The advantages obtained from using a heat-treated pre-oxidised linseed oil counterbalance the fact that the colour of the resultant stand oil is by no means as pale as that which is possible by the use of a bleached varnish oil.

Points from the Discussion

The PRESIDENT, in opening the discussion, said that being more concerned with the colour side he was particularly interested in the great variety of processes which refiners had at their disposal before the oil reached the market and the paint manufacturer. It was obvious that the processes of refining were aimed essentially at producing an oil which would give durable and continuous films and which would, at the same time, largely preserve its colour over ages. It had occurred to him, however, at times whether in other aspects all the properties of oils were considered by the refiners. One in which he was particularly interested was the wetting property of linseed oil, and whilst he realised that this was bound to depend on the mutual relationship between oil and pigment and also very largely on the physical condition of the surface of the pigment at the same time, a knowledge of the life history of the oil and the various processes through which it had passed might assist in producing an oil which under certain conditions would give optimum wetting power. If means could be found for the pigment manufacturers and the oil refiner to work mutually together it would be to the advantage not only of these two branches of the industry but also the paint manufacturer.

Dr. R. BHATTACHARYA said he had been associated with the refining of vegetable oils in Germany and India, particularly for edible purposes, and it seemed to him that the edible oil industry aimed at much higher than what was required by the paint or varnish industries as regards linseed oil. The acidity which was required by the edible oil industry was lower than 0.05 per cent., whilst the requirements as regards colour and in other respects were also higher.

In Germany, the practice of refining oil had undergone considerable changes during the past twenty years, and in connection with the author's comment that oils of better quality were obtained in the past than was the case to-day, he suggested that this was due to the modern practice of oil pressing. The desire to-day was to get the maximum

yield and to leave as little as possible in the cake. Even in the pressing of linseed oil, there was what was called the first press oil and then the cakes were pressed again. Naturally, if the results of these two pressings were mixed there would be a larger proportion of mucilaginous matter and, therefore, such an oil would be more difficult to refine. He therefore agreed with the President that some knowledge of the life history of oils would have a considerable bearing on the refining process. In Germany, the practice was to mix a certain amount of tannin with the oil—not more than 1 per cent.—and to mix it very thoroughly in order to emulsify it, after which the oil was allowed to stand for 24 hours when the mucilaginous matter settled out very nicely. He did not know whether this method was used in refining oil in this country. Again, the modern tendency in Germany was to reduce the initial acidity of the oil by preliminary distillation.

Referring to the bleaching of oils, Dr. Bhettacharya said this should be done prior to the refining process, but he believed that, generally, bleaching was carried out subsequent to refining, because, as a rule, it was very difficult successfully to bleach unrefined oil. Phosphoric acid had been used for refining with some oils and it was generally used in conjunction with fuller's earth or some similar material after initial refining.

A Question of Economics

Mr. MUNDY said that the comparative treatment of edible oils and linseed oil was quite definitely a question of economics so far as the paint trade was concerned. Concerning the removal of colour, there was no question that in this country the technique of colour removal in the case of linseed oil was at least as highly developed as in Germany, and he said this after having visited several German refineries. He agreed that raw linseed oil to-day was inferior to what it was many years ago; it was probably due to the greater care taken years ago in crushing, and the fact that more oil was now removed from the seed than used to be the case. The addition of tannin was well known as a method of refining, but it had no effect on the acidity or colour. At the same time, he was not aware that it was used in this country. The invariable practice in this country was to bleach subsequent to refining, and not before, although there were special instances in which the reverse was adopted. Phosphoric and other acids were used in conjunction with activated earths for bleaching linseed oil and it was possible to choose an earth with a suitable ϕH value.

Bleaching by sunlight had been done in this country, especially by the manufacturers of artists' colours. The time taken to bleach in this way to an extremely pale colour, however, was possibly a year, but such oils had extremely useful properties for grinding pigments. They had very considerably developed wetting powers and were quite interesting for that reason. The improved wetting power was probably, in part, due to the increase in the acid value of the oil by hydrolysis and partly also by the amount of oxidation which went on when an oil was exposed to light and the free access of air. In this country, when oils were bleached in this way they were always bleached in unstoppered bottles.

A Fetish from Two Points of View

Mr. R. F. BOWLES remarked that a considerable amount of trouble and expense was incurred by the oil refiners in bleaching and in the production of very pale colour linseed and stand oils, but it seemed to him that the question of colour was very largely a fetish from two points of view. It was very nice from a selling point of view to be able to offer an almost colourless oil, but this had to be paid for and in ninety-nine cases out of one hundred the oil was again discoloured by the addition of driers. In his view, the paint manufacturer or the printing ink maker was not really so much concerned with the colour of the raw oil as the colour of the dried film and whether it was being dried by normal air oxidation or by baking, the colour was always darkened in comparison with the raw oil. Could the author say whether there was any evidence that the paler colour linseed or stand oils gave a paler colour-dried film, or, alternatively, whether the paler colour refined or stand oils required less driers for drying in the required time, thus adding less colour in the form of driers?

Mr. MUNDY said the paint manufacturers usually required a very pale oil and apparently they considered they were getting value for the extra money paid.

Mr. R. F. DENINGTON asked how an unoxidised linseed or an air-bleached linseed oil of low acid value compared with an acid-refined oil of the same colour. Would there be any difference in the dispersing power?

Mr. MUNDY said there would not be any difference in the dispersing power, but he believed that the normal acid-refined oil was regarded as the better of the two.

Mr. DENINGTON then asked what was the reasonable commercial acid value for a practically oxidised oil.

Mr. MUNDY replied that an acid value of 4 would be reasonable, but there was no difficulty in adjusting it.

Modifying the Properties of the Oil

Dr. L. A. JORDAN, asking what bleaching was done for, said that obviously the bleaching of linseed oil started with the problem of dealing with the break, which was a nuisance unless it was properly provided for. The second reason for bleaching was obviously colour. It seemed to him that the next step in the procedure was to so treat the oil as to modify the properties from the chemical point of view. On the question of colour, his experience had not been quite so happy as the paper might lead one to image. However, he would like to hear the author on what was likely to happen in the future. It must be admitted that there had been great activity during recent years in regard to this matter, and no doubt the author himself would agree that even as recently as 1928 he could scarcely have foreseen the development that had taken place in technique up to the present time, but what was going to happen in the next 20 years?

Although treatment with earths was well known, it was only comparatively recently that it had been used in this country on an extensive scale, but what was the next step in the programme? He believed there were many good reasons for believing that there was as much in the cupboard as regards the refining and treatment of oils as had come out of the cupboard during recent years, but it would be interesting to hear the author's views in this connection. He would also like to hear a little more about these earth treatment processes, because he felt that they were of greater importance than the amount of space given to them in the paper indicated. Finally, Dr. Jordan said that although there might be much to be said for a nice, bright, so-called water-white oil, he was not at all sure that a good deal of the merit of such oils lay in the fact that they provided another weapon to hit the poor producer with and bring down prices.

Chlorinated Linseed Oil

Mr. DENINGTON asked in what direction the author thought the characteristics of oil would be modified by future treatment.

Mr. MUNDY said he had already indicated in the paper that it was possible, for example, to modify the oil along the lines of chemical treatment as distinct from merely physical treatment.

Mr. DENINGTON remarked that chlorination seemed to be quite a popular hobby for the research people and asked what the results of that would be on linseed oil.

Mr. MUNDY said he had no personal experience of the use of chlorinated linseed oil, but it had defintely been investigated by his firm some years ago with some measure of success.

Mr. DENINGTON then asked if there was any possibility or probability of increasing the unsaturation by substitution and subsequent removal of the substitution products.

Mr. MUNDY replied that this was wholly a question of economics and depended upon whether the industry would pay for it.

Mr. MUNDY, in reply to another speaker, said that as far as he was aware the pale colour oil was quite as durable as the dark colour oil, and, provided the refining was carried out in a suitable manner, with a view to the preservation of the properties of the film, he maintained that there was definitely no difference in the durability of the two films.

THE Soc. Italiano Potassio Marino has developed, with assistance of the Italian Government, the so-called Niccoli process of extracting potash salts from concentrated sea brine. It is operated on a commercial scale at Massaua, on the Red Sea, in conjunction with the Erythrean salt works, and experimentally near Naples. Starting with a brine solution from salt pans a concentrated brine is obtained by solar evaporation. This, it is alleged, can be processed to yield kainite or potassium-magnesium sulphate, with sodium chloride and magnesium chloride as co-products.

Rubber Latex as a Manufacturing Material

Rapidly Growing Applications

SPEAKING before the Royal Society of Arts on April 1, Mr. D. F. Twiss, chief chemist, Dunlop Rubber Co., Ltd., discussed the qualities of rubber latex which rendered it of extensive use as a manufacturing material. He said that in order to appreciate the advantages possible from latex it was necessary to have some knowledge of the ordinary methods of manufacturing procedure based on the use of dry rubber.

Raw rubber to-day commonly arrives in the forms of "pale crêpe" or "smoked sheet," which already possess a considerable degree of mechanical strength. The rubber is first submitted to a mechanical mangling until no substantial strength remains: into this raw rubber the desired compounding ingredients are then incorporated. The hot rubber is then shaped by extruding or moulding, and vulcanisation follows. During the masticating, the temperature may rise above 100° C., and this fact restricts the selection of possible vulcanisation accelerators, as, if this is so active as to cause incipient vulcanisation during preliminary operations, the result is the production of "burned" rubber which is relatively worthless. Even if the raw rubber is to be used for manufacture of goods by a dipping process, the preliminary milling is again inevitable to enable the eventual production of rubber solutions of sufficiently high concentration without impracticably high viscosity.

Elimination of Mechanical Working

In the use of latex the need for the drastic mangling of the rubber in any milling operation is entirely obviated, thereby eliminating the possibility of burning. It is possible, therefore, to use more powerful vulcanisation accelerators and to secure their advantages with respect to eventual vulcanisation at lower temperatures and formation of products of higher tensile strength. Elimination of the mechanical working also means avoidance of the weakening effect which this entails. This difference is clear from the exceptionally high tensile strengths observable with appropriate latex products, with fine round latex thread tensile strengths exceeding 4 kg./sq. mm. and even 5 kg./sq. mm. being frequently observed. The low temperature of vulcanisation attendant on the use of powerful accelerators also permits the colouring of the rubber with organic dyestuffs, which would otherwise become discoloured, while on account of its high rubber content rubber latex lends itself to a number of special methods for the production of rubber articles for which there is no counterpart with dry rubber or rubber solutions. The attendant disadvantages include the customary presence of a small proportion of alkali for preservation and stabilisation, and the necessity for drying the wet coagulum which represents the penultimate stage of the product. A further limitation of rubber latex is the fact that it has proved difficult to incorporate the standard rubber-reinforcing or toughening agents to their full effect, for the larger proportions, such reinforcement of latex rubber *without milling* still being a problem awaiting solution.

Rubber latex is generally received from the plantations in the form of a fluid concentrate containing about 60 per cent. by weight of rubber.

Dry Manufacturing Processes

For dry manufacturing processes the ingredients are mixed into the latex in their normal state or after having been thoroughly wetted. The resultant coagulum is dried, milled and finally moulded and vulcanised. In this way it is possible to produce milled rubber mixings with as high a proportion of carbon black as 100 per cent., though the final products have little advantage in degree of reinforcement of the rubber over the customary 45 per cent. For wet manufacturing processes it is desirable to introduce all compounding ingredients whether in the form of a dispersion in water: another advantageous precaution is to pass the dispersions through a "colloid mill" which also serves to assist in the production of emulsions of oils and other fluid or fusible compounding ingredients. The compounded latex may then conveniently be adjusted in consistency and stability; the former can be increased by careful concentration with gentle agitation or, in the exceptional case of the compounded latex being required in a more fluid condition, diluted with ammoniacal water. With ammonia-preserved latex the stability can be decreased by removal of the ammonia by blowing or by addition of formaldehyde solution. It is often desired to render latex so stable that it can be subjected to drastic conditions without forming clots of coagulated rubber which would mar the value of the final products. For addition to large proportions of fibre pulp, for instance, the latex is required to distribute itself uniformly. This end can be secured by first treating diluted latex with a suitable coagulant—*e.g.*, an aluminium salt—under such conditions that instead of a coherent clot a very fine suspension of coagulated rubber is obtained. This "flocculated latex" or "latex precipitate" has most of the desirable properties of latex, but is no longer sensitive to coagulants. Both flocculated latex and ordinary latex can be successfully applied to the binding of short fibre, *e.g.*, of cotton or disintegrated leather scrap for the production, for instance, of excellent leather substitutes.

The Dipping Process

Among the many methods for converting the latex into rubber articles one of the most frequently used is the dipping process, the principle of which can be applied in a variety of ways. This can be used with ordinary latex, but in order to reduce the number of immersions latex of increased concentration is to be preferred. To facilitate the production of articles of considerable thickness from latex, a device called "ionic deposition" or "coagulant-dipping" is used. The dipping former in this case is coated with an adherent film of coagulant and is then immersed in the latex. The migration of the coagulant into the surrounding latex not only causes rapid formation of a shaped coagulum, but also reduces the number of immersions necessary for thick deposits. A further device to effect controlled deposition of rubber from latex on to a shaped surface is by so-called heat sensitisation. On immersion of a hot former into such heat-sensitised latex a layer of rubber coagulum is gradually built up, and when of the desired thickness can be removed with and dried on the former. A special form of the dipping process which may be mentioned is the production of rubber thread. The latex, preferably concentrated compounded latex, is allowed to flow through a number of small orifices into a suitable coagulant, such as acetic acid, or into a bath capable of effecting osmotic dehydration and setting, through which it is drawn continuously to conveyors on which it can be spray-washed, dried and vulcanised in a continuous operation. The thread so obtained is of circular cross-section and can be obtained in very fine "counts" as low as 1/125th of an inch in diameter.

Electrodeposition

There are two possible methods of procedure in the electrodeposition process. The deposit may be formed directly on the anode or on a porous diaphragm surrounding the anode. When an electric current is passed through latex around a suitable anode, the anode is not insulated by the rubber deposit which forms on it. The deposit is porous and permeated by serum, so that electrodeposition continues to occur on the rubber deposit already formed. The deposition is, therefore, essentially not electrophoretic, but it is effected by ions formed at the anode and migrating under the electric stress to the exposed surface of the deposit. Deposits up to 1 centimetre or so in thickness can therefore be built up rapidly on the anode by this special form of "ionic coagulation." The compounded rubber dispersion is kept well stirred, so that the electric current is not responsible for bringing the particles to the anode or anode diaphragm. For the production of hollow rubber articles it is possible to use a suitably shaped porous diaphragm around the anode containing an electrolyte in which the anode is situated. An advantage of this arrangement is that any anodic electrolytic gases are liberated away from the rubber deposit, and so cannot lead to the inclusion of bubbles therein. If the latex is contained in a permeable vessel, the cathode can be placed in a bath of suitable electrolyte, such as dilute ammonia, surrounding the permeable latex container. While the current is being passed, electrodeposition takes place on the anode and serum simultaneously flows from the latex bath through the permeable

wall of its container to the exterior space around the cathode, whence it can overflow to waste. This removal of serum usually compensates closely for the anodic loss of rubber, so that the concentration of the bath is automatically maintained constant. In the production of rubber-protected wire sieves or screens, electrodeposition has an advantage in that it leaves the spaces between the wires clear, wheras a dipping process using more concentrated latex would tend to form undesired films of rubber across the meshes. Where desired, areas can be separated by insulating strips so that different current densities can be used over them with corresponding local differences in the thickness of the deposit.

Moulding of latex by coagulation to a continuous solid mass in a shaped cavity has two distinct disadvantages; the time required for complete drying of a wet coagulum of substantial dimensions and the shrinkage which occurs during drying of a coagulum of soft rubber. These apparent disadvantages disappear in at least two special cases of this type of moulding. If latex containing sufficient sulphur is vulcanised to the condition of ebonite in circumstances substantially preventing the loss of the entrained water, the resulting ebonite retains the dimensions of the mould, the water being very finely distributed in pores throughout its mass. On drying, a light-brown microporous ebonite is obtained, the pale colour being due to the discontinuity of the surface, pure ebonite dust also being brown. By selecting the concentration of the original latex it is possible to produce ebonite with microporosity as high as 80 per cent. of the total volume or as low as 15 per cent. or less.

Ebonite for Filtration Purposes

Such ebonite can be used for filtration purposes, and is particularly applicable in the form of diaphragms for electric batteries and accumulators. Even if the rubber is not vulcanised to a hard condition, the shrinkage of the rubber to a solid mass may not be complete, and it is possible to obtain microporous soft rubber, the practical advantages of which, however, are more limited. Compounded latex, to which has been added a small proportion of a frothing agent, can be beaten into a froth which, after the addition of a coagulant with delayed action, will set after pouring into moulds. After vulcanising the ultra-accelerated froth-coagulum by immersion of the filled moulds in a bath of hot water the serum and additional water can be removed by centrifuging, followed by drying; in this way it is possible to produce as single units sponge rubber of any desired shape. The frothed latex can be used in many ways, such as for dipping purposes so as to produce articles with a soft sponge-rubber covering, while another striking application is in the preparation of moulds for the production of ornamental cement castings such as are popular in gardens.

Method of Shipping Latex

To-day, much of the latex is shipped in a concentrated condition, the form of concentrate which was first available being obtained by evaporating in a special type of rotary drum after the addition of a small percentage of potassium hydroxide or potassium soap to the latex for stabilising purposes. The product contains approximately 75 per cent. of total solids and approximately 68 per cent. of dry rubber, and forms a pasty fluid which can be shipped in tins or drums or even in wooden chests. Later, however, there were developed methods for the concentration of latex based on the natural tendency of the latex globules to form a cream. One method of expediting this creaming is by the addition of a small proportion of a suitable colloidal substance. The effect of the creaming agent is to cause in a few hours the formation of a cream containing up to 60 per cent. of its weight of total solids over an almost equal layer of clear or almost clear brown serum. Another method of expediting creaming, one which obviates the addition of any foreign creaming agent, is to submit the latex to centrifugal treatment in special machines operating at 8,000 revolutions per minute and giving approximately equal volumes of "cream" and "skim." Before passage through the machines the latex contains about 0.25 per cent. of ammonia, and this is subsequently increased in the concentrate to 0.5 per cent.

Mr. Twiss concluded by saying it was important to remember that but for the existence of rubber plantations the necessary supplies of latex could not have been available.

The Paint Industry and Modern Finishes

Some Recent Developments Reviewed

MR. W. A. LOWE, of Donald Macpherson and Co., Ltd., read a paper on "The Paint Industry and Its Development of Modern Finishes" at a meeting of the Manchester Literary and Philosophical Society (Chemical Section), on March 29. The variety of raw materials at the command of the modern paint technician, he said, enables him to build his products to comply with almost any specification, and to meet any physical and many chemical requirements. The most recent addition to the paint family, synthetic materials, has added still further to the possibilities and scope of the paint technician. In some industries synthetic mediums are being increasingly used in lieu of vitreous enamelling—with very good effects in mottling, marbling, etc.

The first consideration of industrial users of paint is that of colour, the beauty of colour and the general finish of their production as a material help in sales. They are then vitally interested in the most rapid and cheapest shop methods for producing these finishes. It is for the paint industry to foresee and satisfy these wants, using the new materials at its command. We have entered a great colour-using age, which age is also one of fierce competition. In the development of modern finishes, colour is playing an important part. In these days an ever-increasing range of beautiful colours is available. The desire for colour is as old as the world. With certain colours the brain is stimulated, and with others it is depressed. It is said that Mr. Hore Belisha, in order to obtain the maximum amount of concentration, has had a colour scheme selected for his office consisting of cream, gold and blue, and the effect is a beautiful room. These considerations of colour have been closely studied by users of modern finishes, such as the manufacturers of all classes of domestic hardware, canisters, bedsteads, kitchen cabinets, cookers, heating appliances and hosts of other everyday articles. Colour, neatness, and simplicity of line have, to a gerat extent, fostered and furthered the sales of such appliances.

Another important study for the manufacturer of modern finishes is the subject of heat and also light radiation in relation to paint and lacquers—again, light radiation is probably mainly the concern of the architect. Reflections of light and heat are dependent upon the conditions of the surface and colour—the glossier the surface the easier it is to obtain specular reflection and high radiation. White is the best reflector of all, giving about 84 per cent. reflection, and then we come down through creams, yellows, pinks, green and blues, in order of reflecting value. Comparisons of heat radiation effects show that omitting black and dark browns, the reflecting power of ordinary pigments and colours is much the same, although that of aluminium is particularly high. That is why petroleum storage tanks are usually painted with finishing coast of aluminium. Petroleum engineers maintain that there is an appreciable saving in evaporation losses of their spirit when their storage tanks are painted with aluminium.

The paint producer's next problem is the working out and then recommending the most expeditious method of applying his finishes—particularly when it is to be done on a large or factory scale. This is an integral part of his work. There are such factors to be considered as stoving, air drying, spraying, flowing, dipping, roller application, *e.g.*, cycle frames and bedsteads are dipped and stoved, motor chassis flowed, and then stoved through a travelling japanning oven. Roller application is also used for tin canister work and on fibre board decoration. Most industrial articles are sprayed or dipped, only a few being brushed in these days of speed and mass production. Up-to-date paint manufacturers must not only employ chemists and other technical men on the

production side, but the activities of these men must be linked up with those of the outside men, who must be technical and well versed in the application of the finishes in modern shop practice, and men who have appreciation of factory output costs.

In the early days a painter or artist, as he then was, supplied his own requirements of paint by pestle and mortar, or muller, tediously grinding various earth pigments in linseed oil. These paints, admittedly hard wearing, were necessarily very limited in other ways. Cleaner and brighter finishes generally were developed from this early start by the advent of chemically made colours, blues, chromes, greens, reds such as signal and post office, made from dyes, and also by the use of machinery for better grinding and wetting out. A still more striking development was the production of the fossil gum varnishes. These further media made possible a host of other enamels and varnish paints both for decorator and industrialist, the basis of such varnishes being naturally occurring fossil resins. These are the resins exuded from trees in tropical areas such as the districts of the Belgian Congo, New Zealand, Sierra Leone, etc. There are many varied types, each with its own physical characteristics and peculiar suitability for different varnish purposes. Amber, years ago, was used for the finest of varnishes owing to its brilliance and toughness. The scarcity and price today, however, militates against its use.

Durability, Hardness and Elasticity

These gums are fused in the region of 600° F. until 25 per cent. to 35 per cent. of their weight is driven off in fumes—in this condition they are miscible with various types of linseed oil and tung oil, and their manufacture is completed by the addition of salts of lead, manganese, cobalt, etc., as drying agents, and the requisite turpentine or other solvents to impart flow. They are then matured and filter pressed. The physical properties of such oil gum varnish media can be widely varied in manufacture, *e.g.*, the drying time varied by the driers. Durability, hardness and elasticity are obtained by varying the respective gum and oil contents.

Coal tar pitch, natural asphalts, Swedish or wood pitches, and stearine pitches have varied properties and which are found useful by the paint producer in improving such products as black stoving enamels, bitumen blacks, stains, coachmakers' black japans, and insulating materials. Stoving enamels of all types have a better film thickness than air-drying qualities. Consequently they fill up the porosity and irregularities of surface better. Whilst having the necessary oil content to give durability, they can be dried by stoving in an hour or two, as against the twelve to eighteen hours required for air-drying.

We are indebted to the oil chemists for important improvements in the qualities of linseed oil, for the production of more useful types of linseed oil such as the pole stand oils, and for the development of a pale, tougher, and more waterproof oil, known as tung oil or China wood oil. In recent years these have all added considerably to the range of media available to the paint and enamel producer, the more important properties gained being higher gloss, better general finish, greater durability and weather resistance, hardness and paleness for the production of more delicate finishing tints. The improvements in these oils and varnishes have materially assisted over the last quarter of a century in the production of the present-day high-grade materials available for the house decorator and also, though to a smaller extent, the industrial user.

Development of Cellulose Finishes

The war-time development of cellulose dope for aeroplanes and the post-war production of a stable collodion cotton of a comparatively low viscosity, permitting of a reasonably thick coat of enamel or lacquer, led to the development of the so-called cellulose finishes. The way in which these finishes in the motor trade rapidly displaced the old protracted methods of the coach painter is remarkable. They met modern requirements in speed and were quite equal to the somewhat shorter life now looked upon as being adequate or necessary for a motor-car finish. Incidentally, these motor cellulose finishes requires much less care in maintenance. Whereas finishing a motor car by the old coach process took anything up to three weeks, a reasonable cellulose finish can be obtained in two days. Similarly these finishes caused great changes in many types of industrial finishes, *e.g.*, witness the way french polish has been displaced on such articles as furniture, pianos and wireless cabinets. Cellulose is used on electric meters, steel office furniture, etc., in lieu of stoving enamels. It saves times and stoving. Such appliances are generally finished in tin work or smooth sheet metal, and naturally a big film thickness is not necessary to hide any irregularities of surface. These cellulose lacquers consist of nitrocellulose or collodion cotton, gums, plasticisers, solvents and the necessary pigments. They dry by evaporation of solvents, whereas linseed oil or linseed oil varnish films are subject to lengthy oxidation drying.

It was seen that whilst the development of cellulose had speeded up finishes generally, these finishes comparatively lacked adhesion and flexibility, and a certain amount of durability. This led to a demand for materials to reproduce the adhesion, elasticity and durability of the old oil gum varnishes, but if possible with the cellulose saving in time. Here we come to the field of synthetics. Investigation of these materials has been proceeding apace in connection with other industries, *e.g.*, mouldings and coatings for many purposes, the substitutions of synthetic plastics for wood-laminated boards, table tops, wall panelling. There are newer applications of synthetics almost every day and in many diverse fields. It was soon found that the incorporation of various synthetic gume in paint media improved the light and weather resistance of cellulose films, and gave a much better film thickness.

Synthetic Resins

Whilst cellulose appeared to sweep the decks at first, when its true place was found in industry it became evident that the number of coats required to build up the requisite film thickness was a drawback, since it had a comparatively poor film thickness, and attention was focused on synthetics. Synthetic resins are not necessarily a copy of natural products. A better description would be that they are built up from a definite combination of materials, under a technically controlled process, so as to give a standard end product of known properties, *i.e.*, controlled as against the old type varnish-making, which was dependent on the skill of a non-technical operator, and which could not be controlled—raw materials, for instance gums, varied considerably, with the care employed in selection and their place of origin.

Synthetic resins for the paint industry fall mainly into two classes, those incorporated or dissolved into drying oils, and the others where the resin itself is the finishing medium dissolved in very volatile solvents. Of the latter types many possess the interesting property of drying by heat conversion, not by oxidation, and when once converted they cannot be restored to the original form. They are hard, lustrous, adherent and give film coats three times the thickness of a cellulose paint.

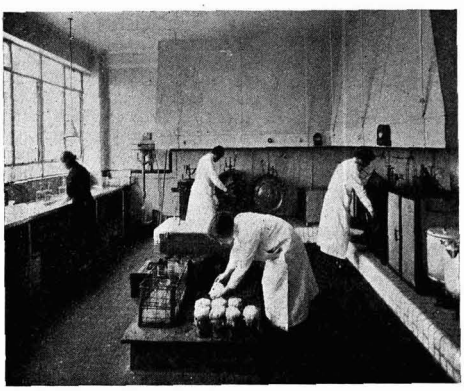
The phenyl-formaldehyde types possess excellent resistance to chemicals, sea air, and stand up to most exacting conditions. They are, however, not too good for pale shades as they tend to "after-yellow"—a question which is at the moment being investigated.

Another type is the urea formaldehyde resin—these resins are almost water white, possess remarkable heat resistance, and an almost porcelain-like hardness. Significant of the speed possible with these finishes, three coat wet on wet processes are possible. The three coats are applied with intervals of a few minutes aid-drying only.

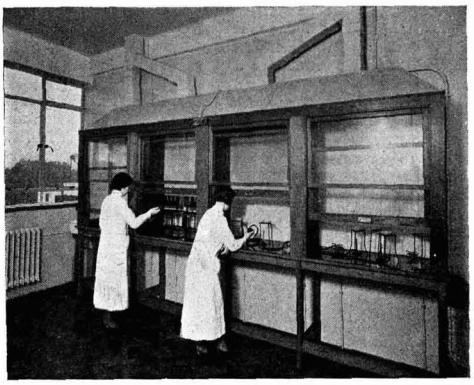
Some Necessary Modifications

While much has been achieved none of the various available synthetics are without *some* kind of fault. Modifications are necessary on account of the large increase in the number of types. A tremendous amount of work is necessary to keep pace with their introduction, and to reach the perfection desired. In the introduction of these new finishes the problem of suitability of pigment for each type arises anew, and considerable time has had to be spent on this problem. Again, an enormous number of new solvents are being turned out from the research laboratories. Paint technologists are examining most of these to estimate their value in the formation of new products, and enormous strides in synthetics generally have been made in the last few years.

In illustration of his lecture, Mr. Lowe displayed a number of raw materials for paint-making, such as fossil resin gums, modern synthetic lacquers, colourless stand oils, china wood oil. He also showed a number of synthetic finishes on pottery, asbestos cement, fibre board and metal, etc.



Bacteriological Media Laboratory, showing Sterilising Equipment.



The Kjeldahl Laboratory, showing Fume Cupboard construction.

Dairy Research and Control

New Central Research Laboratory of United Dairies, Ltd.

THE Central Research Laboratory of United Dairies, Ltd., at Shepherd's Bush, London which Mr. Geoffrey Shakespeare, Parliamentary Secretary to the Ministry of Health, opened on April 5, is the "nerve centre" of a chain of thirty-three district laboratories throughout the country. The main function of this laboratory is to establish and maintain standards and ideals, to expose unsatisfactory results, and to seek to trace them to their often obscure causes. It standardises laboratory materials and methods so that the results and records of the different district laboratories can be compared and correlated; but one of its most urgent preoccupations is the improvement of the cleanly and healthful quality of milk as it is produced on the farm. Last year the total number of individual samples of milk examined in the central, country and London laboratories of United Dairies, Ltd., reached a total of 1,831,000, of which 309,000 were bacteriological analyses.

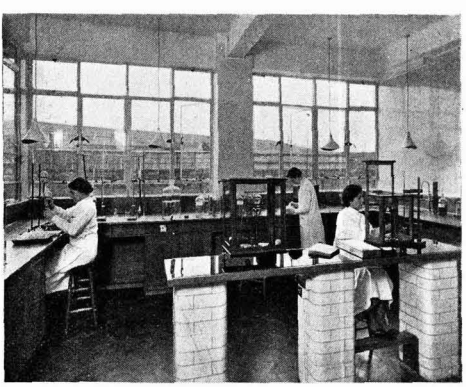
This new Central Research Laboratory is situated on part of a site of 7½ acres, and is housed in a building 200 feet in length, specially designed for laboratory requirements and lighted on all sides. The centre portion of the building has an upper storey and a basement, providing for kitchens and staff restaurant, as well as for steam and hot-water boilers, refrigerating plant, and other services. The laboratories are arranged on two floors and on either side of a central corridor. As far as possible, partitions are of glass, benches and floors of teak, sinks and fittings of stainless steel. Each bench is supplied with water, gas, electricity and compressed air.

The work of the laboratory is divided into four main sections: (1) research, (2) routine control, (3) supplies and stores, and (4) library and records.

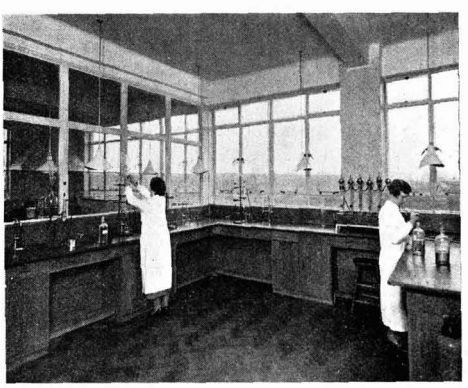
Three laboratories are devoted exclusively to research, and are intended to accommodate eight workers and their assistants. Fundamental investigations are at present in progress into such problems as (*a*) the purification of creamery and factory effluents, (*b*) the bacteriology of Cheddar cheese, (*c*) the reductase test, (*d*) thermoduric organisms in milk, and (*e*) the significance of *B. coli* in relation to pasteurised milk. Besides these main investigations, others are carried out dealing with immediate problems referred to the laboratory from time to time by the milk collecting, manufacturing, or distributing organisations, or which are suggested by the published announcements of other science workers.

The research work is directed by a research advisory council and the chief chemist. In order to keep him in touch with the day-to-day problems of the industry, each senior research worker is made responsible for the supervision of one or more of the routine and plant laboratories. An important adjunct to the research laboratory is the "plant testing laboratory," where new machinery and processes can be tested, and where small-scale plant will be tested to carry out investigations beyond the bench stage.

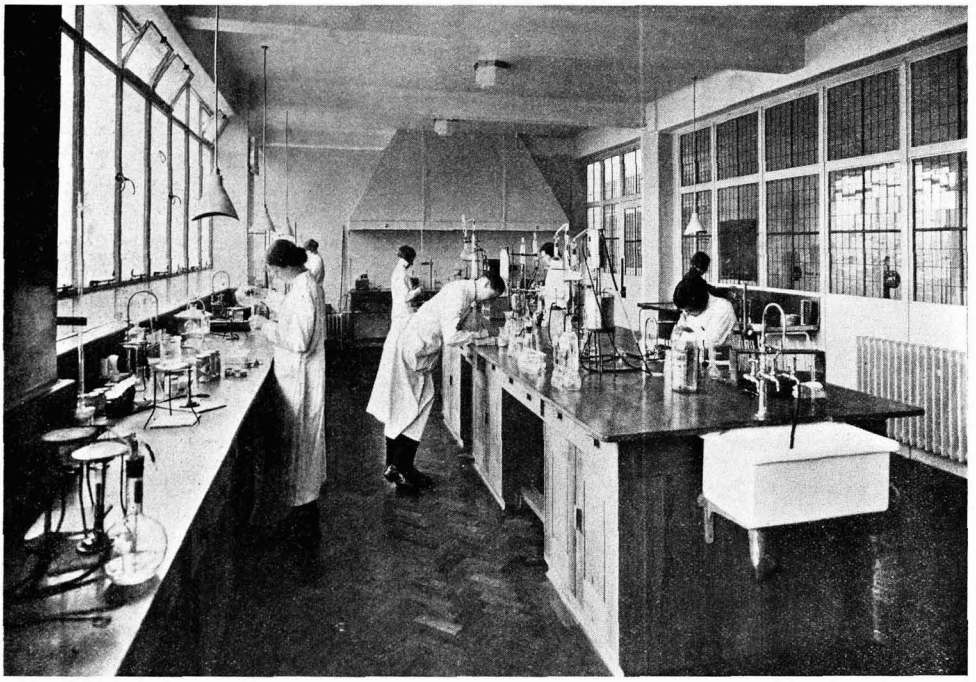
Six laboratories are devoted to routine control work. The milk chemical laboratory deals with all official samples taken



Standardisation Laboratory, showing special brick supports for Balance Bench.



The Distillation Laboratory, showing simple design of Laboratory Benches



General View of the Foodstuffs Laboratory, which deals with the chemical analysis of all goods (excepting fresh milk) sold in the shops of United Dairies, Ltd.

by public authorities; it also deals with test samples collected from bottling depôts, shops and in the course of distribution by the inspection department. The routine bacteriological laboratory deals with the bacteriological examinations of all the above-mentioned samples; it also deals with the analyses of samples of ice cream, butter, water, etc., and carries out investigations connected with any plant problems referred to the laboratory. The microbiological laboratory deals with more specialised work, such as the examination of milk for hæmolytic streptococci, with cheese starters, meat pastes, yeasts and moulds, and examination of foodstuffs in general. The general foodstuffs laboratory carries out the chemical analyses of all the goods sold in United Dairies shops, ranging from tinned peas to packaged suet; it is also responsible for the analysis of such milk products as condensed and dried milk. The stores laboratory deals with the great variety of consumable goods purchased for use in the factories, depôts and shops of the company, such as paper, tinplate, detergents, paints, fuel, oil, etc. The glass bottle laboratory has been stablished in view of the enormous importance of glass bottles to the milk industry; it is equipped with special apparatus for testing bottles in respect of their resistance to impact in all directions, to strains due to extremes of temperature, and their exactness of capacity.

The new Central Research Laboratory supplies all the apparatus, chemicals and bacteriological media required by the thirty-three district laboratories in town and country. A section is devoted to the preparation of standard solutions and the verification of all graduated glassware, such as flasks, butyrometers and pipettes.

Federation of British Industries

Industrial Progress during the Past Year

THE election of Sir Francis Joseph as president was confirmed at the annual meeting of the Federation of British Industries in London on April 10. The vice-presidents were re-elected with the addition of Mr. J. L. Ferguson (joint managing director of Lever Brothers, Ltd.) and Mr. P. J. Hannon, M.P. (director of Birmingham Small Arms, Ltd.).

Lord HERBERT SCOTT, the retiring president, in reviewing the events of the past twelve months, said the financial structure of Great Britain had been put upon a sounder basis, as evidenced by the steady figures of revenue and a balanced Budget. The methods of finance, which had been adopted and maintained by the present Chancellor of the Exchequer, had gone a long way to restore public confidence and credit both at home and abroad. It was with great satisfaction that he noted the increasingly intimate consultations which the Government was prepared to have with the Federation. Members and officials had been privileged to serve on many committees, and he was particularly gratified to be able to say that they had been closely associated, both at home and abroad, in commercial treaty negotiations and with Government missions which had undertaken this work in foreign countries.

Index of Production

Reviewing the general progress in Great Britain during 1934, the extent of improvement was shown by the increase of 12 per cent. in the Board of Trade Index of Production, as compared with that of 1933, bringing the aggregate level of the output of this country to that which obtained in 1928-1929. In interpreting these figures it must not be overlooked that the consumption trades had been mainly responsible for the forward movement. Fortunately, the slackening in momentum of expansion in those industries during the second half of 1934 was more than offset by the expansion which occurred in the constructional trades—a progress which appeared to be still proceeding.

In spite of increasing difficulties abroad, particularly in Europe, arising from exchange controls, import quotas and the like, exports of British goods to overseas markets increased in volume during last year by 8 per cent. In conformity with the recovery in industrial activity in Great Britain, our purchases of raw material rose by approximately an equal amount in volume.

An important activity initiated during his period of office was the sixth International Congress on Scientific Management. This congress would be held in London this year, under the patronage of the Prince of Wales, at the Central Hall, Westminster, commencing on July 15. In the absence of a permanent organisation in this country for the study of management problems in industry, the Federation convened a meeting of representatives of professional and scientific bodies, who subsequently formed themselves into a council, under the chairmanship of Sir George Beharrell. They were responsible for the organisation of the congress. The objects of the congress were firstly to awaken a real national consciousness as to the importance of the adoption of the best principles of management in the conduct of business, and to give every opportunity for the discussion of managerial subjects by those having similar interests, whether from Great Britain or abroad; secondly, to show the international delegates that this country could, and did, produce some of the finest examples of organisation in the world.

Survey of Commercial Policy

The Federation was actively engaged in making a detailed analysis of our trade and production statistics in a considered survey of the commercial policy of this country. Our exports to Empire countries continued to increase, but the statistics still suggested that the overseas countries of the Empire were reaping at least as great, if not greater, advantages from the Ottawa agreements than certain British industries had experienced.

Considerable progress in the elaboration of our tariff schedules was made during the year, but, even so, imports tended to increase faster than exports. This had occasioned considerable concern in certain industries. It must not, however, be overlooked that the increase in imports was, in the main, occasioned by the increased demand for the raw material and manufactured goods—including machinery—which arose in connection with the expansion of British industrial activity.

Great Britain moved slowly, but with wisdom and caution. She abandoned some three years ago her policy of free trade for one of tariffs, to a great extent because she found that the rest of the world had refused to follow the idealistic lead of free trade, to which she had been attached for nearly a century. By our example and good leadership we must endeavour to bring other nations into a system of mutual trading, which should mean more prosperity for all, if unnatural restrictions and impossible barriers are cleared away.

A Difficult Situation Possible

Great Britain had both courage and endurance. Given good leadership, backed by strength and judgment, the progress which she had made in the last few years would place the Empire in a stronger position in the councils of the world—and in the regard of nations—than it had ever held before. Under most difficult conditions the Import Duties Advisory Committee, headed by Sir George May, had, on the whole, earned the confidence of the industrial community, and had gone a great way towards giving a sound level of protection for the time being.

A difficult situation, however, might arise—they had seen what had happened in Belgium. Events in foreign countries, over which we had no control, might at any time substantially diminish the level of protection which our tariffs now afforded us. It would, of course, be open to any industry to apply to the Import Duties Advisory Committee for a revision of the level of protection accorded to it. This, however, would be a slow progress, and action might be required urgently. It might be necessary, without wasting time, to impose a general revision of the level of duties in an upward direction, in order to meet our difficulties. He had already urged the Government to take any steps which might be necessary to safeguard the level of our industrial protection, and he trusted that the Federation would whole-heartedly endorse this policy so that the incoming president might know that he had their support in pursuing it.

Science and Crime

An Advisory Committee Appointed

SIR JOHN GILMOUR, in opening the new Metropolitan Police Laboratory for the scientific investigation of crime at Hendon on April 10, announced the appointment of a committee to advise him as to the manner in which the laboratory may best be developed in the national interest. The members of the committee are: Lord Atkin, Lord Dawson of Penn, Lord Trenchard, Sir Russell Scott (Permanent Under-Secretary of State, Home Office), Sir Edwin Deller (Principal of the University of London), Sir Bernard Spilsbury, Sir Frank Smith (Secretary, Department of Scientific and Industrial Research), Sir Robert Robertson (Government Chemist), and Mr. Hugh Lett (senior surgeon to the London Hospital).

The distinguished company present at the opening ceremony included Lord Trenchard, Lord Dawson of Penn, Lord Atkin and Sir Bernard Spilsbury.

Sir JOHN GILMOUR said the provision of the laboratory was the beginning of a department which ought to have been established long ago. Glasgow and Edinburgh had had their criminal laboratories for years, but very little had been done in that direction in England and Wales.

Lord ATKIN said that to anyone interested in the medico-legal problems of science the opening of the laboratory was of the greatest importance. It was fitting that the men who were to take a leading part in the police work of the future should be familiar with the latest developments of science. Lord Atkin suggested that a central morgue should be established, where investigations could be carried out, and declared that post-mortem examinations in London were often conducted in a state of disorder and on the most haphazard lines.

Far Eastern Chemical Notes

Indo-China

CRUDE PHOSPHATE PRODUCTION has now fallen to vanishing point, the latest available figures being 12,900 tons in 1931 and 400 tons in 1932.

Siam

ACCORDING TO A SINGAPORE REPORT, a Siamese company is endeavouring to develop the export of a cheap substitute for sandalwood oil derived from *Dipterocarpus alatus Roxb* (" Chemische Industrie ").

Manchukuo

ENGINEERS OF A TRANSPORT CONCERN are understood to have obtained satisfactory results when experimenting with soya oil products as substitutes for petrol and lubricating oil (" Industria Chimique ").

Japan

MANUFACTURE OF CHROME PIGMENTS, metallic chromium and magnesium salts, is understood to be planned by Nippon Seiren K.K.

SODIUM SULPHITE MANUFACTURE to the extent of 100 tons monthly has been started up by Dainippon Jinzo Hiryo K.K. at their new Kizugana factory.

MANUFACTURE OF FORMIC ACID in 90 per cent. concentration is contemplated by Edogawa Kogyodro. At present this concern turns out 1,500 tons of 80 per cent. formic acid annually, as well as 600 tons oxalic acid.

MANUFACTURE OF THE FOLLOWING PRODUCTS is included in the plans of Nippon Soda K.K. for their newly-erected dyestuffs factory: malachite green, auramine, naphthol AS, chloroform, phenyl dimethyl pyrazolone, tartaric acid, and synthetic acetic acid.

UREA RESINS ARE BEING MADE IN JAPAN by four concerns (reports " Nikkan Kogyo "), Chugoku Toryo K.K. (daily output of 150 kg. exported mainly to Czecho-Slovakia, Belgium and Turkey), Matsushita Denki K.K., Kobe Denki K.K. and the newly-established concern of Sanwa Kagaku Kogyoshu (with a contemplated daily output of 350 kg. lacquer). Safety glass manufacture is also contemplated by the last-named firm.

Chemical Nature of Low-Temperature Tar

Professor G. T. Morgan's Lecture to Dutch Chemists

ON the invitation of Professor H. I. Waterman and of the Technologisch Gezelschap (Students' Association) of the Technical High School at Delft, Professor G. T. Morgan, F.R.S., Director of Chemical Research, Department of Scientific and Industrial Research, lectured at this institution on Thursday, April 11, on recent investigations into the chemical nature of low-temperature tar. The audience, which numbered about 100, consisted partly of the staff and research students of the Department of Chemical Technology and partly of chemists and technical engineers resident in Amsterdam, Delft and the Hague.

The lecturer, who was welcomed by Mr. Roessingh van Iterson, President of the Association, summarised earlier work on the technically important constituents of the longer-known varieties of tars from vertical and horizontal retorts and from coke ovens. He then referred in greater detail to the procedure which had been devised at the Chemical Research Laboratory, Teddington, for the study of low-temperature tar, a material which although produced at 600° to 650° nevertheless contains components undergoing thermal decomposition at 140°. Accordingly, such tars were treated with inorganic reagents and organic solvents at temperatures well below this decomposition point.

Extraction of Phenols

Dilute caustic soda solution extracts not only true phenols, but also non-phenolic materials, which, however, are precipitated and removed by the addition of chloroform or sodium chloride. This non-phenolic deposit when dissolved in ether and reprecipitated by light petroleum is obtained as a resinous mass of neutral materials termed resinenes. The true phenols may be separated into crystallisable and resinous constituents. The latter are divisible by caustic soda and aqueous sodium carbonate into resinols and resinolic acids respectively. The tar bases, extracted by 5 per cent. sulphuric acid, are likewise divisible into crystallisable and resinous bases, the latter being termed resinamines.

These four groups of resins may be separated from the crystallisable constituents of tar in two ways. In the first process the tar is passed through a homogeniser with four volumes of light petroleum. Two layers issue from the orifice of this apparatus, a lower viscid fluid containing all the resinoids and an upper linked petroleum solution of the crystalloids. The second process, which depends on the non-volatility of the resinoids, is used to separate the less volatile crystalloids by distilling at temperatures below 140° a mixture of the two in an ultra-cathode ray vacuum still. The crystalloids pass into the distillate; the resinoids remain in the residue.

When tars containing resinoids are distilled under ordinary pressure, the resins and their decomposition products remain in the pitch, of which they form the main ingredients. The resinoids may, however, be converted into volatile oils by hydrogenation under 100 to 200 atmospheres at temperatures ranging from 410 to 500° in presence of a molybdenum oxide catalyst. Even at the lower temperature the resins are all converted into volatile oils. At the higher temperature practically all the phenols are converted into hydrocarbons. The first light oils of low-temperature tar contain olefines, such as octylene and nonylene, monocyclic aromatic hydrocarbons, such as benzene, toluene, the xylenes, pseudocumene and mesitylene and naphthenes, such as the mono-, di- and tri-methylated *cyclo*-hexanes. The second light oils contain naphthalene, α- and β-methylnaphthalenes and two dimethylnaphthalenes.

Contents of Liquors

The least volatile oils contain anthracene, β-methylanthracene and several polymethylated anthracenes. These solid hydrocarbons are all coloured by the presence of a golden-orange hydrocarbon which has recently been shown to consist principally of 2 :6-dimethylnaphthacene.

The aqueous liquors from low temperature tar contain notable quantities of phenol and catechol, together with smaller amounts of cresols, resorcinol and quinol, and their homologues. The tar itself is very rich in higher phenols containing five out of six possible xylenols, 3-methyl-5-ethylphenol and 2 :3 :5-trimethylphenol. The less volatile phenolic fractions contain substances having a pronounced wetting action on cotton. This mixture of higher phenols known as "Shirlacrol" is used in considerable quantities as an adjuvant in mercerising cotton. The predominant xylenol of low-temperature tar, namely, *m*-5-xylenol, is readily converted into *m*-5-xylidine by heating under pressure with ammonium chloride and ammonia. This base which has hitherto been the rarest of the xylidines is thus obtained with considerable facility.

Among other industrial applications of low-temperature tar are the production of aviation spirits, fuel oil, phenolic oils for sheep dips and disinfecting solutions. These fractions are obtained by distillation. The residue is pitch, which is employed for road surfacing and for the manufacture of briquettes. This variety of tar is particularly adaptable to hydrogenation processes, and its extended use in this direction will lead to an increased production of fuel oils.

The lecture was fully illustrated by lantern slides and by a comprehensive set of specimens from the Tar Research Section of the Teddington Laboratory.

"An Unjustifiable Tax"

Industries' Deputation to Chancellor

THE Chancellor of the Exchequer, Mr. Neville Chamberlain, has been asked to receive a deputation representing the chemical, dyeing and cleaning, painting, white spirits, wall-paper, india rubber and boot and floor polish industries to discuss the remission of the duty of 8d. per gal. on industrial light hydrocarbon oils, first imposed in 1928. In a memorial to the Chancellor, signed by Mr. S. K. Thornley, chairman of the joint committee of the industries represented, the reasons for asking for the remission of the duty are given as follows:

The duty on light hydrocarbon oils was intended primarily as a duty on petrol, to be paid by road-users, and therefore its incidence upon manufacturing industries was not justified either in equity or in logic. The duty was imposed at a time of financial crisis which has now passed. The fear of evasion of the duty by motorists, etc. (which has been adduced by the Government as a further reason for its retention), is ill-founded in the case of white spirits and turpentine, since neither in Germany nor in the Irish Free State has difficulty been found in the administration of an exemption for these two commodities—an exemption which places many British manufacturers at a disadvantage in foreign markets. The remission of the duty will tend to lower manufacturing costs and so promote the revival of industry and improvement of employment which is the avowed aim of the Government. A special timeliness would attach to a remission of the duties in the present year, because any lowering of the cost of the products of the industries concerned would inevitably be reflected in the costs of housing, which at the moment is a matter of both national and municipal concern and special activity. This lower cost would also be reflected in the costs of the many repainting and redecorating programmes which are contemplated by municipal authorities, private firms and individuals as an appropriate manifestation of rejoicing in this year of Royal Silver Jubilee.

The trade organisations concerned in presenting the memorial are the National Federation of Associated Paint, Colour and Varnish Manufacturers, the National Federation of Master Painters and Decorators, the National Federation of Dyers and Cleaners, the Association of British Chemical Manufacturers, the India Rubber Manufacturers' Association, the Boot and Floor Polish Manufacturers' Association, the Wallpaper Manufacturers' Association, and the White Spirit Association.

IMPORTS OF NICKEL-SULPHATE and nickel ammonium sulphate into the United States, which in 1931 totalled 134,837 lb. ($8,258), declined in each of the subsequent years and in 1934 amounted to only 845 lb. ($106).

British Overseas Chemical Trade in March

Decrease in Imports and Exports

ACCORDING to the Board of Trade returns for the month ending March 31 exports of chemicals, drugs, dyes, and colours were valued at £960,442, as compared with £1,028,282, a decrease of £67,840. Exports were valued at £1,768,886, as compared with £1,804,356, a decrease of £35,470. Re-exports were £126,936.

Imports

	Quantities. March 31, 1934.	Quantities. March 31, 1935.	Value. March 31, 1934. £	Value. March 31, 1935. £
Acids—				
Acetic .. .. cwt.	16,134	16,292	25,269	24730,
Boric (boracic) .. ,,	4,800	3,441	4,677	3,258
Citric .. .. ,,	2,140	1,265	6,139	5,117
Tartaric .. ,,	6,135	2,775	25,248	11,768
All other sorts .. value	—	—	11,371	8,534
Borax .. .. cwt.	28,816	19,700	15,544	9,881
Calcium carbide .. ,,	87,151	91,578	52,021	52,576
Phosphorus .. ,,	362	1	1,113	5
Potassium compounds—				
Caustic and lyes ,,	11,844	7,366	13,597	8,891
Chloride (muriate) ,,	57,789	54,164	21,018	16,191
Kainite and other mineral fertiliser salts ,,	276,931	291,471	44,975	41,149
Nitrate (saltpetre) ,,	15,460	14,263	8,200	11,414
Sulphate ,,	29,500	46,189	13,781	16,144
All other compounds ,,	10,933	8,494	17,913	14,024
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	19,995	7,119	6,017	2,316
Chromate and bichromate .. .. ,,	6,537	1,648	9,144	2,286
Cyanide .. .. ,,	800	1,004	1,921	2,442
Nitrate .. .. ,,	75,667	43,212	16,133	10,483
All other compounds ,,	19,448	16,112	15,955	12,753
Other chemical manufactures .. .. value	—	—	243,706	242,208
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	58,230	120,560	5,084	10,006
Medicinal oils .. cwt.	4,275	3,702	10,153	12,755
Ointments and liniments cwt.	13	14	536	633
Proprietary medicines	—	—	38,204	44,830
All other sorts .. value	—	—	43,698	25,376
Bark cinchona (bark) Peruvian, etc.) cwt.	2,451	2,484	17,354	15,792
All other raw or simply prepared .. value	—	—	35,438	34,746
Finished dye-stuffs (coal tar) .. .. cwt.	1	—	8	—
Total	4,775	3,573	126,766	101,863
Extracts for dyeing cwt.	6,778	5,299	10,063	11,101
Extracts for tanning—				
Chestnut .. cwt.	26,076	26,797	17,952	18,236
Quebracho .. ,,	37,443	23,372	23,786	14,390
All other sorts .. ,,	19,824	64,899	16,082	44,721
All other dyes and dyestuffs .. .. cwt.	498	1,067	5,654	24,227
Painters' colours and materials—				
White lead (basic carbonate) .. cwt.	6,385	6,592	7,627	7,466
Lithopone .. ,,	23,448	16,287	16,170	11,261
Ochres and earth colours cwt.	28,351	30,494	9,600	9,404
Bronze powders ,,	1,348	1,670	9,741	11,370
Carbon blacks .. ,,	27,560	18,121	39,884	29,126
Other pigments and extenders dry .. cwt.	24,252	22,398	7,489	7,128
All other descriptions ,,	16,928	17,570	33,259	29,841
Total of group value	—	—	1,028,282	960,442

Exports

Acids—				
Citric .. .. cwt.	3,110	1,884	10,456	7,344
All other sorts .. value	—	—	27,123	19,565
Aluminium compounds tons	1,527	953	17,425	7,428
Ammonium compounds—				
Sulphate .. tons	43,156	30,042	252,703	183,015
All other sorts .. ,,	1,086	1,906	16,358	19,324
Bleaching powder (chloride of lime) .. .. cwt.	44,168	36,239	12,109	10,416
Coal tar products—				
Cresylic acid .. gal.	104,252	113,091	8,425	9,531
Tar oil, creosote oil, etc. gal.	2,522,991	586,974	39,606	15,938
All other sorts .. value	—	—	10,844	13,940
Copper, sulphate of tons	9,774	9,164	138,054	124,016
Disinfectants, insecticides cwt.	33,537	33,598	75,594	73,049
Glycerine .. .. ,,	19,564	14,549	38,229	34,427
Lead compounds .. ,,	11,233	15,885	13,779	18,105
Magnesium compounds tons	438	392	10,524	9,245
Potassium compounds cwt.	9,152	4,192	13,129	9,599
Salt (sodium chloride) tons	15,401	21,740	46,056	60,700
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	364,315	405,852	89,046	98,515
Caustic .. .. ,,	131,843	219,215	78,865	116,718
Nitrate .. .. ,,	9,817	1,169	3,415	485
Sulphate, including saltcake .. .. cwt.	1,589	14,143	574	1,589
All other sorts .. ,,	60,051	58,398	81,473	64,483
Zinc oxide .. tons	1,144	1,333	22,353	23,079
All other descriptions value	—	—	202,709	200,188
Drugs, medicines—				
Quinine and quinine salts oz.	49,523	251,423	5,629	25,627
Proprietary medicines value	—	—	109,064	108,791
All other descriptions ,,	—	—	137,527	145,072
Finished dye-stuffs (coal tar)—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,771	1,581	10,808	8,163
Other sorts .. ,,	5,856	6,466	76,124	89,232
All other descriptions ,,	19,416	25,445	24,412	28,758
Painters' colours and materials—				
Ochres and earth colours cwt.	12,550	16,621	13,435	18,871
Other descriptions ,,	16,784	17,837	22,346	29,293
White lead .. ,,	5,086	5,373	9,476	9,875
Paints and painters' enamels, prepared cwt.	40,231	35,967	100,721	93,429
Varnish and lacquer (clear), coloured or not gal.	82,966	75,304	32,1?0	29,163
All other descriptions cwt.	24,932	30,896	53,825	61,913
Total .. .. value	—	—	1,804,356	1,768,886

Re-Exports

Chemical manufactures and products value	—	—	30,452	18,199
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	8,433	9,575
Raw or simply prepared value		—	12,669	15,034
Dyes and dye-stuffs and extracts for dyeing and tanning .. .. cwt.	1,068	636	1,657	2,465
Painters' colours and materials .. .. cwt.	437	314	1,060	625
Total .. .. value	—	—	54,271	45,898

Continental Chemical Notes

Belgium

A DRASTIC REORGANISATION SCHEME is now proposed by the board of Union Chimique Belge, which will enable the company's activities to be continued.

Italy

ACCORDING TO PRESS REPORTS the government has decided to distribute gasmasks at cost price to the whole of the population. All employers will be required to hold an adequate stock of masks.

Russia

AN EXPERIMENTAL FURNACE for arsenic manufacture has been started up at the Novotroitzki Arsenic Combinate.

SLOW PROGRESS IS RECORDED in cultivation of the rubber-secreting plant, sagis, in Kasakstan, where only 5.6 tons of rubber were isolated in 1934. A yield of 188 tons is expected this year.

Czecho-Slovakia

PERCHLORETHYLENE is now being manufactured by the Ossig Union.

A COSMETIC MANUFACTURING CONCERN, the "Miraculum" Company, has been registered with a capital of 200,000 kronen to exploit the process of Dr. Luster, of Cracow ("Chemische Industrie").

Germany

AN OPTION FOR WORKING A HEAVY SPAR DEPOSIT in the so-called Mount Hermann has been acquired by a consortium in Merzig.

RAPID METHODS FOR EXAMINING the atmosphere of rooms for the presence of ethylene oxide after fumigation work have been officially published. A 40 per cent. potassium thiocyanate solution is the reagent in one method, while the other is based upon 22 per cent. common salt solution and phenolphthalein ("Chemische Industrie").

THE I. G. FARBENINDUSTRIE in their report for the trading year 1934 state that the enlarged research laboratories of the Bayer section at Elberfeld, Höchst and Marburg were responsible for a wide range of new medicinal products, including several vitamin and hormone preparations. Good results have been achieved by the new dental department at the Bayer works, as also by the sera and veterinary products of the E. von Behring department. Cuprammonium rayon production was increased, this textile having found a new market in combination with cotton fabrics. Reference is also made in the report to the inauguration of bituminous coal hydrogenation, a process described as industrially feasible if accorded adequate protection.

France

OXIDES OF PLATINUM AS HYDROGENATION CATALYSTS have been studied by Laffitte and Grandadam, who find the dioxide to be two to three times more effective than ordinary platinum black in hydrogenations at the double bonds of C = C and C = O groupings. This property is exploited towards improving the catalytic value of platinum black, the latter acquiring an activity very close to that of the dioxide after heating at 150° to 180° C. in an oxygen atmosphere under a pressure of 150 kg. per sq. cm. when it absorbs 2.3 to 3.4 per cent. by weight of oxygen ("Comptes rendus," February 4).

A CONVENIENT PROCESS FOR OBTAINING CYMENE utilises pinene as raw material. This is agitated in solution with bromine, the solvent evaporated off on completion of the reaction and the heated product debrominated in the presence of 2 per cent. catalyst, preferably iodine. A 50 per cent. yield of cymene is claimed ("Bull. de la Soc. Chimique," November, 1934).

METHYLAL IS A LOW-BOILING SOLVENT (b.p. 42° C.) now produced on an industrial scale for which certain advantages over ether are claimed. Owing, for instance, to its remarkable solvent power on many organic acids and its failure to dissolve normal mineral acid solutions, it is useful in the extraction and rapid estimation of organic acids in a wide range of biological media. It is also fairly soluble in water, 600 c.c. in 1 litre water forming a homogenous mixture ("Bull. de la Soc. Chimique," November, 1934).

A TURPENTINE OIL DERIVATIVE, "aminocimène," has been tested by the French Air Ministry as an anti-knock agent for motor spirit and is believed to be equivalent of tetraethyl lead.

IN ITS ANNUAL REPORT for 1934 the Fabrique Alsacienne de Levure et Alcools (F.A.L.A.) announces that sales of butyl alcohol, acetone and other products were maintained after modernisation and enlargement of plant had reduced production costs. A dividend of 18 per cent. (unchanged) is declared.

Personal Notes

COLONEL SIR HENRY LYONS has been appointed a member and chairman of the Advisory Council of the Science Museum, Kensington, in succession to Sir Richard Glazebrook, who has resigned.

THE LATE LORD GREENWAY, president of the Anglo-Persian Oil Co., Ltd., the British Tanker Co., Ltd., and National Oil Refineries, Ltd., who died on December 17 last, left gross estate valued at £298,953, with net personality £100,595.

MR. A. CHESTER BEATTY has been awarded the Gold Medal of the Institution of Mining and Metallurgy in recognition of his distinguished services to the mining industry in the development of mineral deposits, with particular reference to the copper resources of Northern Rhodesia.

MR. FRANK RUSSELL, chairman and managing director of General Refractories, Ltd., will be chairman of the new International Diatomite Co., Ltd. Mr. E. W. D. Tennant, a partner in C. Tennant, Sons and Co., Ltd., has also agreed to join the board.

MR. W. C. MITCHELL, director and general manager of the National Oil Refineries, Ltd., Skewen, Swansea, is leaving shortly for Persia, where he is to assist on the technical side of production in the fields. He will return to Wales in about nine months time.

MR. FERDINAND BUSH, youngest son of the late Mr. W. J. Bush, founder of the firm of W. J. Bush and Co., Ltd., died at Bexhill-on-Sea, on April 4, aged 59. Mr. Bush represented the company in Scotland from 1908 until 1916, when he returned to London upon his appointment as general manager. Six years later he was elected to the board, on which he continued to serve until the time of his death.

PROFESSOR KENNETH ASTON, of Cardiff, has been appointed professor in the electro-technology department of the Indian Institute of Science, Bangalore. Provision has also been made for certain honoraria to two distinguished men of science, Dr. Max Born and Professor Havesy, who are going to India to work as special readers in theoretical physics and general chemistry respectively.

MR. A. W. KNAPP has been elected chairman of the Birmingham and Midland Section of the Society of Chemical Industry. Other officers are: Vice-chairman, Mr. H. W. Rowell; hon. treasurer, Mr. W. T. Collis; hon. secretary, Mr. O. King; hon. recorder, Mr. J. E. Such; hon. auditor, Mr. J. R. Johnson. The following have been elected to fill five vacancies on the committee: Mr. H. A. Caulkin, Dr. J. C. Hudson, Dr. S. R. Carter, Mr. T. H. Gant and Mr. N. A. Nicholls.

MR. B. UNDERHILL, of the factory technical staff of Cadbury's, Bournville, has retired after 31 years' service. He had charge of the refrigerating and filter plants and was connected with the water supply and cold storage for the whole of that time. He began with a small carbon dioxide refrigerating machine that was the beginning of the refrigeration plant at Bournville, and in those early days of experimenting had to work for long stretches in a small store at a low temperature. His concentration on this work brought him extensive knowledge of cold storage methods, and he has long been regarded as an authority on the subject. On his retirement, Mr. Uunderhill has been presented with an illuminated address signed by all members of the engineers' office staff and with a clock from the technical staff.

Notes and Reports from the Societies

Society of Dyers and Colourists

Manchester Section : Annual Meeting

THE annual meeting of the Manchester Section of the Society of Dyers and Colourists was held in the Lecture Hall of the Literary and Philosophical Society, on April 12, Mr. L. G. Lawrie presiding. The report for the session showed a membership of 234 members, 30 associates, and 12 juniors, total 276, as contrasted with the corresponding figures for the previous year of 241 members, 35 associates, and 14 juniors, total 290. During the session there had been eight meetings, two of them being held jointly with other societies, and 12 papers had been read and discussed. The section had sustained a great loss by the death of Mr. William Marshall, J.P., who had at one time acted as chairman and had served also on the committee for many years.

Messrs. Adams, Blakeley, R. J. Hannay, Heap, Holden, McMyn and Williams were re-elected members of the committee.

Azoic Colours on Cotton

Mr. H. BLACKSHAW read a paper on "Azoic Colours on Cotton, some observations on fastness properties relative to soaping after treatment," the result of the examination of 26 typical azoic combinations. These 26 combinations, whilst representing only a small percentage of the commercially available ones, included some of the more widely used combinations and could be regarded as a representative series. Dyeings were carried out on unmercerised limbric employing for laboratory purposes an open bath method of working, namely, a liquor ratio of 25 : 1. After coupling, the dyeings were well rinsed in cold water and then divided into three portions. One portion was left in the unsoaped state without any further treatment; another portion was soaped for five minutes at 80° C. in a 25 : 1 liquor bath containing 3 g. neutral soap flakes and 2 g. soda ash per litre. The third portion was treated for half an hour at the boil in the same concentrations of soap and soda ash as used for the second portion. Following this treatment the dyeings were finally well rinsed in hot and then cold water.

As would be expected from well-known and published data, the light fastness of the unsoaped shade in a number of cases was definitely inferior to that of the normally soaped shade. Twelve combinations showed the unsoaped shade to be considerably inferior in light fastness to the normally soaped shade. Five combinations were found to be inferior to a less degree than the 12 already mentioned. Four combinations were found to be only a little inferior, whilst in five combinations the light fastness of the unsoaped shade was approximately equal to that of the normally soaped shade.

Effect of Light Soaping Treatment

With regard to the effect of subnormal or light soaping treatment on the light fastness of the 26 combinations, it was found that the general tendency, as anticipated, was for the fully soaped shade to be better in fastness. At the same time, it was found that nine combinations out of the 26 examined showed that there was only slight or no difference in the resultant light fastness of the two methods of soaping. In so far as light fastness was concerned, the position could be broadly summarised to the effect that a subnormal soaping after-treatment was most likely to result in a dyeing of subnormal fastness to light; although there were a number of interesting exceptions to this rule.

In no case was it found that in the series of 26 combinations the unsoaped shade was equal to a fully-soaped shade in fastness to chlorine, and there were only two combinations which could be described as being a little inferior in fastness in the unsoaped state. These two combinations were worth mentioning, and they were Brenthol CT developed Fast Red TR, and Brenthol BA developed Fast Red KB. The general tendency so far as chlorine was concerned was for the unsoaped shade to be considerably inferior in fastness to chlorine in comparison with the fully-soaped shade. Nineteen out of the 26 combinations were either not affected or were only slightly depressed in fastness to kier boiling when processed in the unsoaped state.

The possibility of obtaining subnormal fastness to rubbing by over-soaping was due probably to the presence of the alkali in the soaping bath, which caused undue aggregation of colouring matter, accelerating migration to the outside of the fibre. As the excess matter was removed by the emulsifying action of the soap, its place was taken by a further amount of pigment which had been aggregated and loosened by the action of the alkali.

Light Fastness of Dyestuffs

Mr. C. M. WHITTAKER presented a paper on "Some Comments on the Classification of the Light Fastness of Dyestuffs on Vegetable Fibres." The standards of light fixed, he said, were specified depths of shade of dyestuffs dyed under specified conditions: the standards were not the dyestuffs themselves but a specified percentage of the dyestuffs. If a shade was classified by a light fastness number it meant that it was equal in fastness to the depth of shade laid down as the standard for that particular light fastness number. Since no dyestuff was equally fast in varying depths of shade it followed that no dyestuff might be accurately classified in one class, yet one found that dyestuffs were classified repeatedly as, say, 6, 7 or 8. Such a classification was clearly not true, and he said most emphatically that such a practice was a misuse of the light fastness classification schemes. Since it was no use putting forward destructive criticism without a remedy, he stated that the remedy was extremely simple; all that required to be stated was the minimum percentage of the dyestuff which, it was claimed, was equal in fastness to light to the standard pattern.

It was his practice in all his recent light fastness testing of dyestuffs to dye up a range of eight shades of each single dyestuff, and mount them on cards. He commended the method as a useful one, because in a series of joint exposures the relative fastness of a number of dyestuffs could be judged.

Society of Glass Technology

Annual Meeting

THE eighteenth annual general meeting of the Society of Glass Technology was held at Sheffield on April 10. Mr. G. V. Evers was succeeded as president by Mr. B. P. Dudding (Research Laboratories of the General Electric Co., Ltd., Wembley). Mr. F. G. Orme succeeded Mr. Dudding as general treasurer. Mr. F. C. Flint was re-elected American treasurer, and Professor W. E. S. Turner was re-elected hon. secretary and editor. The following were elected to fill other vacancies due to retirement: Vice-presidents, Milton Asquith, A. E. Hill and J. B. Murgatroyd; ordinary members of council, E. J. C. Bowmaker, James H. Hogan, W. A. Moorshead, A. E. J. Vickers and W. H. Withey. The retiring auditors, C. E. Ramsden and A. J. Somer were re-elected.

Purification of Sands

At an ordinary meeting which followed, Mr. F. W. Adams presented a paper on "The Purification of Sands." Mention was made of the origin of sands and of the types of impurities which occurred in them likely to affect their suitability for the manufacture of colourless glass. Attention was mainly directed to British sand deposits with particular reference to the amount and occurrence of their iron oxide content. A short account was given of several chemical methods for treating sands to reduce their iron oxide content sufficiently to render possible their use for the manufacture of good quality white glass. The investigations which led to the development of the process outlined in the paper were described; also the results obtained by its use on various types of sand. For this process, dilute solutions of acid oxalates were used together with small quantities of ferrous sulphate. The sand to be treated was agitated for a short time with a solution, containing these two chemicals, at a temperature of 26° to 65° C.

Mr. A. E. J. Vickers read a paper on "The Effect of the Addition of Small Amounts of Volatile Salts upon the Viscosity and Surface Tension of a Molten Soda-Lime-Silica Glass." The investigation was undertaken in order to obtain some exact information as to how the addition of such substances as ammonium sulphate, salt cake, borax, sulphur, etc., affected the viscosity and surface tension of a glass. Various methods were tried and finally the method of L. Margules was used for the measurement of viscosity.

A glass of the following percentage composition was used: SiO_2, 75.66; Al_2O_3, 0.74; CaO, 9.89; MgO, 0.18; Fe_2O_3, 0.04; Na_2O, 12.90; K_2O, 0.18; SO_3, 0.01. To this, salts were added in the following quantities: salt cake 10 parts, ammonium sulphate 10 and 15 parts, and sodium nitrate 10 parts per 1,000 parts of sand; also borax to give B_2O_3 of 0.7 per cent., and sulphur. In each case of a salt addition the composition of the batch was adjusted so that the final glass always had the above composition with the exception of borax, in which case adjustment was impossible owing to the non-volatility of the borax. All the salts tried produced a decrease in the viscosity of the glass over the normal working range of temperature, ammonium sulphate and borax being especially active in this respect. The use of borax gave a glass of rather different character to the plain glass taken as the standard of comparison. With ammonium sulphate, the final glass was of identical chemical composition to the standard.

In the case of surface tension, the general effect was to lower the value, but the decreases obtained by the use of ammonium sulphate, borax and sulphur were unexpectedly large. A lowering of the surface tension would result in a very large increase in the rate of wetting of the batch, and hence would help in the glass-melting process.

Chemical Engineering Group

Annual Meeting and Dinner

THE sixteenth annual general meeting and dinner of the Chemical Engineering Group will be held on Friday, April 26, at 6.45 p.m., at the Waldorf Hotel, Aldwych, London. The chairman of the Group, Dr. W. R. Ormandy, will preside, and the principal feature of the after-dinner programme will be an address by Lord Amulree entitled "A Historical Survey of Wage Adjustments." Lord Amulree, who was president of the Industrial Court from 1919 to 1926, is an acknowledged authority on this subject. He was also Secretary of State for Air in 1930-31 and has been chairman of many important commissions, including the Royal Commission on Licensing and the Royal Commission on Newfoundland. He was chairman of the British Government Industrial Delegation to Canada and the United States, and he is also the author of many legal works. The cost of the dinner is 12s. 6d. per head (inclusive of gratuities but exclusive of wines), and members are cordially invited to bring guests. Ladies are not being invited this year. Tickets can be obtained from the Hon. Secretary, Chemical Engineering Group, Abbey House, Victoria Street, London.

Royal Society of Arts

Part Played by Rubber in Transport

MR. COLIN MACBETH, consulting mechanical engineer to the Rubber Growers' Association, read a paper on "The Part Played by Rubber in Transport" at a meeting of the Royal Society of Arts on Monday. Mr. L. H. Pomeroy, president of the Institution of Automobile Engineers, presided.

A million tons of plantation rubber yearly, said Mr. Macbeth, is the figure now reached by the Eastern growers. Figures show that of this yearly figure 88½ per cent. can be accounted for as used in transport—tyres take 78½ per cent. boots and shoes 4½ per cent., heels and soles 3 per cent., and about 2½ per cent. in railway and automobile rubbers. Rubber is used in the make-up of tyres and tubes, accounting in detail for the consumption at a figure of 11¼ lbs. per tyre and 2 lbs. per tube of a popular size. What rubber has done for transport was to meet the demand for fast travel when steam power came. Legislation stopped the pneumatic tyre of Thomson from being needed, but the bicycle brought forth Dunlop's air tyre in 1888, and this has gradually grown till to-day air tyres can carry 4¾ tons per wheel. The multiple ply cord tyre has led to air tyre usage on heavy transport since 1920.

Road economy has been made possible while carrying fast and heavy-laden vehicles only due to rubber air tyres. To-day's tar-bound and concrete roads are the road engineers' response to the need for something to stand wheel pounding and tyre suction. Now that we have such roads and compulsory air tyre usage we are within sight of "everlasting" roads and low road upkeep costs. Air tyres are kind to the roads. The air tyre spreads the load over a big surface compared with solid tyres, and infinitely so compared with steel tyres. Opening up the world to transport has become possible in roadless districts, desert places, and often where bridges do not exist, and balloon tyre development started first in the African sandy deserts to substitute camel usage by automobile traction.

Aeroplane tyres of giant size have all been air tyres, often coupled to rubber wheel suspensions. Such tyres have led to the earlier adoption of very low pressures in road vehicle tyres and have made it possible to negotiate soft ground for landings. Slow-speed tyre usage has come for wheelbarrows, farm carts, dairymen's carts, farm tractors, etc. There is now an increasing demand for horse-hauling vehicles requiring to stop frequently. Automobile cushions, as the last line of defence against road shocks, are now coming into extended use as air cushions, latex-hair cushions, and latex sponge cushions, these latter being particularly popular on public service vehicles. Rubber car springing and possible substitutes for steel springs form a promising new outlet for plantation rubber, and their use becomes particularly advantageous when coupled to independent wheel suspensions.

British railways are large users of rubber for drawbar and buffing purposes, and as auxiliary springs, etc. The application of the cord air tyre to railway vehicles has arrived as the Micheline system, this being a development aiming at making railway branch passenger lines profitable, more attractive to passengers, and speedier. If no plantation rubber was available, and if the pioneer planters had not made the world independent of the haphazard wild rubber gatherer, rubber prices would be fabulous; there would be no speeds above 15 m.p.h. and no objectors to a 30 m.p.h. limit. Looking at the matter from a still wider angle we would be congested in our towns, as travel facilities would be limited, and our slum clearance problem accentuated. Our countryside would be languishing instead of revived. Our Dominions would be less developed. The production of the world's goods would be limited, due to less flexible transport facilities.

In effect, improved road transport facilities have enabled the flow of population, food and other supplies to meet local demands, and famine due to shortage, and disease due to congestion, are now becoming of minor importance as recurrent world problems.

Institute of Fuel

Discussion on Hydrocarbons

AT a meeting of the Institute of Fuel at Burlington House, on April 11, it was announced that Sir John Cadman, president-elect, would take office on October 16. Lord Melchett has been appointed a vice-president. The following were elected to the Council:—Mr. H. Clifford Armstrong, Mr. John Bruce, Mr. R. A. Chattock, Dr. A. E. Dunstan and Mr. H. A. Humphrey.

An ordinary meeting followed when the paper on "Processing of Solid and Liquid Hydrocarbons in the Coal, Oil and Gas Industries, with References to Developments at Corby" by Mr. A. Fisher (summarised in THE CHEMICAL AGE last week, page 335) was read and discussed.

Mr. JOHN ROBERTS, referring to the author's suggestion that it was desirable to concentrate on raw materials of low market value if coal processing were to be commercially successful, said that this view could easily be challenged and disposed of by the gas and coking industries. Though the flexibility of the Knowles process was stressed in the paper, he failed to see how the oven could be any more flexible than an ordinary horizontal D-shaped gas retort, as anything which could be done in a Knowles oven could be done in a gas retort.

The Chairman reminded Mr. Roberts that it is possible to get 72 or 73 per cent. of coke from a 33 per cent. volatile coal in the coke oven, for the simple reason that the volatile matter, as determined by heating at the rate of some hundreds of degrees per minute for seven minutes in a crucible, was usually 5 or 6 per cent. higher than that as determined by heating coal at one or two degrees per minute.

Mr. W. H. CADMAN, who commented on the flexibility of

the Corby plant, suggested that the paper would be more complete if the author would add the calorific values of the cokes referred to in the paper, because the coke that was being made at the time of his visit to Corby was intended primarily for metallurgical purposes; to produce, from a non-coking coal, a coke which could be delivered direct to the blast furnaces was quite novel, and from that aspect the plant deserved careful consideration.

Mr. P. C. POPE, secretary of the Institute, gave the results of his experience of burning in an open grate some coke produced at Corby from a 50/50 mixture of Bestwood coal and high-temperature tar from the Becker ovens adjacent to the Knowles ovens. The volatile content of the coke, he believed, was about 4 or 5 per cent.

Mr. FISHER said that the product of the ovens he was dealing with contained less than 3.7 per cent. volatile. A much longer time was required to drive out the last 1 per cent. than to drive out the first 1 per cent.

Society of Chemical Industry

Birmingham Section : The Lockwood Electrode

SPEAKING on a new type of hydrogen electrode for *p*H determination at a meeting of the Society of Chemical Industry (Birmingham and Midland Section) at Birmingham on April 9, Mr. H. C. Lockwood said that the Lockwood electrode consists essentially of a U-shaped vessel down one limb of which slides a glass tube carrying a sealed-in platinum wire. A flex is sealed to the platinum by means of Wood's metal. The end of the platinum wire is arranged directly above a jet through which the hydrogen bubbles. Each bubble impinges on the end of the platinum wire and, being pierced, travels up the whole length. The liquid is made to circulate by means of a suitable inlet and outlet in the U-tube. The electrode is very economical with hydrogen and 40 ml. per minute is ample. The hydrogen can be conveniently prepared from three cells containing sodium hydroxide as an electrolyte and using nickel electrodes, a current of 2 amps. being required. A 20-ft. cylinder of hydrogen is sufficient for 1,500 determinations. Before using the electrode, the platinum wire is cleaned on fine emery cloth and re-coated with a minimum deposit of platinum black. The electrode takes from half a minute to five minutes to reach equilibrium. Two modified types have been designed whereby the containing vessels are incorporated. These work on one or five millilitres respectively.

Improvement in Oil Refining

Greater Lubricating Qualities

REDUCTION of wear in engines was promised by Mr. Wilson Cross, chairman of the Vacuum Oil Co., at a luncheon at the Dorchester Hotel, on April 3. He had called together technicians and others to explain the Clearosol solvent extraction process, which is the result of two years' efforts by the company to find a new method of refining crude oil. The process, Mr. Cross said, is expected to change the whole trend of present-day refining, and he claimed it as the greatest forward step since the discovery of petroleum. The best of modern oils contain undesirable constituents, and these are the cause of carbon deposits, sludge formation in crankcases, sticky deposits on valves, and, sometimes, seized piston rings. The company's experts have been seeking a means of removing completely the tarry compounds which have no lubrication value, and their new process entirely eliminates the former acid treatment and virtually eliminates the necessity for filtration of the oil through clay.

It employs a purely physical method of separating the desirable and undesirable elements. Its basic principle is that of dissolving the desirable elements (paraffinic hydrocarbons), with one solvent, and the undesirable materials, naphthalenes, olefins, and aromatics, with another. The two solvents are used simultaneously, and since they are mutually insoluble can readily be separated by gravity. The solvent is finally extracted from the paraffinic solution leaving what has been termed Clearosol treated stock. The new process has many advantages over the old process.

Worthington-Simpson, Ltd.

A Contract of World-Wide Interest

A PREFERENCE dividend of 6 per cent. was declared at the 44th ordinary general meeting of Worthington-Simpson, Ltd., held at the company's London Office, Queen's House, Kingsway, on Friday, April 12. This dividend declaration represents the full dividend, less tax, on the 6 per cent. cumulative preference shares for the year ended December 31, 1929.

The accounts for the year ended December 31, 1934, show a net profit of £13,713 after carrying all charges, including depreciation and debenture interest, which added to the balance brought forward from the previous year leaves a surplus on profit and loss account as at December 31, 1934, of £53,800. From this surplus the dividend declared, less tax, will absorb £9,242, leaving a balance to be carried forward of £44,557.

During the past few years the company has improved and developed its many lines of engineering products and, at the same time, installed modern production machinery for economical manufacture. Substantial savings in operating expenses have been made through the reduction of debenture interest charges. During the year 1933 the directors, with the unanimous approval of the debenture holders, carried through a debenture conversion operation. At the beginning of that year the debentures outstanding amounted to £283,760, bearing interest at 5 per cent. per annum, whereas at the close of the year the total debentures outstanding amounted to only £99,500, bearing interest at 4½ per cent. per annum.

A contract of world-wide interest was completed in 1934 for the Iraq Petroleum Co., Ltd., for the supply of special pumping equipment in connection with their great pipeline project. This contract was secured in international competition and emphasised the company's leadership in design and construction of equipment for the oil industry. The order was the largest ever placed in this country for pumping equipment of this description. The total contract consisted of 228 units of various sizes and types for different service conditions along the pipeline. Other important contracts received by the company last year include condensing plant for the power stations of the Birmingham, Nottingham and Sheffield Corporations.

Salt Deposits in Russia

Recent Discoveries

LATEST surveys of the Ural-Emba Oil Trust and the Chemical Institute of the Academy of Sciences have shown that the Ural-Emba district, in the Southern Urals, is rich in potassium salts. The table salt deposits are found here both underground in the form of salt domes and above ground in numerous lakes and salt beds. Some 360 salt domes have already been discovered, and some of these are 12 km. long by 8 kilometres wide, going down to a depth of from two to five kilometres: in some places wells have been sunk to a depth of over 2,500 metres and have not yet passed beyond the salt deposits.

In Sagiz potassium salts were discovered in an oil well at a depth of from 530 to 560 metres and in a well at a depth of from 240 to 800 metres, while they have also been found at Ozinki and Akjar. Investigation has shown that these deposits contain not only cloride but also sulphate salts, which are not found at Solikamsk, already known as one of the richest districts in the Soviet Union for potassium salts.

Sagiz, Ozinki and Akjar are situated about 400 kilometres from one another, which makes it probable that there are potassium salts in the whole area. This is further confirmed by the fact that Inder Lake, lying in the centre of this region, contains salt at a much higher concentration than in the sea and many other salt lakes.

THE STATE NITROGEN-FIXATION FACTORY at Moscice, Poland, in 1933-34 began the manufacture of oxygen, nitric acid, bleaching powder, caustic soda and ammonium nitrate. Meanwhile, the State factory at Chorzow was producing, for the first time, oxygen, ammonium nitrate, sodium nitrate, refined ammonium chloride, ammonium carbonate, potassium nitrate and commercial calcium carbide.

News from the Allied Industries

Fertilisers

NATIONAL FERTILISERS, LTD., the company recently formed by Fison Packard and Prentice, Ltd., and the Imperial Smelting Corporation, Ltd., have entered into an agreement with Stewarts and Lloyds, Ltd., in regard to the grinding and marketing of the entire output of high-grade Bessemer basic slag from the new Corby works of Stewarts and Lloyds. A new company has been formed under the title of Corby Basic Slag, Ltd., the capital of which will be provided by National Fertilisers, Ltd. It is anticipated that approximately 50,000 tons of basic slag will be handled annually.

Iron and Steel

NINETY-SEVEN FURNACES were in blast at the end of March, the same number as at the end of February, one furnace having been blown in and one put out of operation. The production of pig-iron in March amounted to 553,200 tons, compared with 4883,100 tons in February, and 503,600 tons in March, 1934. The daily rate of pig-iron production shows an increase from 17,254 tons in February to 17,845 tons in March. The month's production includes 137,000 tons of hematite, 285,000 tons of basic, 111,300 tons of foundry, and 11,500 tons of forge pig-iron. The output of steel ingots and castings amounted to 841,900 tons in March, compared with 769,500 tons in February and 834,500 tons in March, 1934.

Artificial Silk

THE TOMASZOW ARTIFICIAL SILK CO. (Fabrique de Soie Artificielle de Tomaszów, S.A.) will hold its meeting on April 27 at Warsaw, for the ordinary business and for modification of the articles to permit of the carrying on of "similar and auxiliary industries" to trade in and manufacture artificial silk.

A CONTRACT HAS BEEN ENTERED INTO for the sale of the British Acetate Silk Mills, Stowmarket, near Ipswich. The total site area involved is approximately 110 acres, and the working floor space no less than 600,000 square feet. The property is alongside the L. and N.E. Railway and has its own sidings.

The Chemical Age Lawn Tennis Tournament

Closing Date for Entries: April 29

LAWN tennis players throughout the chemical industry are reminded that Monday, April 29, is the closing date for entries for the fifth annual CHEMICAL AGE Lawn Tennis Tournament, which will be conducted on the same lines as those which have proved so successful during the past four years. The tournament is open to all men engaged in the chemical industry either as principals or members of staffs throughout Great Britain, and will comprise singles and doubles, the latter being open to members of the same, or associated, firms. THE CHEMICAL AGE Silver Challenge Cups, one for the singles and one for the doubles, will be awarded, to be held jointly for twelve months by the winners and the firms they represent, and there will also be, as in previous years, smaller trophies to be presented outright to the successful players and the runners-up.

Intending competitors are urged to apply by telephone, post or in person for entry forms without delay to The Editor, THE CHEMICAL AGE, Bouverie House, Fleet Street, E.C.4.

Rules

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.
2. Each pair in the Doubles Tournament must be members of the same, or an associated, firm.
3. The Challenge Cups shall be competed for annually on courts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cups shall make arrangements for their safe custody and insurance.
4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches, except in the Final of the Singles, when the best of five sets shall be played.
5. **Entries shall be made not later than April 29, 1935, and addressed:**

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

6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.
7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.
8. Except in the case of the finals, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.
9. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers), immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.
10. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the other's appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.
11. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.
12. While competitors will decide as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on courts selected by the Editor of THE CHEMICAL AGE.

Death of Mr. C. F. Cross

A Pioneer of Artificial Silk Production

MR. C. F. CROSS, F.R.S., who, by the discovery of viscose jointly with the late Mr. E. J. Bevan, made possible the production of artificial silk on a commercial basis, died at Hove on Monday, April 15, in his 80th year

The son of Mr. Charles J. Cross, J.P., of Brentford, he was educated at King's College, London, Zurich University and Polytechnikun, and Owens College, Manchester. After graduating B.Sc. at London University, Cross was engaged from 1879 to 1881 at Barrow-in-Furness in research on the constitution of jute fibre-substance and the technical developments thereof. These researches he continued and extended in collaboration with Mr. Bevan at the Jodrell Laboratory, Kew, and went into partnership with him in 1885 as research and consulting chemists.

Jointly with Mr. Bevan and Mr. C. Beadle, Mr. Cross discovered and patented in 1892 the viscose process of treating cellulose, and in the years 1893 to 1900 launched the technical developments of the process through parent companies founded for the purpose—namely, the Viscose Syndicate (London), Continentale Viskose G.m.b.H. (Breslau), the Société Française de la Viscose (Paris), and, with Mr. C. H. Stearn, the Viscose Spinning Syndicate. The last-named concern developed the spinning of artificial silk, afterwards acquired and industrially developed by Courtaulds, Ltd., in the United Kingdom and the United States.

Mr. Cross was awarded the medal of the Society of Chemical Industry for conspicuous services to the industry in 1916, and the research medal of the Worshipful Company of Dyers in 1918. He was elected F.R.S. in 1917, and was president of the Society of Dyers and Colourists from 1918 to 1920.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

Price Changes

General Chemicals.—SODIUM PERBORATE, 10%, 9¼d. per lb.
Pharmaceutical and Photographic Chemicals.—COCAINE, alkaloid and citrate, 32s. 6d. to 34s. 6d. per oz.; hydrochloride and nitrate, 29s. 9d. to 31s. 9d. per oz.
Essential Oils.—CLOVE, 92% English, 4s. 3d. per lb. PEPPERMINT, Wayne county, 13s. 6d. per lb.; Japanese, 4s. 3d. per lb.
Coal Tar Products.—PITCH, medium soft, 40s. per ton. TOLUOL, 90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d. MOTOR BENZOL (London), 2s. 1½d. per gal.

All other prices remain unchanged.

SLIGHT changes have occurred in the prices of a few photographic and pharmaceutical chemicals, essential oils and tar products, but there are no price changes to report in the markets for rubber chemicals, wood distillation products, perfumery chemicals and intermediates. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Motor benzol is quoted at 1s. 2½d. per gal., against 1s. 5½d. Apart from this reduction there is no change to report in general chemicals or coal tar products.

MANCHESTER.—As is usual at about this time both inquiry and new business on the Manchester chemical market during the past week have been restricted and slow conditions are expected until after Easter. Deliveries against contracts to works in Lancashire and the West Riding of Yorkshire districts will be seriously interfered with next week, but the tone of the market is reasonably cheerful and satisfactory trading conditions, judged by recent standards, are anticipated when the holidays are over. The generally steady appearance of the market has been maintained, and there is no disposition to look for any change in this respect. One or two classes of by-products are meeting with a fair demand and there has been little further weakness in any department.

General Chemicals

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

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

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

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

ACID, CITRIC.—11¾d. per lb. less 15%. MANCHESTER: 11¾d.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7½d. per lb., according to quality.

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

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

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

BARYTES.—£6 10s. to £8 per ton.

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

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

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

CADMIUM SULPHIDE.—3s. 2d. to 3s. 6d.

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

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

CARBON BLACK.—3¾d. to 4¼d. 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, 3½d. per lb.; liquor, £19 10s. per ton d/d.

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

CREAM OF TARTAR.—£3 19s. per cwt. less 21%. LONDON: £3 17s. per cwt. SCOTLAND: £4 2s. less 2½%.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

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

LEAD NITRATE.—£27 10s. per ton.

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

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

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

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

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

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. for delivery up to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £40.

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

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.
POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 10½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¾d.
POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £22. SCOTLAND: £20.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. 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 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 15s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¾d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra. d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p-CRESOL 34.5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
ϒ-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.: 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
CHARCOAL.—£5 to £10 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. to 8d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 2½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 40s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.
PYRIDINE.—90/140, 6s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—£7 5s. per ton delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Books Received

Shellac—Its Production, Manufacture, Chemistry, Analysis, Commerce and Uses. By Ernest J. Parry. London: Sir Isaac Pitman & Sons, Ltd. Pp. 240. 12s. 6d.

Table of Incompatibles. By Dr. R. L. Worrall. London: John Bale, Sons and Danielsson, Ltd. 1s. 6d.

Chemical Manufacturers' Directory for 1935. London: Simpkin Marshall, Ltd. Pp. 198. 4s. 6d.

Les Matieres Colorantes Artificielles. By Georges Martin. Paris: Librairie Armand Colin. Pp. 212. 10f50.

Liquid Fuels. By Harold Moore. London: The Technical Press, Ltd. Pp. 264. 21s.

Applied Chemistry. Vol. I. By C. Kenneth Tinkler and Helen Masters. London: The Technical Press, Ltd. Pp. 297. 15s.

Van Nostrand's Chemical Annual. Edited by John C. Olsen. London: Chapman and Hall, Ltd. Pp. 1030. 25s.

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.

Calcium Formate

CALCIUM formate is obtained by treatment of calcined and slaked dolomite with carbon monoxide under pressure and is separated by leaching from the residual magnesia. An example is given. The calcium formate may be converted to formic acid or alkali formates by known methods. See specification No. 413,240 of I. G. Farbenindustrie.

Catalytic Agents

IN the catalytic thermal conversion of hydrocarbon gases or gas mixtures into aromatic hydrocarbons, those catalysts which are porous, *e.g.*, graphite, have their pores sealed with catalytic metal, *e.g.*, by producing the catalytic metal in distributed form in the pores by reduction of the corresponding metal salt. See specification No. 412,933 of C. Greenstreet.

Caustic Potash

CAUSTIC potash is obtained from potassium sulphate by first treating with alkaline earth formate, or components yielding the same, so as to produce potassium formate, heating the latter to convert it into oxalate, and acting on the potassium oxalate with alkaline earth hydroxide to give caustic potash solution, which may be concentrated. See specification No. 412,776 of R. Koepp and Co. Chemische Fabrik A.-G.

Cleansing Compositions

A CLEANSING or sterilising composition for pipes for aerating fermentation liquids, which may either be added in atomised form to the air which is blown through the pipes in cleansing, or else merely poured into the pipes previous to blowing with air, comprises 60 parts of 92 per cent. alcohol, 20 parts of 45 per cent. formaldehyde, 10 parts of sulphuretted hydrogen and 10 parts of chlorine. See specification No. 412,842 of J. Gosda.

Delustred Artificial Silk

VISCOSE artificial silk of matt finish or dull lustre is obtained by adding to the viscose a solution of barium persulphate, preferably soon after the dissolving up of the xanthate in caustic soda, so that the barium persulphate gradually decomposes with the formation of barium sulphate during the ordinary process of ripening of the viscose. The amount of barium persulphate added is sufficient to produce, for example, 4-10 per cent. of barium sulphate calculated on the cellulose content of the viscose. See specification No. 413,087 of North British Rayon, Ltd., and E. Walls.

Sulphur Dyes

New sulphur dyes are obtained by sulphurising arylamino naphthols which may contain further substituents such as halogen atoms or sulphonic groups. According to examples the following compounds are sulphurised with sodium polysulphide in presence of glycol monomethyl ether as solvent: 6-anilino-2-naphthol, 6-*p*-chloranilino-2-naphthol, 6-*p*-toluidino-2-naphthol, 7-anilino-2-naphthol, 7-2¹-naphthylamino-2-naphthol, phenyl-γ-acid, and phenyl-J-acid. The arylamino naphthols are obtained by treating the corresponding 2 : 6 or 2 : 7 dihydroxynaphthalene with the amine in presence of aqueous sodium bisulphite. See specification No. 418,444 of Imperial Chemical Industries, Ltd., and E. Chapman.

Camphane Carboxylic Acids

p-Diketocamphane carboxylic acid and related acids are obtained when carbon dioxide is introduced into a solution of *p*-diketocamphane or bromo-*p*-diketocamphane in an organic solvent in the presence of metallic sodium, potassium or magnesium. The metal is present in at least one atomic proportion per molecular proportion of the starting material. The products, of which one appears to be *p*-(or 2 : 5)-diketocamphane-3 or 6-carboxylic acid, possess therapeutic properties. According to the example, dry carbon dioxide is passed into a solution of either starting material in xylene, toluene, or benzene, to which the metal has been added. The solution is kept at a temperature of 100-140° C., if desired under a pressure of 5-10 atmospheres. Cold water is added, followed by an inorganic acid, and the *p*-diketocamphane carboxylic acid then extracted therefrom with ether and crystallised from benzene. From the mother liquor, two further acids of the formula $C_{11}H_{16}O_4$ are isolated by means of their quinine or cinchonine salts. See specification No. 418,385 of K. Tamura, G. Kihara, Y. Asahina and M. Ishidate.

Applications for Patents

(March 28 to April 3 inclusive.)

COMMINUTED METALS, ETC., manufacture.—Baker and Co., Inc. (United States, April 5, '34.) 9997.

HALOGEN DERIVATIVES OF METHANE, manufacture.—J. P. Baxter and Imperial Chemical Industries, Ltd. 10274.

CELLULOSE DERIVATIVES, manufacture.—British Celanese, Ltd. (United States, April 10, '34.) 10347.

GLYCOL ESTER DERIVATIVES.—Carbide and Carbon Chemicals Corporation. (United States, April 11, '34.) 9935.

CHLOROETHYL, ETC., ETHER.—Carbide and Carbon Chemicals Corporation. (United States, April 17, '34.) 10188.

ESTERS, production.—Celluloid Corporation. (United States, March 29, '34.) 9819.

DIAMINO-ALCOHOLS OF AROMATIC SERIES, production.—Chemische Fabriken Dr. J. Wiernik and Co., A.-G. (Jan. 12, '34.) 10001.

UREA, synthetic preparation.—Compagnie de Produits Chimiques et Electro-métallurgiques Alais, Froges, et Camargue. 10003.

GLASS, manufacture.—Compagnie Internationale pour le Fabrication Mécanique du Verre Soc. Anon. (Germany, Sept. 8, '34.) 9986.

DECOMPOSING BERYLLIUM MINERALS.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, April 3, '34.) 10266.

RUBBER, preservation.—E. I. du Pont de Nemours and Co. (United States, March 28, '34.) 9740.

METALLIC POWDERS, manufacture.—Etablissements Expert-Rezançon. (France, April 5, '34.) 9891.

HYDROCARBONS, production.—J. Francon. 10146.

DYESTUFFS, manufacture.—W. W. Groves. 9680.

POLYMETHINE DYESTUFFS, manufacture.—W. W. Groves. 10000.

CONDENSATION PRODUCTS from trihalogen esters of fatty acids, etc., production.—Heine and Co. A.-G. (Germany, Dec. 22, '34.) 9979.

MONOAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (May 9, '34.) 9708.

N-SUBSTITUTION PRODUCTS of alpha-amino-anthraquinone, etc., derivatives, manufacture.—I. G. Farbenindustrie. (Sept. 15, '34.) 10200.

ALKALI NITRATE, production.—I. G. Farbenindustrie. (Germany, April 7, '34.) 10236.

ORTHO-OXYAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, April 14, '34.) 10237.

PREPARING D-TRANS-π-OXOCAMPHOR from iso-ketopinic acid.—M. Ishidate and Y. Asahina. 10112.

CALCIUM CARBONATE, production.—J. Y. Johnson. 9835.

AMMONIUM SULPHATE SOLUTIONS, purification.—J. Y. Johnson. 9836.

WORKING CARBON MONOXIDE at elevated temperatures, etc.—J. Y. Johnson. 9837.

POLYMERISATION PRODUCTS, production.—J. Y. Johnson. 9838.

HALOGEN ALKYLS, manufacture.—J. Y. Johnson. 10082.

ESTERS OF DICARBOXYLIC ACID, ETC.—Kodak, Ltd. (Sept. 11, '33). (United States, Sept. 10, '32.) 9638.

EMULSIONS OF BITUMEN, ETC.—P. Lechler. (Germany, March 31, '34.) 10131.

CELLULOSE DERIVATIVES, manufacture.—L. Lilienfeld. 9762 to 9778.

DERIVATIVES OF DIALKYLAMINOALKYLAMINO-ACRIDINES, preparation.—P. May (Soc. des Usines Chimiques Rhône Poulenc). 10014.

CHLORINATED RUBBER, manufacture.—J. G. Moore and Imperial Chemical Industries, Ltd. 10273.

ETHYLENE OXIDE, manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, April 23, '34.) 9898.

FERRO-MANGANESE, production.—Sachtleben A.-G. für Bergbau und Chemische Industrie and Mannesmannröhreonwerke. (Germany, July 23, '34.) 9725.

HYDROGENATION PRODUCTS of follicle hormones, production.—Schering-Kahlbaum A.-G. (Oct. 26, '33.) 10113.

COPPER SULPHATE, manufacture.—M. Serciron. (France, April 7, '34.) 10360.

VOLATILE HYDROCARBONS, hydrogenation.—Soc. Industrielle des Carburants et Solvants and J. Francon. 10145.

VINYLIC RESINS, manufacture.—Soc. Nobel Française. (France, May 3, '34.) 9905.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, April 14, '34.) 9847.

From Week to Week

IMPORTS OF CHEMICALS into the Irish Free State during February last totalled £58,747, as compared with £50,921 last year. In addition, imported chemical fertilisers totalled £56,074 against £33,307 last year.

THE NAME OF THE NEW COMPANY to be registered under the agreement relating to viscose sponge manufacture entered into between the Société Française de la Viscose and the Viscose Development Co. is "Sponcel Limited," not "Spontex" as reported in "Continental Chemical Notes" last week.

FOUR CHEMISTS WERE KILLED on April 11 in an accident at the ammonia department of the Leuna works, near Merseburg, Central Germany, the second largest nitrogen and chemical works in the country. Details of the accident are not disclosed, the official report stating that it happened when carrying out experiments.

THE EDINBURGH OFFICE of English Clays, Lovering Pochin and Co., Ltd., and associated companies (English China Clays Sales Co., Ltd., John Lovering & Co., Ltd., Varcoes Sales Co., Ltd., and Pochin Sales Co., Ltd.) has been removed from 4a St. Andrew's Square to 2 St. Andrew's Square, Edinburgh.

AN EXCEPTIONALLY STABLE CHOLINE DERIVATIVE, namely, carbaminoylcholine chloride, which is available under the name of Doryl (Merck) is now being prepared by E. Merck, Darmstadt. Solutions of this product are not affected by heat and are not readily attacked by ferments. The product is non-hygroscopic, and acts as a typical stimulant of the parasympathetic nervous system.

BURNING TAR ENAMEL in a 3,000-gallon tank overflowed at an outbreak of fire at a Middlesbrough pipe works on April 10. Middlesbrough fire brigade was occupied three hours in quelling the outbreak, which was at Cargo Fleet of Cochranes (Middlesbrough, Ltd.), and succeeded in preventing damage to surrounding plant, the fire being confined to the tank and the burning tar that had overflowed.

THE STATUTORY MEETING of creditors in connection with the voluntary liquidation of Cellulose Colours, Ltd., Cranmer Works, Brixton, was held on April 10, when it was reported that the liabilities amounted to £1,680 13s. 8d., of which £757 8s. 6d. was due to the trade. The assets totalled £825 and there was a deficiency of £855 6s. 8d. The company was incorporated in April, 1935, with a nominal capital of £1,000 in £1 shares. It was stated that large sums of money had been spent on development, which left the company with insufficient capital for trading. A liquidator was appointed to act with a committee of inspection.

THE MINING INSTITUTE OF SCOTLAND held its fifty-seventh annual meeting on Wednesday, when it was reported that the prizes for papers written during the session had been awarded as follows: Norman Henderson Prize—John Finlay and Dr. Winstanley, for their paper entitled "The Interaction of Longwall Workings"; President's Prize and Council's Special Prize—Divided equally among John Smellie, J. M. Cowan and Robert Westwater, in view of the general excellence of their respective papers. An item of interest during the session was a visit to the works of Fullerton, Hodgart and Barclay, where an opportunity was given to inspect electrical winding plant of exceptionally large dimensions.

SPECIAL COURSES FOR EXECUTIVES are now provided in the Department of Industrial Administration at Loughborough College. The general aim of the department is to build up a staff college for industry where executives may come to be informed as fully as possible on current developments in management practice. The arrangements include week-end, ten-day, and longer courses, adapted to the degree of experience of those attending. Instruction includes personal discussion of individual problems with the director (Mr. E. T. Elbourne), lectures, organised reading, group discussions and visits to works and offices. In this way executives can acquire a new outlook on their own methods, and a larger understanding of the fundamental requirements demanded by modern conditions. Inquiries should be addressed to the Registrar, Loughborough College, Leicester.

THE COMPETITION for the Bakelite Golf Trophy, under the auspices of the Institute of the Plastic Industries Golfing Society, was held on April 10. The tournament was held conjointly at two centres, the London section playing at Beaconfield, Bucks, and the Birmingham section playing at Blackwell, near Birmingham. The event attracted 31 entries, but the golf on the whole was poor owing to prevailing gales and weather conditions generally. The winner of the trophy and replica presented by the directors of Bakelite, Ltd., was Mr. W. W. Bode, London manager of Alfred Herberts, Ltd., who returned a score of 3 down on bogey. The runner-up was Mr. J. Butler, of British Cyanides Co., Ltd., who returned a score of 4 down on bogey, and received the runner-up prize of two dozen "Silver King" golf balls, presented by Mr. H. V. Potter, managing director of Bakelite, Ltd. The event was followed by an informal dinner in each section.

THE ROCK HILL CHINA CLAY CO., LTD., is to be wound up voluntarily, and Mr. A. M. Richards, of Stenalees, has been appointed liquidator.

NOTICE WAS GIVEN in the "London Gazette" of April 9 of the voluntary winding up of British Suchar Processes, Ltd., and the appointment of Mr. H. F. Stone, of 3 Lloyds Avenue, London, E.C.3, as liquidator.

A NEW FUEL to take the place of petrol in aeroplane engines is being perfected in France. The fuel, a mixture of alcohol, benzol and oil derived from coal, can be entirely produced from French products and is considerably cheaper than petrol.

A FIRE which broke out at South Bank Chemical Works, near Middlesbrough, on April 16, spread rapidly, involving a large part of the works. Firemen concentrated on preventing the flames from reaching a number of tanks containing tens of thousands of gallons of benzol, situated some distance away.

THE PARTNERSHIP between Charles Bacon and F. M. Brooks, of Leicester, carrying on business as manufacturing chemists at Duns Lane, Leicester, in the name of the Babro Co., has been dissolved. Debts due to and owing by the firm will be received and paid by Mr. Shirley March, of Granby Chambers, 1 Halford Street, Leicester.

SIXTEEN LARGE RESERVOIRS EXPLODED on April 10 in the yards of an oil refinery at Ploesti, owned by the Franco-Belgian company, Concordia. A heavy death roll would have occurred except for the fact that the explosions followed one another at intervals. Three workmen were badly burned in the first explosion, but the others had time to flee. Two fires at refineries have occurred within a few days and it is suspected that incendiaries are at work.

WITHIN ONE MONTH after the close of the British Industries Fair in London applications for 377,262 sq. ft. of space had been received from 735 exhibitors who wish to participate in next year's Fair. Seventeen of the exhibitors ask for 5,713 sq. ft. in the chemical section. The total space already applied for is more than three-fourths of the area occupied this year and the number of exhibitors more than half of those who occupied it. The figures do not include applications for the textiles and furnishing fabrics sections for which provisional applications for space are not made.

A MINISTERIAL DECREE has been issued concerning the standard of purity of chemical fertilisers sold in Spain. The decree provides for the registration of manufacturers, persons holding stocks, commission agents and other vendors of fertilisers, who must make monthly returns of the quantities and nature of their fertilisers. Definitions of fertilisers are laid down, and labels on sacks, packets, etc., must bear a clear indication of their contents and a printed statement of the quantity of each fertilising component which is contained in 100 kg. of fertiliser. The admixture of phosphate of alumina with other phosphates is prohibited.

THE GOVERNMENT'S DECISION to make money grants for research in rubber through the Rubber Industry Bill was described as "a piece of genuinely constructive legislation" by Major J. H. Mandleberg, chairman of the Research Association of British Rubber Manufacturers, at a luncheon of the association in London on Monday. "During the whole of this generation," he said, "whatever party has been in power, there has always been an excessive amount of restrictive legislation. When the Government first decided to make money grants certain people said the Department of Scientific and Industrial Research would come and interfere with us. Well, the department has come and helped us both with criticism and advice."

THE FIRST NUMBER OF "WORLD SURVEY" appeared on April 15. It is published under the auspices of the World Power Conference and is therefore able to deal with especial authority with the manifold problems arising from the application of power to industry. At the same time it is intended to deal with all major aspects of economic activity and to record by means of special index numbers changes in production and trade, prices and stocks, etc., throughout the world. Articles in the first number cover such important subjects as the significance of power production for mankind, the long term trend of industrial development, the displacement of labour and the problem of world commodity stocks. In its economy section, "Word Survey" publishes a special article on the Belgian situation and on rubber, in addition to the wide series of indices and comments on the world economic situation.

Forthcoming Events

Apr. 24.—Institute of Chemistry (London Section). Visit to London Power Co., Battersea.

Apr. 26.—Chemical Engineering Group. Annual general meeting. Waldorf Hotel, London.

Company News

Broken Hill Proprietary.—The half-yearly dividend of 5 per cent. (Australian currency) is declared, payable on May 15.

Milton Proprietary, Ltd.—An interim dividend of 7½ per cent. on account of the year to September 30, 1935, is declared. For the previous period of nine months an interim of 5 per cent. was paid, followed by a final of 6¼ per cent., making 11¼ per cent., against 18¾ per cent. for the fifteen months to December 31, 1933.

Benzol and By-Products.—The report for the year ended September 30, 1934, shows a profit, after depreciation, of £499 (against loss £5,637), which deducted from debit brought forward £132,468, leaves balance to debit of profit and loss account £131,969. The preference dividend is paid to September 30, 1926.

British Celanese, Ltd.—The directors have decided to pay on April 30, 1935, one year's dividend on the 7 per cent. first cumulative preference shares. This brings the payment on these shares up to October 31, 1932. A year's dividend was paid in January this year. The dividend on the second preference shares is paid to April 30, 1930. No dividend has yet been paid on the ordinary 10s. shares.

Lewis Berger and Sons.—An interim dividend of 6 per cent., less tax, is declared. This compares with 4 per cent. paid a year ago, which was followed by a final distribution of 6 per cent., making 10 per cent., against 7½ per cent. for 1932-33. In 1931-32 a 5 per cent. dividend was paid, while nothing was paid for 1930-31. The net profits, after tax, for the year to July 31, 1934, amounted to £102,460, compared with £74,405 for the previous year and £57,322 for 1931-32.

Barry and Staines Linoleum.—A final dividend of 6 per cent., less tax, is announced for the year to January 31, 1935. With the interim dividend of 4 per cent. paid in October last, the total distribution for the year is thus 10 per cent. This compares with 6 per cent., paid as a final, for the previous ten months to January 31, 1934, equal to 7 1-5 per cent. per annum. Net profits for the ten months to January 31, 1934, amounted to £92,896, compared with £69,261 for the previous twelve months to March 31, 1933, and £149,297 for 1931-32.

Babcock and Wilcox, Ltd.—A final ordinary dividend is announced of 4 per cent., making 8 per cent., less tax, for 1934, against 6 per cent. for 1933 and 9 per cent. for 1932. For the latter year, however, 1½ per cent. was paid as a special distribution in respect of profit on investment sales. Issued ordinary capital totals £4,299,656. This is the first increase in dividend since 1927. For that year, and for 1928 and 1929, the company paid 15 per cent., tax free. For 1930 14 per cent. was forthcoming, but a similar rate in 1931 was subject to tax deduction. Total profits for 1933 were £260,398.

United Premier Oil and Cake Co.—It is reported that income from dividends, etc., for 1934 rose from £56,172 to £80,631, and after including other income of £3,406 and allowing for tax, interest, etc., £58,302 is available for dividends, against £33,647 a year ago. In addition, there has been a further realised profit from the sale of British Government securities of £7,814, which, together with £10,000 from revenue, has been added to reserve. From that fund £20,000 has been transferred to depreciation reserve, leaving £45,687 in the reserve account. A 7½ per cent. dividend is to be paid on the ordinary shares, the first since 6 per cent. was paid for 1924.

Bryant and May.—The net profits, it is reported, have reached a new record, at £571,249 for 1934. This is nearly £10,000 higher than the 1933 figure of £561,722. The dividend on the ordinary shares, which are held by the British Match Corporation, is maintained at 25 per cent., tax free, and, in addition, a bonus dividend of £250,000, representing £100,000 profit on sale of investments and £150,000 from reserves, is to be distributed, which will be carried to reserve by the British Match Corporation. The reserve fund of Bryant and May is again to receive £100,000, and after providing for the preference and partnership dividends and for the employés proportion of £43,228, £82,455 is carried forward, against £68,248.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to April 27, 1935.

Esinth. 556,767. Class 1. Chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. Jenson & Nicholson, Ltd., Goswell Works, Warton Road, Stratford, London, E.15. December 31, 1934.

Fiberloid. 557,049. Class 1. Cellulose acetate and cellulose nitrate being chemical substances used as ingredients in manufactures. The Fiberloid Corporation, 300 Worcester Street, Indian Orchard, Massachusetts, United States of America. January 11, 1935.

Granafilm. 558,166. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Hadfields (Merton), Ltd., Western Road, Mitcham, Surrey. February 21, 1935.

Lombrasin. 558,392. Class 1. Chemical substances for steeping colouring and brightening textile fabrics and leather in the course of their manufacture. A. Th. Bohme, Akt.-Ges., 29 Moritzstrasse, Chemnitz, Saxony, Germany. February 28, 1935.

Opposition to the registration of the following trade marks can be lodged up to May 10, 1935.

Faspos. 557,686. Class 1. A fire-proofing compound. I.C.I. (Fertiliser and Synthetic Products), Ltd., Imperial Chemical House, Millbank, London, S.W.1. February 4, 1935.