The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXVIII. February 25, 1933 No. 713

Notes and Comments

A Plea for Mutual Confidence

THAT buyers and users of chemical plant should take the plant makers into their confidence and give them the fullest possible information regarding the chemical and physical nature of the materials to be treated in the plant, and all the conditions under which the plant will have to work, has been frequently urged in our columns of late, and a number of speakers in the discussion on Mr. Singlehurst Ward's paper on "Metallurgy from the standpoint of the Chemical Engineer" at the annual meeting of the Institution of Chemical Engineers raised this point, which in our view is a most important one. The plant maker cannot possibly do his best for his client if he has to work blindfold with only a partial knowledge of the conditions he has to meet. Many plant users do not realise that very small, and to them unimportant, things can make all the difference. The presence of a few parts per thousand of some acid may cause serious corrosion if the plant maker is not made aware of its presence, whereas if he knows about it he can avoid the trouble. Similarly, the presence of very small quantities of colloid material may render a salt unfilterable, but the chances are that the plant maker is just given the name of the salt to be filtered and nothing is said about the colloid.

In other cases the plant buyer is afraid that, if he gives the plant maker full details of his process, information may leak through to his competitiors. We are certain that this suspicion is totally unfounded, and it is fairly obvious that any plant maker who made improper use of confidential information imparted to him by his clients would soon be out of business. We urge once again that the makers and users of chemical plant should get together in a spirit of mutual confidence and co-operation, and put all their cards on the table. Fewer mistakes would then be made, and both sides would have much more cause for satisfaction.

Industrial Research

THERE is undeniable evidence that the lowest depths of the trade depression has passed and that the future outlook is bright, even if that brightness is not yet as vivid as we could desire. Mankind has made its mistakes, and has learnt its lesson. The importance of the recognition of these facts is that the industrialist can now look ahead to devise methods whereby the revival of trade can be accelerated rather than look around to devise economies which may help to keep his head above water. There are few branches of industry in which research does not play a prominent part in any reconstruction. It is one of the most encouraging signs of our day, and in our nation, that never before has there been so much genuine interest taken in research. Unemployment among scientific workers is exceptionally low; out of some 6,000 members of the Institute of Chemistry only some 200 are not engaged. The British Association of Chemists has an equally good record. Employers are inquiring for scientific staff in good numbers; there is active preparation for the future. Repeated reference has been made in the Press to the speech of Mr. Beaumont Pease, chairman of Lloyds Bank, in which he foreshadowed the creation of an organisation to provide finance for research and similar development work. The achievements of the research organisations in this country are of solid value to the industries they serve, though in general they are not sufficiently spectacular to be appreciated by the non-technical public. The Cotton Research Association may be mentioned as an instance of the value of scientific research to an apparently non-scientific industry. There is more obvious need for the application of scientific research to the electrical industry, based as it is upon the discoveries of Faraday and many others in pure physics. The president of the British Electrical and Allied Industries Research Association has just stated that the electrical trade realised that research was primarily a matter for the manufacturers, and that "some of them were spending over £100,000 a year on the research." In spite of this, many problems have been found which are better to be investigated co-operatively so that the industry has also an independent research body. An economic investigation was undertaken by this body in 1929 as a result of which it was able to show figures that withstood critical examination by the suppliers of electric current demonstrating that research was saving the suppliers no less than £1,000,000 a year; to-day that figure would be much increased.

The Position in the Rubber Industry

RESEARCH is so much a necessity in the chemical industry, the mainstay of its progress and expansion, that it comes as a surprise to hear that the rubber industry is in considerable difficulty in maintaining its co-operative Research Association. The Department of Scientific and Industrial Research was voted £1,000,000 in 1917 for the founding of associations of this type and the rubber industry early took advantage of the scheme. Its Association, after some thirteen years of life, has received the support of 85 manufacturing members and 95 other subscribing firms and institutions, including the majority of chemical suppliers to the industry. Although the bulk of its scientific investigations remains in confidential reports to its members, quite sufficient has been published and reviewed in

recent years to indicate the value and wide scope of the fundamental researches actively carried out. The intelligence service developed over the same period is well known to all interested in the industry, covering one of the largest rubber libraries in the world, with the necessary vast indexes, and coping with some 1,000 enquiries per year in recent times.

Need for the Research Association

HITHERTO this work has been supported on a progressive basis by the more far-seeing firms, but the nature of the industry as a whole, owing to the widely-differing sizes of its units, does not lend itself well to voluntary arrangements. It is not to be expected that the few largest members will continue indefinitely to support an organisation for the benefit of all. Consequently the Association has prepared a scheme for securing a stable income based on a small levy on raw rubber (one forty-fifth of a penny per lb.), analogous to the schemes used for encouraging cotton growing in the Empire and for collecting money for the Miners' Welfare Fund by a levy on coal. In this way contributions to the Association can be spread over the whole industry proportionately. A scheme of this kind requires parliamentary sanction and a Bill promoted for that purpose passed its second reading and committee stages in 1931 but time did not allow the third reading. The Bill is again before the House as a Private Member's measure, backed by a majority of the firms in the rubber industry and all its responsible trade organisations. It is however, difficult to carry such measures through against even slight opposition and the Association is to-day threatened with disbandment within the next few weeks unless the passage of the Bill is ensured.

The value of such an organisation spreads far outside its own particular industry and affects the general chemical industry, for example, in many ways. The rubber industry is a large consumer of chemicals such as solvents, vulcanising agents, dyestuffs, and of the particular reagents such as accelerators and anti-oxidants introduced in recent years entirely as the result of research. There is a wide field of expansion for research into derivatives of rubber, such as new plastics and halogenated rubbers for anti-corrosion and varnish coatings. The general chemical industry is also making free and increasing use of rubber and ebonite in its plant for dealing with highly corrosive substances.

A Very Important Question

THE Association stands as a direct source of information on all these problems and a link between the rubber industry and general chemical organisations and firms in developing such activities. The general consumer of rubber goods, in fact, is keenly interested in the organisation, and may well consider that there is a sharp contrast between the recent granting of a tariff for the benefit of the rubber manufacturers and the threatened abandoning of this research station which benefits him. The chemical industry cannot stand indifferent to the elimination of a body which forms a unit in the growing national chain of intelligence organisations and it is to be hoped that means will be found, as in the Government giving facilities for passing the existing Bill into law at an early date, for securing the continuance of the Association.

The position in the rubber industry raises an important question upon which we should like to have the views of our readers. Should a Government compel any firm to join a research organisation along with the other firms in the same industry? Is research to be left to the policy or whim or initiative—according which way one regards it—of the individual, or should it be regarded as a duty. For our part we are definitely in favour of research by compulsion, if other means have failed. It may be argued against this view that many of the dissentient firms have their own research staff; that may be true, but there are many problems in any industry which affect every firm engaged equally, and which would not " pay " the individual firm to investigate because there is no immediate profit to be expected. Failure to investigate these problems, which may even be academic at the outset, may act as a brake on the whole industry. Other firms are perhaps in financial straits, or have passed their dividends. The directors feel that the interests of their shareholders come first, and, as directors, who shall blame them? Is not their position somewhat analogous to that of the individual who objects to paying his income tax on the ground that the fighting forces are of no interest to him; or of the man who fails to see why he should pay his rates, since the sanitary services of his borough council are unnecessary as he burns his own rubbish in the boiler? We do not suppose there are any such individuals in this enlightened age; all agree that they have a duty to perform to their neighbours of assisting to provide the defence of the community against human foes or against disease. In our view this *reductio ad absurdum* makes the case against compulsory research very weak because in this twentieth century we are bound to regard industrial and scientific research as one of our most essential weapons against external economic forces. If that is so it becomes as much a duty for our industrial units to support the one as it is for individuals to support the other.

A Town of New Factories

PARTLY owing to the new tariff barriers set up during the past twelve months and partly on account of its favourable geographical situation, Welwyn, Hertfordshire, has lately become the home of many new factories, and in some instances, actually new industries, amongst which chemical interests are represented. There is one firm employing more than 100 people making engineering accessories which up to August, 1931 had been made in the United States.

One firm of German origin now making medical requisites decided a few weeks before the announcement of tariffs in England to set up a factory at Welwyn. That was partly due to the action of the patent laws, but partly also to "'intelligent anticipation." A small factory has just been started by an English firm to make a benzine product hitherto imported from Austria. These new factories are modern and highly rationalised, which means that they consist of a large amount of machinery looked after by a few workers. But the labour they now employ directly and indirectly is British. The raw materials are British as far as possible. The transport they use is British, and they pay British rates and taxes.

The Institution of Chemical Engineers

Lord Leverhulme's Presidential Address

THE eleventh annual corporate meeting of the Institution of Chemical Engineers was held at the Hotel Victoria, London, on Friday, February 17, being followed, in the evening, by the annual dinner. Lord Leverhulme, the president, was in the chair. In presenting the annual report and accounts, he spoke of the satisfactory manner in which the membership had been maintained and, indeed, slightly increased, during the past year. Looking at the position generally, he said we need have no fear as to the future of chemical engineering nor as to the quality of those who were coming along to continue the work, for he had been very much impressed with the students and graduates of the Institution.

Mr. H. W. CREMER (hon. secretary) in a general review of the work of the Institution during the past year, said that from the membership point of view it was very pleasing to notice the number of requests for information concerning the Institution and the necessary qualifications for membership. From this it was evident that those engaged in the chemical and allied industries were become increasingly alive to the advantages attaching to membership of the one professional organisation dealing with chemical engineering. There was ample evidence, too, that the Institution now represented a very living force in the industrial, educational and, he might say, the social life of the country quite apart from the ties which it had formed with the Dominions through its members resident overseas and with the corresponding body in the United States. Referring to the Education Committee, he said this was now engaged in the modification of the memorandum issued eight years ago on "The Training of a Chemical Engineer," it being felt that some revision was necessary in the light of developments since the original issue. The question of possible future developments in the present methods of training chemical engineers was also receiving very full consideration. The provision of the new chemical engineering laboratory at King's College, London, was a very pleasing sign, following so closely after the opening of the new Ramsay Memorial Laboratory at University College. In conclusion Mr. Cremer paid a warm tribute to the work of Mr. Mackie (the assistant secretary) and his staff, whose willingness and cheerfulness under the most trying conditions, he said, never flags.

VISCOUNT LEVERHULME
who has accepted the Presidency of the Institution of Chemical Engineers for a second year

MR. F. A. GREENE (hon. treasurer) presented the accounts, and referring to the small deficit of £8 said that, although it might be argued that there should not be any loss, it must be remembered that the Institution could only do its work efficiently by wisely spending the money it received. It was not a savings bank and the policy was to try and arrange things so that the expenditure and income more or less balanced.

The report and accounts were then adopted.

It was announced that the following had been elected to the Council for the coming year:—Viscount Leverhulme (president); Dr. H. Levinstein, and Mr. H. Talbot (vice-presidents); Mr. H. W. Cremer (hon. secretary); Mr. F. A. Greene (hon. treasurer); Mr. E. Briggs, Mr. H. J. Pooley, and Dr. F. S. Sinnatt (members of Council); Mr. C. C. H. Brazier and Mr. H. A. S. Gothard (associate members of Council).

The Osborne Reynolds Medal was presented to Mr. S. G. M. Ure, hon. editor of the Transactions for seven years; the Moulton Medal to Dr. C. M. White, for his paper on "Fluid Friction and its Relation to Heat Transfer"; the Junior Moulton Medal to Dr. W. B. Hawes (graduate) for his paper on "Some Sidelights on the Heat Transfer Problem."

Cordial votes of thanks were passed to the president for his services during the past year, to the assessors in connection with the award of medals and to the honorary officers and Council.

LORD LEVERHULME, in the course of his presidential address, traced the history and development of the soap industry, illustrating his remarks with a number of lantern slides of ancient and modern methods of soap making. He said that in no other branch of manufacture is production more definitely dependent upon the work of the chemical engineer, and certainly the development and expansion of those business concerns with which he was associated had been chiefly due to the recognition of the chemical engineer's importance.

When and how soap was discovered—if indeed it was ever definitely discovered, and not gradually evolved from crude mixtures of alkaline and fatty materials—nobody knew. It was used in ancient Rome both for medicinal and cleansing purposes, and Pliny wrote of two kinds—hard and soft—and spoke of it as being originally a Gallic invention for giving a bright hue to the hair. Report had it that the first English soap-maker lived in Bristol at the end of the 12th century. In the 13th and 14th centuries a small community of soap-makers grew up in the neighbourhood of Cheapside, London, and included amongst the companies associated with his firm was one of the oldest of candle and soap-making businesses in the world—that of John G. Rathborne, Ltd., established in 1488 at Dunsinea, Ashtown, Co. Dublin. In the reign of Charles I, soap-making was a monopoly. The Bristol soap-makers were not allowed to make more than 12 tons a week, and for each ton they had to pay £4 to the Crown. When, after the Napoleonic wars, the firms of Crosfield and Hazelhurst started to manufacture, the tax on soap was threepence a pound, and soap-boiling pans were fitted with lids so that they could be locked every night by the Exciseman, thus preventing production under cover of darkness to the prejudice of the national revenue. There is still in use at Warrington, in the works of Joseph Crosfield and Sons, Ltd., a soap pan put down in the year of Waterloo, and its original padlock still exists. It was not until the year 1853 that this tax was abolished by Mr. Gladstone, at a loss to the State of over £1,000,000 per annum.

Turning to the chemical side of the subject, Lord Leverhulme said that in early times soap was looked upon as a mechanical mixture of fat and alkali and no satisfactory method had been discovered for the cheap production of alkali. It was the famous French chemist Chevreul who showed that the formation of soap was in reality a chemical combination and the reaction that took place when oil and alkali were mixed could be expressed by the typical formula:—

$$(C_{15}H_{31}COO)_3C_3H_5 + 3\ NaOH = 3\ C_{15}H_{31}COONa + C_3H_5(OH)_3$$

Palmitin Caustic soda Soap Glycerine

Originally, the valuable by-product glycerine, so important in the explosives industry, ran to waste. It was not until towards the end of the 1880's that the recovery of the glycerine was made a practical possibility by the researches of Dumeier, who thus won his place as one of the most important of early chemical engineers. The most revolutionary discovery in the history of soap making, however, was undoubtedly the perfection of Leblanc, in 1790, of his method of producing soda ash from common salt. The basic process of soap-making had altered little in the last century, and the method most usually followed to-day was to saponify the

blend of oils and fats used (which varies with the type of soap required and the market price of the materials) with liquid caustic soda and to separate out the lyes containing the glycerine by the addition of salt or brine. The developments of recent years concerned the improvement of plant, the pre-treatment of oils and fats and post-treatment of the finished soap, rather than the actual process of soap-making itself. In this connection Lord Leverhulme showed a lantern slide of the soapery at the plant of Lever Bros. at Hammond, near Chicago, which he described as their most modern factory. The ventilation is effected by delivering into it fresh air which has been filtered to ensure the removal of all dust and particles of soot, while the vapours from the soap pans are withdrawn by means of exhaust fans, and he contrasted the difference between the atmospheric conditions in this and the earlier types of pan rooms.

Pre-treatment of Raw Materials

It was in the pre-treatment of raw materials that there had been remarkable developments since the beginning of this century. The advent of margarine and other edible products made from materials which had long been at the sole disposal of the soap-maker compelled him to investigate new and wider sources of supply, and he found what he required in two ways—thanks to the chemical engineer he was able to convert hitherto unsuitable materials to his requirements and through the development of new refining, bleaching and deodorising processes, he was enabled—again through the beneficence of the chemical engineer—to use cruder qualities of the same materials that he had used before. Under the first of these two headings the most important discovery was that of "hardening" whale oil so that it could be used as a substitute for tallow. Chemically the process consists of adding two or more atoms of hydrogen to each molecule of the so-called " soft " whale oil, in the presence of a catalyst (generally a preparation of nickel), thereby turning it into a "hard oil." For the discovery and development of fat hardening the industry was particularly indebted to the researches of Normann, and the chemical engineering ability of the late Dr. Markell and his collaborators, but many problems connected with it still wait solution. The production of hydrogen was, of course, the first step in the fat hardening process, the gas being obtained by the decomposition of water, either electrolytically, in which case the oxygen simultaneously produced is a valuable product, or by other methods such as the steam-iron process.

Reference was next made to the whaling industry itself. Whereas the extraction and treatment of the whale's blubber used to be done at a "land station," the modern practice is to send to the Antarctic a "floating factory" with its complement of "whale catchers" which bring their catch to the parent ship, on board which is all the machinery and equipment necessary for dealing with the oil and other products of the whale in a much fresher state than would otherwise be possible.

The Finished Product

There had been no fundamental change in the chemical process of soap-making for a long time, although chemical research was constantly suggesting new ideas, some of which might prove to be commercially advantageous. It was in the physical rather than the chemical sphere that the greatest developments had taken place, and this led the president to speak of the post-treatment of soap after it has left the hands of the soap boiler. In preparing his finished product for the market the manufacturer had three aims; (1) to produce a finer looking product; (2) to effect economies in time, space and labour; and (3) to save the time and labour of the user. As to how far the soap industry has succeeded in carrying out the first aim was a question for the public. In economies in time, space and labour there had been great developments. For many years it has been the practice in some factories to cool soap artificially with machines resembling those used for candle moulding, but the master craftsman still held to the old-fashioned method of allowing his soap to cool in frames, although it took five days to a week against a few hours by the other system, because of the peculiar physical quality—the "feather" as it was called—which frame-cooled soaps possesses. But even in the case of frame-cooled soaps, after the soap had been cut, the final drying of the bars, "to put a skin on them," was frequently done by means of a special plant called a "Tomlinson dryer," and these dryers now do in half an hour what used to take a day. As regards labour saving plant there had been enormous developments in the soap industry as in most others, and especially was this so in the packing, wrapping, cartoning and boxing of the finished product.

The saving of the user's time and energy, however, provided a most interesting field of development, one which might more strictly be called physical engineering rather than chemical engineering. The main problem to be solved had been quicker and better solubility manifested in a freer and more profuse lather, and this led to the introduction of soap flakes and soap powders. Very few such preparations consisted of soap alone, other ingredients being generally added and there was now an increasing market for powders containing sodium perborate. These powders are dissolved in tepid water and the articles to be washed are then put into the solution which is brought to the boil. As the temperature approaches boiling point, the perborate molecule parts with its less stable oxygen atom and the liberated oxygen bleaches the clothes. The processes of washing and bleaching are thus done in one operation. The drying and washing has also been combined in the same way, although this form of product has never proved to be a permanent commercial success.

Toilet Soaps

Toilet soap differed from laundry soap (apart from the selection of raw materials used) in that after the soap had left the cooling frames it was shredded and then subjected to a special drying process, after which its colouring material, if any, was added and also perfume. It was then put through a mill, and then through a plodder, after which it was cut, stamped and packed. A novel alternative to the standard practice, and one which had given satisfactory results, was employed by his firm's American company. In this method the milling operation is done away with and the soap, while in a plastic condition, is forced through a series of wire-gauze screens of progressively diminishing mesh. The extruded soap is then put through a plodder in the ordinary way. Among those features which during the past decade have characterised the development of the soap-making industry from a chemical engineering point of view, continued the president, has been the recognition of the influence upon the quality of oils and soaps of minute amounts of metallic impurities. For example, a few parts per million of copper greatly accelerate deterioration on storage. This has naturally been reflected in the choice of metals for plant construction in which nickel, aluminium, and special alloys such as monel metal have found continually extending use.

On the motion of Sir Frederick Nathan, seconded by Mr. S. J. Tungay, a cordial vote of thanks was passed to the president for his address.

Annual Dinner of the Institution

At the annual dinner of the Institution held at Hotel Victoria, London, Viscount Leverhulme presided over a company of more than 200 members, ladies and guests. Among those present were Sir Frederick Gowland Hopkins (president of the Royal Society); Dr. Herbert Levinstein; Dr. A. C. Seward, F.R.S. (Master of Downing College, Cambridge); Professor H. E. Armstrong, F.R.S.; Dr. H. Pickard, F.R.S.; Mr. W. A. S. Calder (past president); Mr. J. Arthur Reavell; Dr. E. F. Armstrong, F.R.S.; Professor F. G. Donnan, F.R.S.; Mr. C. S. Garland; Mr. H. Talbot; Mr. F. A. Greene; Mr. J. F. Ronca; Dr. R. Lessing; Mr. R. E. Gibson; Dr. W. R. Ormandy; Sir Robert Robertson; Mr. F. H. Rogers; Dr. R. Seligman; Mr. L. H. Sensicle; Mr. G. S. Ure and Dr. W. Cullen.

Sir F. G. HOPKINS proposing "The Institution of Chemical Engineers," said it needed the repercussions of the Great War to bring chemical engineering and its great activities into being. When the late Lord Moulton was chairman of the Medical Council in the early days he had said, only a short time before the war and little knowing what was before us, that there were two people who needed encouragement in this country, *viz.*, the bio-chemist and the chemical engineer. That was typical of Lord Moulton's great wisdom and the Institution of Chemical Engineers, once formed, had been very faithful to the ideals of its founders more especi-

ally with regard to its policy of technical education and also in regard to research. From the point of view of the technical education of the younger members of the profession, the Institution was in the forefront of professional associations, whilst in respect of research it was to be congratulated on the researches it had encouraged. It was often said that this country did not carry out the same amount of industrial research that other countries did, and he did not know whether that was right or not, but certainly the amount of valuable research that had been done under the most depressing and difficult circumstances was a thing this country could congratulate itself upon.

Link Between Pure and Applied Science

The PRESIDENT, responding, said the toast of the Institution on the present occasion was of special significance because the proposer of it was not only President of the Royal Society but also President of the British Association for the Advancement of Science, and for that reason the link between pure and applied science was not a missing one. The Royal Society was founded in the reign of Charles II, but whilst that period might have been a good one for pure science, it was rather a difficult one for applied science. There was an Excise Duty of 3d. per lb. on soap and that continued until it was abolished by Mr. Gladstone in 1856 with a loss to the revenue of over £1,000,000. The consumption of soap in this country in 1801 was 24,000 tons and when the tax was abolished in 1853 it had only risen to 40,000 tons. In 1930, however, the consumption of soap amounted to 400,000 tons and perhaps it was well that the Chancellor of the Exchequer was not present or he might be tempted to put back the tax on soap, because it did not need a chemical engineer to calculate that if 40,000 tons of soap yielded £1,000,000 in taxes, 400,000 tons would produce £10,000,000. Nevertheless, there was a moral to be drawn from this and the moral was that if industry was to be stimulated taxes should be taken off and not put on. Speaking generally, we were out for better and bigger business, bigger sales and better products and to accomplish that there must be a partnership between the business man and the technologist. In this connection he recounted that one of the sales directors at a large industrial concern had given an admirable definition of the difference between a salesman and a technician. A salesman was defined as a man who knows a very little about a great deal and keeps knowing less and less about more and more, until he finally knows nothing about everything. A technician, on the other hand, was defined as a man who knows a great deal about very little and he goes on knowing more and more about less and less until he finally knows practically everything about nothing.

Educational Work of the Institution

Dr. HERBERT LEVINSTEIN, who proposed "Out Guests," referred to the educational work of the Institution and said that specialised education such as the training of the chemical engineer, required a perfectly solid secondary education system and a very long preparation for the specialised work to be done later. Chemical engineers, he said, have a very important part to play in the world and that part was the more difficult because of the extraordinarily rapid changes that were taking place and the world would have to take more notice of the chemical engineer than it had done during the past 15 futile and ridiculous years, during which time it had been misled by timid people frightened of their own shadows listening to the popular voice whilst all the time the people were really saying one thing only, *viz.*, "Tell us what to do." With the world in its present unsettled state there was a great responsibility resting upon the work of the chemical engineer.

The toast was replied to by Dr. A. C. Seward, F.R.S., Professor H. E. Armstrong, F.R.S., and Dr. H. Pickard, F.R.S.

Professor H. E. ARMSTRONG, in the course of his remarks, said that similar knowledge to that which Frankland had applied to the provision of pure water for this country and the world in general was now required to be applied to the provision of pure milk, because it was in this connection that chemical engineering could do a vast amount of work. The purity of milk depended on the proper feeding of cows and that depended on the production of the food that the animals could eat in winter being equal to the summer food they got when they were out in the fields. That depended, however, upon properly dried summer grasses, and at the present moment we seemed to be incompetent to do that. The drying of natural products was one of the problems before the world to-day, but engineers had not yet been able to solve it.

Dr. R. H. PICKARD referred to industrial research and expressed satisfaction at the broad outlook adopted by the Institution in avoiding the danger that existed of industrial research getting into water-tight compartments. So many industries were now inter-related that industrial research could not be dealt with in that manner and must of necessiy include a number of industries.

Mr. W. A. S. CALDER proposed the final toast of the evening, "The President."

Lord LEVERHULME in responding, once again acknowledged the great assistance he had received from the members of the Council of the Institution, the hon. secretary, and the assistant secretary and staff.

Letter to the Editor

Chemists and the Next War

SIR,—While there is too much talk, and preparation for the next war, and statemen are warning the civilian population of the horrors in store for them, each nation is casting the blame on some imaginary enemy who is preparing night and day some deadly gas, by which great cities will be wiped out in a night. This is their excuse to arm, and it is the imaginary enemy who will one day be a reality. The League of Nations has shown that it is incapable of preventing even a minor war among its own members. The Council of the League meets and discusses anti-chemical warfare, and that is as far as it gets, for the simple reason that the very nations, especially the great powers, do not want to end war and its horror, but give every encouragement to bring about the next war.

Statesmen and politicians have failed miserably to bring peace to the world, and this is where the chemists can do in a moment what the League of Nations can not or will not do in 100 years. I propose a League of Chemists, who are at the present moment working in research laboratories, universities, and explosive factories, preparing gases, lethal chemicals, and thermite compounds for the next war. I suggest that the quickest way to stop a war or wars, is for the chemists of all nations to unite in the cause of humanity and withdraw their services from all firms and government works and arsenals, where war material is likely to be made, the moment there is a threat of war. After an army has been mobilised, the chemists are the next body of men to be mobilised to prepare the explosives, to make the steel for the guns, to distill the petrol for the raiding aircraft, to make the cordite for the shells, the gun cotton for the torpedoes, the T.N.T. for the high explosive shells, etc. If the chemists of the world would form an international union and withdraw their services at the critical moment war would soon become impossible. Failing to prevent war altogether, the union could call on its members to refuse to manufacture or direct the manufacture of poisonous gases or other chemical intended for use against the civil population.

If by our efforts we cannot stop the next war, then let the chemists take the terror and the sting out of it, and limit the range of war. I shall be pleased to see or hear other views especially from foreign correspondents.—Yours faithfully,

HUGH G. CORR.

79 Wanlip Road,
Plaistow, E.13.

Cawnpore Technological Institute

AFTER due consideration of the report of the Committee of Inquiry, the Government of the United Provinces (India) have now decided that the Cawnpore Technological Institute should be divided into three sections, *viz.* (1) a general research section, (2) a sugar section, and (3) an oil section. It is agreed that the Institute as a whole should carry on both teaching and research. There will be a two years' diploma course for the training of sugar technologists in addition to three minor courses for sugar analysts, sugar boilers and foremen in the Khandsari industry.

Metallurgy and the Chemical Engineer

Another Plea for Co-operation between Plant Makers and Plant Users

THE metallurgical achievements of the past 25 years were due in no small measure to the skill of the chemical engineer, said Mr. L. Singlehurst Ward, in the course of his paper on "Metallurgy from the Standpoint of the Chemical Engineer," read before the Institution of Chemical Engineers on February 17. The production of nickel, aluminium and more recently magnesium in a high state of purity had enabled the metallurgist to produce the important high tensile steels, heat-resisting and corrosion-resisting materials, and light alloys of great strength. The era of chemical industry was passing in which the chemical engineer had a limited choice of metallic materials from which to construct his plant. To-day he was more likely to be embarrassed by the conflicting claims of a wide range of metals and alloys, and he therefore looked to the manufacturer and his staff for guidance in the selection of the most suitable material.

The first factor to be considered in selecting materials was the mechanical properties and fabrication possibilities. The tendency to-day was to increase the output by working processes at temperatures and pressures much higher than formerly, and therefore the mechanical properties of materials must be studied over the whole range of the temperatures of working. Fortunately research organisations were turning their attention in this direction and much important information was available. The next factor was resistance to corrosion which could be considered firstly from the service life of the material and the purity of the product. In cases where little or no data was obtainable on corrosion resistance under service conditions, the suitability of the material might be deduced from careful laboratory tests under conditions approximating to those of actual service. Specifications and acceptance tests, however, have always been a source of irritation between the manufacturer and the user, and it was urged that specifications should always be drawn up clearly and with the avoidance of vague statements regarding composition, method of production and treatment, all possible information being given and all secrecy avoided as far as possible. A reputable manufacturer, like a legal adviser, respects the confidence of his clients.

A Choice of Materials

Dealing with the various metals used in the construction of chemical plant, the author recommended care in the hot working of Armco iron owing to red shortness at certain temperatures, at the same time pointing out how cast iron, which has largely been used in the past for the construction of certain furnace parts, is gradually being replaced by recently developed heat-resisting materials. Whilst high silicon irons containing 12 to 15 per cent. of silicon are extremely valuable because of their resistance to acids, they are usually only available in the cast condition and so hard that machining is almost impossible and therefore grinding to size has to be adopted. Commenting on the use of alloy steels of certain types on an increasing scale in the construction of chemical plant, it was pointed out that probably the most important and recent development is their use for equipment in the ammonia oxidation process for the manufacture of nitric acid. As regards aluminium, it was mentioned that this term was often indiscriminately applied to any material containing 90 per cent. or more of the metal. This fallacy, however, has caused laxity in the drawing up of specifications with subsequent failure in the fabricated material to resist chemical attack. Practically all aluminium chemical apparatus is constructed from metal of the highest state of purity, the total percentage of impurities being rarely more than 1 per cent. and in many cases of the order of 0.5 per cent. The resistance of pure aluminium to chemical attack is very high and in nearly all cases the presence of impurities decreases this resistance and consequently affects the chemical coming into contact with it. Unfortunately, however, aluminium is attacked by all caustic alkalies and by the majority of alkaline material, one interesing exception being ammonia. Gaseous ammonia does not attack the metal but aqueous ammonia attacks it superficially, forming a protective coating which prevents further action. Aluminium condensers are now being used in the ammonia recovery plant on by-product coking plants, as well as in the petroleum and rubber indusries, the fermentation industries and in the preparation of foodstuffs.

Aluminium Alloys

Although aluminium-silicon alloys and aluminium-copper alloys together with aluminium bronzes may have great possibilities in the chemical industry, the other high aluminium alloys have not been found very suitable for use. Copper is being gradually superseded for chemical plant by other materials such as aluminium, nickel or stainless steel, but special bronzes such as the Cu-Ni-Zn; Cu-Ni-Sn-Si, and Cu-Si-Mn should have great possibilities for use in chemical plant. Many uses are also made of lead in the construction of plant; one noted London firm of lead manufacturers is now producing lead in increasing quantities of the order of 99.99 per cent. purity. Such lead, however, has little strength and is often strengthened by the addition of small amounts of antimony and copper which involves a loss in resistance to chemical attack. In America a material is sometimes used termed "crawlproof" lead, which is stated to be chemical lead reinforced with hard lead. For greater strength lead plated steel and iron may be used.

Dealing with the fabrication and treatment of materials it was emphasised that castings for the construction of plant are giving place to modern fabricated materials, owing to certain disadvantages. For instance, when once a casting has been made it is impossible to modify it at some future time or to repair it satisfactorily. It therefore has to be replaced and although castings have certain advantages for certain pieces of apparatus, they are giving way to other methods. Many failures, however, were encountered in the early days of the fabrication of stainless steel plant, due, for instance, to the heating of stainless steel rivets in the same way as when working with mild steel. Manufacturers, however, now give very complete information on the most suitable method to adopt when using special material.

Welding Difficulties

Welding is rapidly taking its place in the fabrication of materials, the latest development being atomic hydrogen arc welding. In this, a fine jet of hydrogen is forced through an arc formed between two tungsten electrodes. The high temperature of the arc breaks the hydrogen molecules into atoms which re-combine into molecules after passing through the arc, giving up the heat absorbed during association in the arc. The welding wire is fused in this flame and deposited in the joint exactly as in a case of gas welding. The intense reducing character of this hydrogen flame results in a nearly perfect weld. Stress was laid upon the importance of the choice of suitable material when using any welding process, especially with heat resisting and corrosion resisting alloys.

Speaking of modern developments the author pointed out that as the result of research a number of new materials have appeared, particularly among the heat resisting and corrosion resisting cast irons. In 1928 the British Cast Iron Research Association introduced a series of heat resisting cast iron under the name of "Silal." These irons contain normally between 5 and 7 per cent. silicon and have a carbon content ranging between 2.8 per cent. to 1.6 per cent. When the silicon is increased beyond 10 per cent. difficulty is experienced in machining. With these irons, however, the growth is diminished considerably at temperatures between 600° and 1,000° C., and there is practically no scaling of the material on exposure to temperatures in the region of 800° C. for prolonged periods. High silicon irons, however, do not have great mechanical strength owing to the hardening influence of the silicon, and they are liable to cracking on sudden heating and cooling. To overcome these disabilities a series of alloys under the trade name of "Nicrosilal" have been developed. These irons contain about 18 per cent. nickel, 6 per cent. silicon, 2-3 per cent. chromium and up to 1 per cent. manganese, and both Silal and Nicrosilal have

been found very suitable for such parts as fire-bars, stoker links, melting pots and retorts where continual replacement due to scaling and growth is a costly item.

Training the Chemical Engineer

Coming to the place of metallurgy in the training of the chemical engineer, it was emphasised that in these times of economic stress the financial side of the training of students must be carefully considered both from the point of view of the payment of fees and the monetary value of time. In the universities and colleagues the average time spent by a student is three years and every minute of working time is fully occupied. To suggest the inclusion of another subject of study is to lead very often to friction between faculties, especially if the length of the course is maintained the same; if the course is extended then the question of extra finance has to be considered. Metallurgy, however, is of such increasing importance that some knowledge of the subject is necessary. The chemical engineer is concerned with the properties, uses, and behaviour of the metallic materials *in their uses,* rather than in their extraction. To a lesser extent he wishes to know the various methods of fabricating the materials. The study should, therefore, be confined to these divisions of metallurgy so that books on particular materials can be read intelligibly. In this country some of the schools of chemical engineering are including this subject. At King's College, London, which includes this subject in the curriculum for chemical engineers, 20 hours of lectures and 40 hours of laboratory work are devoted to this subject in one year of the course. Briefly, the syllabus deals with the chief physical and mechanical properties of metals and alloys, the general metallurgy of iron and steel and a detailed study of selected alloys. In the courses given abroad there is a very large diversity of opinion as to what extent metallurgy should be taught to the chemical engineer. Some American colleges give an enormous amount of time to the study of subjects which are of no use to the chemical engineer, whose knowledge of metallurgy should be confined to the physical side and to methods of fabricating materials, so that he can appreciate the defects in the production of these materials for his particular purpose.

Points from the Discussion

Professor W. H. MERRETT said the trouble with aluminium for some classes of chemical plant was corrosion. For instance, mercury was used in connection with the linings of some pans and the result was disastrous to the pans. He had also tried the experiment of rubbing mercury on aluminium wires and the result had been rapid growths and whiskers. The author did not refer to wrought iron, but the gas companies had recently been advocating the use of wrought iron instead of steel for tubes. The Institution of Gas Engineers had taken this matter up and it had been found that wrought iron did not corrode nearly so quickly as steel, the reason being that whereas in the case of steel the pitting went through the metal, with wrought iron there was a certain amount of corrosion but the main filaments of slag in the wrought iron stopped the corrosion going right through.

Dr. R. SELIGMAN said it would have been interesting to have heard something about the underlying causes for some of the things that happened and about the physical properties of some of the materials that had been mentioned. The question of metallic coatings was one which should be approached with a great deal of circumspection because a metallic coating, once broken down, might produce evils greater than those intended to be cured. That was the case if the metallic coating was not selected for its own intrinsic protectic advantages. In reply to the point mentioned by Professor Merrett, he said that if the aluminium pans that had been affected by mercury had contained a little copper, nothing would have happened.

Mr. W. THOMPSON said the sort of trouble the chemical plant manufacturer had was that a client would ask for quotations for plant in five different metals varying from ordinary mild steel to nickel and high nickel alloys and varying in price from £169 to £4,000 and then, not knowing what he really wanted, the client would write and ask the manufacturer's advice as to the cheapest material which could be used for the purpose to give satisfactory results. A point in connection with the use of expensive materials was the high cost of replacement but at the same time it was often cheaper to use them in the first place than to have constantly to replace a cheaper material, because sometimes this meant shutting down the plant for a week to make the replacement. Another difficulty experienced by the manufacturers was that clients would not give them their full confidence regarding the purpose for which the plant was required and then they complained if the results were not entirely satisfactory. Moreover, the user often modified the process to the disadvantage of the plant as put in originally. With regard to lead linings, an important thing was to avoid the interpolation of tin between the lining and the steel and, at the same time, to use a chemically pure lead. At the present time a lead could be obtained which was even purer than the standard laid down by British Standard Specifications.

Britain in the Forefront of Progress

Mr. S. J. TUNGAY said there had been enormous developments in metallurgy and this country had not been in any way lacking in research and development concerning the materials used in chemical engineering plant. In many respects we had been in the forefront of progress. The high silicon irons which offered such resistance to acids were developed in this country and stainless steels were very largely developed and perfected here. Moreover, in no country in the world had the development of aluminium attained such progress as here. Speaking of "Silal" and "Nicrosilal," Mr. Tungay said he was a little doubtful as to the extent to which these forms of iron would really resist mineral acids and particularly hydrochloric acid.

Mr. R. MCNAUGHT held the view that a study of metallurgy is of paramount importance to the chemical engineer, because this would go a long way to avoid the difficulties of the chemical plant manufacturer through being told only half the story when new plant was being quoted for. Speaking of special steels he complained that the manufacturers advertised them but when orders were sent in it was found there was a delay of months or even that the material was not obtainable at all. Whilst silicon irons were very difficult to cast owing to the large amount of contraction, there were very few metals that gave the corrosion resistance of silicon irons. The troubles in casting could be overcome, however, if the plant was designed in a suitable manner.

Too Much Secrecy

Mr. J. MCGREGOR, speaking of reposing confidence in the manufacturers of chemical plant, said users need have no fear that the manufacturers would divulge the details given to them. There was a tendency for a little too much secrecy as between the user and the manufacturer, whereas there should be the fullest co-operation because that was ultimately in the best interests of the user.

Dr. G. J. GREENFIELD said he had been disappointed that the author had said nothing about steels containing copper which were coming to the front as inexpensive and more or less corrosion resisting materials. Referring to monel metal and abrasion, he said he had had an experience in which monel metal screens wore out in three days, whereas a mild steel screen lasted for 10 days under abrasive conditions, but having regard to the claims made for monel metal he was inclined to think that in his particular case he had not been fortunate in obtaining the best. The variation in quality of presumably the same material was also brought home to him in the case of some antimonial lead which had resisted 95 per cent sulphuric acid for a long time. Then he moved to another works but what was supposed to be the same material obtained from the same makers was mush less successful. Finally, he asked if it were not possible for makers of special steels to give detailed information to those who welded them in order to prevent weld decay occurring and to ensure the best results being obtained.

Mr. WARD, replying to the discussion, said he was surprised that Dr. Merrett—a metallurgist—should have used mercury on aluminium. With regard to welding, the great difficulty was with copper, but experiments carried out by the Imperial Chemical Industries had shown that if de-oxidised copper was used, welding can be made satisfactorily, otherwise the small amount of copper oxide present swells and failure occurred across the weld. In reply to Dr. Greenfield he said that copper bearing steels had met with a certain amount of success but he was not aware of any information as to their use in chemical engineering.

Present Trends in the Choice of Fuels

Points for the Consideration of Fuel Users

THE Oil and Colour Chemists Association held a joint meeting with the Borough Oil and Colour Students Association at the Borough Polytechnic, London, on February 9, when a paper on "Fuel" was read by Mr. W. Carrott, president of the Borough Oil and Colour Students Association.

Mr. G. COPPING, who presided, opened the meeting with a few remarks on the practice of various official trade bodies to offer encouragement to students by awarding prizes to be competed for each year. In the paint industry the Joint Industrial Council had in recent years taken an active interest in technical education, but he thought more might be done in the matter of practical encouragement. It was all very well for the elders to stress the advantages of hard work, but the students, as much as anyone else, appreciated a little practical sympathy. If the Paint Federation offered an annual prize or prizes, to be competed for by students at all technical institutions in Britain where paint technology was taught, it would, he thought, be a step in the right direction. The cost to the Federation would be almost negligible but the effect on persevering students would be important.

Heating Problems and Local Conditions

Mr. CARROTT said that although perhaps some apology should be made for the subject of paper, inasmuch as it was not definitely one dealing with paints, oils and colours, nevertheless fuel was used in the paint industry and therefore it was to be hoped that it was a subject of some general interest in the industry. In heating propositions coal was usually thought of as the most easily obtained source of heat, but under certain circumstances it was often found that other forms of fuel had their particular application according to the conditions to be met and the chemical, physical, hygienic or economic nature of them. At the same time, there was no rule which could be advanced in favour of any one form of fuel for all purposes. Each heating problem must be handled on its merits because local conditions such as flue arrangements, available suction, and cost of fuel, all played a part in addition to the essential heat requirements of the job. If costs of heat unit were taken out for each kind of fuel it would be found that the value of 100,000 B.Th.U. or one therm was lowest for solid fuels, higher for liquid fuels, and highest for gaseous fuels. Against the higher price of the liquid and gaseous fuels, however, could be offset the advantages of ease of handling and greater efficiency of combustion. In dealing with secondary conditions, as applying to efficiency, consideration must be given to such accessories as air pre-heaters, economisers, liquid fuel regulator valves, gas governors, gas economisers and thermostatic controls.

A general survey indicated that coal was a good all-round fuel but under ordinary circumstances it burned with a low efficiency which was, however, offset by its low cost. Coke was particularly applicable where a smokeless condition is required, and where radiation is important. A liquid fuel is capable of yielding high local temperatures where needed and is much more easily controlled than solid fuel. Gas is the most easily controlled fuel and with thermostatic regulation, standard conditions of temperature can be maintained. Both oil and gas are useful for rapidly producing high temperatures, and oxidising or reducing conditions can be maintained at will. Coal, it was pointed out, is reduced in calorific value by the absorption of oxygen and at the same time loses some of its caking properties. With old coal the gas production diminishes by as much as 10 per cent. in some cases and the proportion of coke perhaps is increased due to the reduced coking properties of the coal. The capacity for absorbing oxygen is sometimes the cause of spontaneous combustion in store coal and it is therefore very well to avoid stacking coal in too great bulk. An average depth of a coal stack for safety should not be more than 13 ft., and iron pipes should be let into the mass of coal to allow of periodic temperatures being taken.

One of the advantages claimed for powdered coal is that a cheaper fuel can be used, and at the same time a higher percentage efficiency of combustion is obtained, but certain users of pulverised fuel have reverted to the more expensive coals with lower ash content in order to overcome the grit and fine ash problem. Powdered fuel can be satisfactorily used for direct firing in the furnacing of certain pigments and in works using large quantities of steam. Describing the two methods of supplying pulverised fuel, namely, directly from the disintegrator to the burner, and indirectly by flowing through mains from a storage bunker fitted from the grinding plant, the author advised prospective users to supply full data of their requirements to the plant makers and to obtain a guarantee. The advantages of the use of gas coke were set out as the production of practically no visible quantity of smoke and a much smaller quantity of invisible sulphurous gas than in the case of coal. Commenting on low temperature carbonisation coke, it was pointed out that this is a semi-coke containing an average of 10 per cent. volatile matter, but one of the difficulties in carrying on this process is the economic disposal of the rich gas. A number of plants, however, are in operation in various parts of the country, some on a commercial basis, and the view was expressed that although these plants are comparatively new and still in the development stage, there are now definite indications of the commercial success of the process. One advantage of low temperature coke is its softer nature—due to the retention of some volatile matter—which allows of much better burning and easier lighting.

In a general talk about coke burning, reference was made to the use of coke for the production of carbon dioxide for use in the carbonating of lead in the manufacture of white lead. The sulphur content of coke is usually lower than that found in coal. The fuel most comparable with coke and with which it is in the greatest competition is Welsh smokeless steam coal. A test on a Cochran boiler showed that with Welsh steam coal 7.9 lb. of water were evaporated per lb. of Welsh coal, and 8.18 lb. of water per lb. with coke, and it was added that in such a case the difference in price should make coke an acceptable proposition.

Liquid and Gaseous Fuels

Liquid fuels were divided into two groups, one for steam raising and heating, and one for internal combustion engines. Among the disadvantages which might be raised were the lack of natural supplies in England and risk of interruption of supply from abroad; the comparatively high price; and the corrosive effect on steel boiler plates of the high sulphur content in certain oils. Referring to tar oils, the author pointed out the essential differences between them and petroleum oils and shale oils; the calorific value of the former was 16,800 to 16,200 B.Th.U. per lb. as against 18,500 B.Th.U. with oil of petroleum origin. Tar oils, moreover, are usually more difficult to atomise for burning than petroleum fuel oil. For the furnacing of pigments, such as titanium white and lithopone, oil firing is eminently suitable; for varnish making and oil boiling it is becoming popular.

A final section of the paper dealt with gaseous fuels, namely, coal gas or coke oven gas, producer gas, water gas, semi-water gas and blast furnace gas. Natural gas is not available in this country except at Heathfield in Sussex, where 1,000 cu. ft. per day are obtainable. This gas, however, has a calorific value of 900 B.Th.U. per cu. ft., as against 500 to 540 B.Th.U. for coal gas, and 100 to 290 B.Th.U. for the producers type of gas. Coke oven gas has a similar calorific value to that of coal gas. Advantages of gaseous fuel, such as the absence of storage problems, smoke and ash, ease of control, etc., were stressed.

Dutch Standardisation of Natural Gums

THE Netherland Indies Society for the trade in gums has recently made a request to the Governor General for a grant for one year of 18,750 florins (£1,563 at par) to be used for standardising and conducting a systematic research on natural gums. At the end of one year it is requested that an annual subsidy of 7,500 florins (£625 at par) be made available by the Government for additional research.

Continued Progress in Fuel Research

Activities of the Fuel Research Board for 1931-32

THE Fuel Research Board, in its annual report for the year ended March 31, 1932,* states that the financial crisis that occurred in the summer of 1931 necessitated special consideration of the research programme with a view to possible reduction of expenditure. Reduced activity from this cause was therefore applied to those items which were less likely to produce immediate results of practical importance.

Evidence contained in the report shows that considerable progress is being made towards solving some of the outstanding problems of the low temperature carbonisation of coal by the use of brick retorts. An experimental brick retort has been working satisfactorily and steadily at the Fuel Research Station since November, 1930, and work is in progress on the erection of a setting of two brick retorts of the latest design and a setting of two intermittent vertical chamber ovens. The excellent results obtained with the brick retort, together with the increasing difficulty of keeping the charge moving in cast iron retorts owing to retort distortion, have now led to the abandonment of experiments in cast iron retorts. Using a medium caking coal, such as "Dalton Main," a throughput of 10 tons per day has been maintained with the brick retorts, giving a yield of coke containing approximately 9 per cent. of volatile matter, and suitable for use as a domestic fuel in open grates. Tests have also been carried out to discover the effect of carbonising wet coal taken straight from coal washeries. In these tests both medium-caking "Dalton Main" of nut size, and strongly-caking Durham run-of-mine coals were carbonised at throughputs of 8 tons and 7 tons per day respectively. A series of trials has also been carried out to see how far the brick retort was suitable for producing a satisfactory lump smokeless fuel from small coal, and what throughput could be attained with such coals. The slacks used—caking and non-caking—were all of low ash content, and some were specially washed at the station before use. They were blended when necessary. Throughputs of up to 6 tons per day were attained. No serious difficulty was encountered in working the retort satisfactorily with this small-sized coal and good smokeless fuels have been produced.

Treatment of Tar

The production of a free-burning smokeless domestic fuel is perhaps the main object of "low" temperature carbonisation, but the financial success depends, as has many times been pointed out, on the profitable disposal of all the subsidiary products, and the drop in the price of tars and oils that has occurred in recent years has a serious effect on the balance sheet of such processes. It has been shown that tars, produced at temperatures below about 800° C., can be converted in the laboratory to excellent motor spirit and Diesel oil, with the entire elimination of pitch. A comprehensive scheme is therefore in hand intended to develop such processes and to show how far they can be made an economic as well as a technical success. It is proposed to erect plant by which two separate lines of treatment of the resultant tar can be carried out. In one case the tar will be hydrogenated to produce motor spirit and heavy oils, with the elimination of pitch, in the other, the tar will be treated by fractional distillation.

The new brick retorts mentioned above will provide a range of tars of known origin with which to experiment. For hydrogenation cracking a high pressure convertor is being designed to deal with some 200 to 300 gallons of tar per day. Stills are being provided for the distillation of the crude tar or the products of treatment, as well as a refining plant for the spirit, whether obtained by scrubbing the gases, by straight distillation, or by hydrogenation.

Investigation of the chemical constituents of the tars and their possible use as a source of fine chemicals continues at the Chemical Research Laboratory at Teddington. This work has led to the identification of a large number of the chemical constituents of the tar and liquor. The study of the tars has been extended to include the influence of variations in temperature, type of coal, and type of carbonisation process on the yields of the more important constituents, or groups of constituents, in the tar. Some consideration has also been given to the technical utilisation of the low temperature tar constituents. Apart from the value of the neutral oils as fuels (motor spirits and Diesel oils), possible applications for certain of the tar products include (*a*) utilisation of the phenols as bactericides, fungicides and insecticides; (*b*) application of the phenols to the production of synthetic resins resembling bakelite and novolak; (*c*) use of the phenols as wetting-out agents in the mercerisation of cotton; and (*d*) preparation of stains and lacquers from the resinoids.

Hydrogenation Cracking Reactions

Work on the hydrogenation-cracking of low temperature tar at high temperatures and pressures has been continued in the two-litre convertors. As stated in the previous report, the tar before treatment was separated into two parts—that boiling below 230° C., and that boiling above 230° C. During the course of experiments using various forms of powdered molybdenum catalysts in the small convertors, it was found that very variable results were obtained. This has been attributed to variations in the "accessibility" of the catalyst. It was observed that in he presence of water the catalyst exhibited a more uniformly high activity than when dry topped tar was used. Thus, in actual practice, when using powdered molybdenum catalysts, more consistent results are obtained with crude tars which contain water. For this reason, and because it will probably be more economical to treat the whole tar without subjecting it to a preliminary distillation, all the subsequent work on hydrogenation-cracking of low temperature tar has been carried out with crude tar containing 2 to 3 per cent. of water.

It has since been found that the most certain method of avoiding the variable results obtained with powdered catalysts in the small convertors is to suspend the catalyst on a highly porous support such as charcoal or silica gel; in this way a large and more constant catalyst surface is presented to the reactants. In order to keep the number of variables as small as possible, all the early experiments were carried out on the same batch of low temperature tar, but to ensure that the results obtained with this particular tar were of general application, other low temperature tars were examined. A series of tars produced from different coals by various commercial processes of low temperature carbonisation have been treated, and were found to give very similar results. Thus, calculated on a volume basis, the yield of neutral spirit (boiling up to 230° C.), from 13 tars examined, only varied between 50 and 60 per cent. It may be concluded, therefore, that the process of hydrogenation-cracking is of general application to low temperature tars.

Reduction of Tar Acids

Low temperature tar, however, is a very complex mixture, and in order to elucidate the type and mechanism of the hydrogenation-cracking reactions which take place, a study of the reactions of pure compounds at high temperatures and pressures in the presence of hydrogen has been commenced. Two of the main constituents in low temperature tar are tar acids and aromatic hydrocarbons, and experiments have been carried out on substances representative of these two groups of compounds. Various hydroxy-aromatic compounds have been chosen as examples of tar acids. Other compounds, such as the cresols, are being examined, with a view to determining the relative ease with which the methyl and hydroxyl groups are eliminated. The work on aromatic hydrocarbons has, up to the present, been confined to the study of naphthalene under varying conditions. This study of the behaviour of pure compounds has already led to results of useful application. For instance, it has enabled the mechanism of the reduction of tar acids to be elucidated. This will enable conditions to be chosen for the treatment of tar acids in tar, so that the consumption of hydrogen is reduced to a minimum, or the side chain simultaneously eliminated from the high-

*"Report of the Fuel Research Board of the Department of Scientific and Industrial Research for year ended March 31, 1932." H.M. Stationery Office. Price 2s. net.

boiling tar acids with the consequent production of low-boiling hydrocarbons.

The experiments with pure aromatic compounds are also providing information concerning the conditions which are required for opening the aromatic ring and the subsequent partial or complete removal of the side chains from the compounds formed, with the production of low-boiling hydrocarbons. It has been found that certain specific organic compounds present in low temperature tar, particularly polyhydric phenols such as catechol, cause very rapid deterioration. It is possible that further study may provide means of overcoming this deterioration altogether. In addition, it has been shown that the hydrogenating power of molybdic acid or ammonium molybdate is greatly enhanced by the addition of sulphur. The influence of sulphur can be more accurately determined by experiments with pure substances than with tar.

Lubricating Oils from Tars

Viscous oils which are possible sources of lubricants may be produced from the products of the low temperature carbonisation of coal either by direct fractionation of the higher boiling neutral oils of the tar, or by the action of polymerising agents, preferably anhydrous aluminium chloride, on the unsaturated constituents of the light oils. Viscous oils may also be obtained by fractionation of the neutral oils from the product of the hydrogenation of coal, and from hydrogenated low temperature tar. Satisfactory lubricating oil, however, has not yet been produced by the direct fractionation of the neutral oils from low temperature tars produced at the Fuel Research Station. The products, even after refining, oxidise readily in air, especially at moderately raised temperatures, with the production of asphaltic and gummy substances. Very drastic refining removes the bulk of the oil, leaving only a small quantity of a paraffinic oil of poor lubricating value.

The product of the partial hydrogenation of a low temperature tar in the presence of a molybdenum catalyst has been examined as a possible source of lubricating oils. The heavier neutral oil obtained from this product was de-waxed and fractionated with steam under reduced pressure. The viscous oils obtained had a good appearance, but still possessed a slight tarry odour, and were found to be unstable when heated in air at moderate temperatures (100° to 150° C.). The quality of the oil was improved by refining with 80 per cent. sulphuric acid, which removed 12 to 20 per cent. of the oil. A quantity of the refined oil was prepared and submitted to an engine test. Its performance, unfortunately, was unsatisfactory, and it appears therefore that in order to produce a high quality lubricating oil from these products they must be made more stable. Attempts are being made to hydrogenate these oils further under conditions which avoid cracking, and some improvement has already been effected by this means.

Hydrogenation of Coal

The hydrogenation of coal is effected by subjecting it to a temperature of about 450° C. in an atmosphere of hydrogen at a pressure of some 200 atmospheres. The result is that a large portion of the coal substance is converted to a liquid, and by this method a greater proportion of motor spirit and fuel oil can be obtained from the coal than by any other means. Imperial Chemical Industries, Ltd., have developed the process, originally suggested by Dr. Bergius, and have worked a plant dealing with 10-15 tons of coal a day. Available experience shows that the process is perfectly feasible to work on a large scale, and that an appreciable proportion of the motor spirit used in this country could be made from coal. It is clear, however, that the cost of production from coal would be considerably above the present import prices of petroleum products.

The effect of a large number of catalysts upon the hydrogenation of a particular coal, Beamshaw (Yorkshire), has been studied in 2-litre gas-heated convertors. This coal was chosen because the ash could be reduced readily to 1.2 per cent., and in this work it was desirable to avoid as far as possible the catalytic effect of the inorganic constituents. The proportion of catalyst added in the earlier experiments was 2.5 per cent. of the coal, but, with the discovery of more active substances, this has been progressively reduced until 0.1 per cent., or less, is commonly employed. The convertors were heated to the reaction temperature of 450° C. at a very slow rate: 3° per minute up to 270° C. and then 1½° per minute from 270° C. to 450° C. They were then maintained at 450° C. for two hours. The effect produced by adding a small proportion of titania to iron oxide is particularly important, in view of the fact that luxmasse, as used by Bergius in his process, contained iron oxide and titania in the proportion used in these experiments. The activity of luxmasse is, therefore, presumably due to the association of these oxides, since neither iron oxide nor titania by itself is a good catalyst. Compounds of tin also appeared particularly active, and this activity was shared by other members of the same group of the periodic system, *viz.*, germanium and lead. Thus the idea, long held, that the inorganic constituents of the coal are of great importance in coal hydrogenation receives confirmation, and work has been commenced to study their effect in more detail. Spectroscopic examination of Beamshaw ash has indicated the presence of appreciable quantities of many catalytic substances.

During the course of the year, further progress has also been made with the modified hydrogenation process, in which a stream of hydrogen under pressure passes over coal, maintained at 430° C. in the absence of any pasting medium. These experiments are still being carried out in the reaction vessels of the old Bergius plant. Arrangements were made so that the hydrogen proceeding from the vessel containing the coal passed directly into another vessel in which was supported a catalyst maintained at 450° C. The oil vapours, together with the hydrogen, were thus submitted to a further treatment, and on condensation yielded a pale brown, very limpid product, of which 85 per cent. was volatile below 230° C. The yield of spirit, boiling point up to 230° C., from this test amounted to 140 gallons per ton of dry ash-free coal.

Pulverised Fuel

The report also records progress in the development of more efficient burners for use with pulverised fuel. Successful results have been obtained with a burner so constructed that a mixture of primary air and fuel issues through a "grid" in a series of thin layers, between which are supplied layers of secondary air, preferably preheated. Tests indicate that this burner has a wide range of loads and is flexible in operation. Meanwhile, a complete departure from existing methods of burning powdered coal is made in the "vortex" combustion chamber under development at the Fuel Research Station. Here an attempt is made, for the first time, to control the motion of both the fuel particles and the air required for their combustion, in order to obtain the relative motion requisite for rapid combustion in a small space. It is also hoped by this means to deal with fuel of a coarser nature than that usually required for powdered fuel firing. The chamber takes the form of a shallow cylinder with a relatively small axial outlet. Air is introduced tangentially at the circumference, and travels to the central orifice with a combined rotary and inward radial motion, *i.e.*, it forms a spiral vortex. Fuel, carried by a limited quantity of primary air, is introduced into this vortex and speedily acquires a velocity approaching that of the air. And individual fuel particle is therefore subject to a tendency to be thrown outward by centrifugal force, but it also tends to be carried inwards as a result of the radial inward component of the velocity of the air. By choosing suitable dimensions for the chamber these two opposing tendencies can be balanced, with the result that the particles travel in circles the radii of which are determined by, *inter alia*, the size and density of the particles and the velocity, temperature, and viscosity of the air. The effect thus obtained is equivalent to a cylindrical stationary fuel bed through which air travels from the outside to the centre.

Alcohol Distillation from Maize

It is stated that the Southern Rhodesia Government has been approached by the promoters of a scheme to distil power alcohol from maize. Negotiations are proceeding with a group of London business men, but difficulty has arisen over the price to be paid to the grower, who would have to be given a long contract. The Government has offered a duty rebate of 3d. per gallon on petrol mixed with the spirit in a proportion of four gallons petrol to one of power alcohol.

Minimising the Nuisance from Boiler Flue Gases

The Problem of Removing Dust and Sulphur Fumes

THE problem of eliminating dust and sulphur from boiler flue gases was dealt with by H. E. Wallsom, B.Sc., in a paper read before a joint meeting of the Institute of Fuel with the Society of Chemical Industry, at Bristol University, on February 2.

General methods which are available for minimising the flue dust problem, other than by the use of collecting apparatus, are three in number. In the first place, by pre-treatment of the coal the average ash content of coal burnt in power stations could be reduced from the present 15 per cent., probably to less than 6 or 7 per cent. At the same time, the pyrites may be almost entirely eliminated from coal by cleaning, and the sulphur content reduced by as much as 80 per cent.

In the second place Professor Travers considers that much good might result from a correct design of chimney mouth. For instance, on the Continent and in the United States, where the average degree of humidity of the atmosphere is much less than in England, it has been found that in many cases the sulphur, and, to a lesser extent, the dust problem, may often be overcome if the height of the chimneys is sufficient. If flue gases, at temperatures of up to about 150° F. in excess of that of the atmosphere, are discharged at a sufficient elevation, the effect of the eddy currents in the lower air will be modified, the sulphur fumes will be perfectly diffused, and the dust will settle over so wide a radius that its effect would not be appreciable. Thirdly, suitable design of boilers can be put forward as a remedy, for experience has shown that with corner firing a turbulence is produced in the combustion chamber, and this is the effect which, in a cyclone collector, causes the heavier dust particles to settle in the ash pit. Dust collecting systems are of three main types:—(a) electrical precipitators; (b) centrifugal collectors; and (c) washing apparatus.

Electrical Precipitators

Electrical procipitation was first applied practically by Sir Oliver Lodge, whose work was subsequently duplicated collaterally by Cottrell in America and by Möller in Germany. The principles of electrical precipitation, as applied by Lodge-Cottrell, Ltd., and the Continental and American companies in association with them, is that the dust-laden gas is made to pass through pipes or between plates, which act as the collector electrodes and which are earthed. Suspended in the centre of the pipes, or between the plates, is a series of discharge electrodes, consisting of wires or rods, with discharge points, and which are maintained at a high positive potential of 60/70,000 volts. A brush discharge takes place, and the wires can be seen to glow, and are surrounded with a corona. The solid particles thereby become ionised, and move toward the postive or collector electrodes, where they give up their charge, and thus fall by gravity into hoppers, or if they tend to adhere to the electrodes, these are rapped by automatic hammers to cause the accumulated dust to fall.

Electro-filters are usually installed on the suction side of the induced draught fans, and thus the serious problem of erosion of the fan blades by the dust particles does not arise. The dust is recovered in a dry condition, and in selected instances a ready market has been found for this material in several industries. If the velocity of the gas passing through electro-filters is reduced to about 6 ft. per second, this type of apparatus is, by itself, the most efficient in the elimination of dust from flue gas.

With an electrofilter, efficiency operated, there is no visible emission from the stack. An efficiency of dust extraction of 94 to 98 per cent. is possible with this type of apparatus, but 90.5 per cent. may be considered as an average figure.

Centrifugal Collectors

Basically, the principle of this type of apparatus is that the dust-laden gases have imparted to them a rotary motion, generally by admitting them tangentially into a cylindrical chamber. The gases are forced out to the periphery of the collector by a mushroom plate, or if tangential injection is not used, the same vortex action is produced by vanes fixed in the annular space between the mushroom plate and the shell of the collector. Here a true spiral vortex produces a high velocity flow without turbulence, and the efficiency of separation of dust increases proportionally with the particle size. It has been shown that the presence of large particles causes the smaller particles to be separated probably by a trapping action.

Centrifugal collectors can be installed either on the suction or on the discharge side of the fans, the former being, of course, a preferable arrangement, on account of the erosion of the fan blades by dust. Davidson and Co., Ltd., who are well known in the field of centrifugal collectors, advise that the dust removal should be accomplished in two stages; the centrifugal action in the first stage concentrating the dust at the walls of the unit, and the heavily dust-laden gas thus produced being further treated in a second unit.

Dust Removal by Washing

Any discussion of the washing of flue gases should rightly be dealt with under two separate headings, the elimination of dust, and the elimination of sulphur. Since the removal of sulphur is to be further mentioned, the dust will be first considered.

At its inception, the washing of the flue gas was attempted by means of sprays situated in the chimney. The gases thus had to pass contra-flow to a curtain of finely divided water particles, and whilst the results obtained were, to some degree, satisfactory in preventing the wholesale dissemination of dust, it was found that the high velocity of the gases resulted in the carrying upward in the chimney of the smallest water and dust particles. These were then deposited in the form of a muddy rain in the immediate neighbourhood of the power station. Some of this wetted dust would would also adhere to the inside of the chimney, and periodically aggregations of this material would drop back. Further developments were made by the use of staggered vertical rows of hollow baffles, down which water flowed, placed in the path of the gases. This is the principle of the Modave washer where the baffles are rectangular, the faces being concave. The water from a supply tank overflows from the follow baffles, which are water-sealed at the bottom in order to retain a surface film of water. The efficiency of this type of apparatus is proportional to the number of rows of baffles used; six rows being usually employed. The water requirements are 2 to 3 gallons per 1,000 cu. ft. of gas; the quantity varying with the length of the elements and the number of rows of baffles.

A Two-Stage Process

The Underfeed Stoker Co., Ltd., has developed a two-stage washing process in which the primary stage consists of atomising sprays, followed by sprays produced by the impinging of jets of water against flat plates, and a secondary stage of rows of staggered V-shaped baffles down which a constant supply of water is flowed. Following the path of the gases through a washer of this type, it will be seen that, in passing through the atomising sprays, they will first absorb water vapour. They thus become cooled below the dew point, and when the evaporated water is recondensed some of the dust is deposited with it. The secondary sprays further baffle and wash the gas, leaving the baffles the onus of the removal of a thoroughly wetted dust. Since the velocity of the gases is suitably reduced in their passage through the washing chambers, it is reasonable to assume that all but the smallest particles of dust become wetted and deposited, and therefore the dust escaping to the atmosphere is dry and will not be deposited in the form of a dirty rain. Actual practice confirms the truth of this assumption, and long period tests have shown that the efficiency of removal of dust by this type of apparatus to be about 75 per cent., even when dealing with the whole of the dust leaving the combustion chamber.

The principal difficulty inherent to the operation of all flue-gas washing systems is the disposal of dust slurry produced. This problem has ben solved very satisfactorily by Mining and Industrial Equipment, Ltd., with a process of

thickening and filtering the slurry. The slurry containing, as an average, 3 to 5 per cent. of solids is fed to a central distribution box of a thickener tank. From this water is overflowed carrying less than 20 parts of suspended matter per 100,000, whilst slurry thickened to about 40 per cent. by weight is removed by a scraping device, and delivered to a rotary vacuum filter. A clear filtrate is recovered, and the residue, which is associated with 20 to 30 per cent. of moisture, is capable of being disposed of with greater ease than dust obtained by dry collection systems.

The Sulphur Removal Problem

In a paper read before the Third International Conference on Bituminous Coal, at Pittsburgh in 1931, H. F. Johnstone dealt very thoroughly with the theory of the removal of sulphur by washing the flue gases, and gave a summary of results obtained when catalysts were used to accelerate the action.

Presupposing efficient combustion, practically the whole amount of sulphur present in the raw coal passes in the gaseous state to the stack. In practice the ash will retain some combustible material, and thus some sulphur, and the gaseous sulphur compounds passing to the stack will be equivalent to from 70 to 95 per cent. of the sulphur in the coal. The exact amount of sulphur compounds present in the gas is difficult to determine with accuracy, but assuming a concentration in flue gases of 0.3 per cent., sulphur dioxide is soluble in water at 80° F. to the extent of 5.8 lb. per 1,000 gal., which is much less than the saturation quantity. On this basis all the sulphur dioxide evolved by the burning of one ton of coal, having a sulphur content of 1.5 per cent., could be absorbed by 11,600 gal. of water, which is a figure to bear in mind for further consideration.

Incidental recovery of sulphur compounds is the principal disadvantage of all flue gas washing systems, particularly when the water has to be re-circulated. Unless the sulphur compounds emitted from the chimney will definitely cause a nuisance, it is the aim of washing systems to collect only the minimum possible amount of these. When water enters the washing chamber its alkalinity, *i.e.*, temporary hardness, is first neutralised; further sulphur compounds then dissolve, and the effluent leaves the washers in a slightly acid condition. After a short period of contact the acid is neutralised by the alkaline constituents of the flue dust, principally with the formation of calcium salts. If the dust be removed and the water re-circulated its acid content increases, for the reasons that the initial alkalinity of the entering water is less, and the low solubility of calcium sulphate precludes the further formation of this compound to the original extent. The sulphur is present in the washing water almost entirely as sulphates, although sulphur may be removed to an extent in excess of the 2 to 3 per cent. of sulphur trioxide, which it is assumed is formed; and with recirculating systems the concentration of sulphuric acid soon reaches a maximum of approximately 0.2 grams per litre, *i.e.*, 20 parts per 100,000.

Investigations for Battersea Power Station

In connection with the erection of the Battersea Power Station, much investigation on the treatment of sulphur fumes has been carried out by the London Power Co., Ltd., and their advisers, the results of which have been published in the Ministry of Transport white papers, No. 3442 and 3714. In the very complete investigations carried out, gas was passed through a vertical cylindrical absorption tower, contraflow to a current of water, entering the chamber through a series of nozzle sprays. The tower was packed, at times, with spiral absorption rings, and in a further series of tests the possible catalytic effect of iron was eliminated by coating with cement the iron parts of the tower, and using pottery absorption rings. Summarised briefly, the results obtained show (1) the amount of cold water necessary to bring about the solution of approximately 90 per cent. of the sulphur compounds in the gases was about 30 tons per 1 ton of coal burnt, varying slightly according to, but not proportionately to, the sulphur content of the coal; (2) a contact time of at least 7 secs. is necessary to attain the 90 per cent. efficiency; (3) the amount of wash water required is considerably decreased by the use of water heated to 145° F.; and (4) iron has a definite catalytic effect.

The disposal of the settled or filtered effluent from washing chambers need not be a disadvantage of this type of system. Even if the water is faintly acid, the slight acidity is soon neutralised by the addition of the effluent to, say, the condensing water. The extra amount of dissolved solids present in this mixed effluent cannot reasonably be considered objectionable when the water is returned to a river or canal.

The use of alkaline solution to neutralise acid gases is well-known, but in the case of flue gases the cost of chemicals would preclude the general adoption of this method. It has been shown, in connection with the experimental work carried out for the Battersea Power Station, that the use of sodium carbonate greatly increased the efficiency of the elimination of sulphur and necessitated a much smaller quantity of water, the time of contact remaining constant. The committee, presided over by the Government Chemist, which reported upon this experimental work, states that soda ash would not, however, be used on account of its excessive cost, and that milk of lime would be substituted. Whatever alkali is to be used, the recovery of the product of the reaction is an impossibility, on account of its dilution and its association with other salts, and the total cost of the alkali must be debited against the process. If sulphur dioxide could be reduced catalytically to free sulphur, and this material could be recoverable as a by-product, the problem of acid corrosion would cease to exist.

Oxidation of the Sulphur

It has now been definitely established that the capacity of water for absorbing sulphur dioxide may be greatly increased by ensuring its contact with the dissolved oxygen from the flue gases, in conjunction with catalysts. The use of catalysts in this particular reaction is well established, and processes for the use of copper sulphate, and salts of manganese, iron and tin are patented. H. F. Johnstone has summarised the conclusions arrived at in connection with experimental work carried out along these lines. Iron and manganese salts possess a strong catalytic action which remains unimpaired by moderate concentrations of acid, and there exists an optimum concentration of catalysts above which the catalysis decreases, the concentrations being approximately 1.2 per cent. of iron and 0.025 per cent. manganese. Using manganese salts, 5,400 cu. ft. of gas containing 0.325 per cent. of sulphur dioxide, were washed at an average efficiency of 92.2 per cent. with one gallon of water; the efficiency had then fallen to 30 per cent., and the concentration of sulphuric acid risen to 45.5 per cent. At the optimum catalyst concentration, an increase in temperature resulted in a decrease of the acid concentration at which the efficiency fell. Catalytic action may be inhibited by compounds such as phenols, which have been proved to exist, as unburnt coal tar constituents, to a concentration of five parts per million in flue gases. Salts of copper and tin have this same effect, and whilst with concentrations of less than 0.2 per cent. sulphuretted hydrogen is without effect, above that concentration complete inhibition occurs.

Choice of Plant

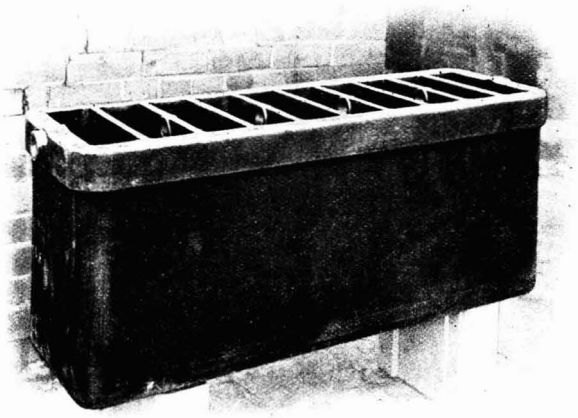
Summarising the available information, the author pointed out that the choice of plant must be governed by (a) location of plant; (b) characteristics of the coal, the emission of dust and sulphur fumes being minimised by the choice of suitable coals; (c) disposal of refuse; (d) the degree of dust concentration; (e) availability of water supplies. Other things being equal, the facility with which large quantities of water may be obtained and disposed of, must probably be the deciding factor in the choice of electric or wet processes. Considering their comparatively low initial cost, wet systems will give the highest degree of commercial efficiency. Centrifugal collectors, whilst they definitely alleviate the trouble, are not so efficient as other systems. With electrical and wet systems it is desirable that velocity of the flue gases should be reduced to 6 ft. per second, to ensure the retention of the finer dust particles. In wet systems, especially where re-circulation is necessary, the use of unprotected steelwork is undesirable, on account of acid corrosion, and it may be advisable to increase the gas velocity through the system in order that this trouble should be minimised. The velocity of gases in the stack, however, should be sufficiently great to prevent the collection of wetted dust from washing systems at the top of the stack, or its deposition on roofs. Where wet washing is favoured the use of lead lining for washing chambers and stacks is preferable, rather than concrete, as this material is liable to rapid deterioration by acid action.

Chemical Stoneware

Activities of the Hathern Station Brick and Terra Cotta Co.

THE history of Hathern chemical stoneware goes back to the early days of the war, when this country's pressing need for chemicals demanded stoneware for plant used in the manufacture of acids and explosives. The old-established firm, Hathern Station Brick and Terra Cotta Co., Ltd., at Loughborough, with their wide experience of clay products and glazes, gave the authorities valuable help in this direction, and at a moment's notice the whole works were turned over to the making of stoneware for Government factories and chemical works.

After the end of the war, the demand for the company's products naturally diminished and the bulk of the trade was again supplied by the Continental makers. The Hathern works, however, still continued progressing with the object of producing stoneware that would meet the most exacting demands of the chemical and chemical using industries. The advent of protection for British industries has now given a welcome impetus to the efforts of the firm, and resulting orders have enabled them to carry out an extensive programme of research. By the installation of special machinery, careful selection and blending of the raw materials, and by many years' practice in methods of drying and firing, Hathern chemical stoneware is now one of the foremost productions in this line. Great improvements have been effected in corrosion- and temperature-resisting properties, whilst the latest product of the firm is practically non-porous. The characteristics claimed are not dependent upon the glazes which are applied; they are due to the body of the stoneware, resulting from the natural properties of the clays used and the special preparation which they receive in manufacture.



Hathern Chemical Stoneware Partition Tank or Cell.

It is not to be expected that one type of body will meet all requirements, and Hathern stoneware is therefore made in several grades to withstand varying conditions of corrosion and temperature. This enables separate consideration for the particular requirements of each user. The company realise that it is only by co-operation with the users that they will be able still further to develop this important industry, and it will be eventually to the benefit of all British chemical manufacturers to investigate the uses of Hathern stoneware, especially as the prices compare favourably with those for the imported goods.

Vessels of circular cross-section are more convenient to manufacture as compared with rectangular shapes, as they are distorted least by the strain of contraction during the drying and firing operations. The accompanying illustration, however, shows a difficult piece of moulding which has been accomplished successfully. The actual firing operation also calls for considerable judgment on the part of the kiln man, as the water which remains in the unburned clay must be driven off slowly. Added to this the intensity of temperature in the kiln has to be taken into consideration, for wares of various sizes and wall thickness, whilst it becomes necessary to regulate the admission of cooling air so that conditions are correct for producing a body of the maximum degree of toughness and imperviousness. The ultimate soundness of the ware depends to no small degree upon the precautions which are adopted in cooling it after removal from the kiln.

Hathern chemical stoneware is now made in a great variety of forms, such as nitrating vessels, evaporating pans, absorption towers, pressure vessels, acid eggs, stills, receivers, and condensing and cooling coils. For the storage of acids, stoneware vessels have many advantages. Where sulphuric acid is stored in lead-lined tanks any desired increase in storage capacity usually necessitates the installation of a much larger tank than is actually needed at the moment, but with the adoption of stoneware vessels storage capacity can be increased in small increments of 100 to 200 gallons. Such a storage plant consists of a number of vessels interconnected by syphon pipes, so that the acid can be put into the vessels and distributed as required without difficulty. Whilst lead lined tanks are often loathe to develop leaks, this contingency is quite absent in the case of a stoneware vessel. Stoneware towers have unlimited applicability where gases, at or near normal pressure, have to be brought into contact with liquids. It is false economy to build such towers from lengths of sewer pipe as the initial cost, together with periodical replacements which are invariably necessary, is no lower than that of a tower specially designed for dealing with absorption problems. The walls of such towers must be sufficiently thick to provide the necessary mechanical strength for resisting the weight and side thrust of the packing material which provides scrubbing surface for gas and liquid; on the other hand, where used for the absorption of hydrochloric acid or for the recovery of nitric acid, the walls of such towers must be sufficiently thin to permit the radiation of heat. Towers of various designs are also used for absorption purposes, chiefly in the manufacture of hydrochloric acid, or in the recovery of hydrochloric acid where obtained as a by-product.

Opening of the British Industries Fair

The Duke of York's Visit to Birmingham

THE high prestige the Fair enjoys to-day is largely due to the atmosphere of sustained co-operative effort. Especially in the eyes of overseas buyers the Fair represents not one industry nor one group of industries, nor mere groupings. It represents the industrial resources and activities of the nation.—The Duke of York at the opening of the Birmingham section of the British Industries Fair, on February 20.

THE British Industries Fair opened successfully on Monday at Olympia and the White City, London, and Castle Bromwich, Birmingham, and will be continued until March 3. The Duke of York opened the heavy industries section at Castle Bromwich, the Duchess of York visited the White City, and the Prince of Wales was the principal speaker at the usual banquet held at the Mansion House, London, to celebrate the opening of the Fair. The spirit of this year's effort was well summed up by the Prince. "Conditions to-day call more and more imperatively for co-ordination of effort," he said. "It is not enough that some of our major industries should set up organisations and combinations with a purpose of increasing sales; every industry in the country, big or little, should examine its organisation and see what alterations may be necessary in order to steer successfully through the changes that are taking place all the time in world conditions. The opporunity is at our door. There is a growing feeling of confidence. It has its main origin, I think, in the realisation that throughout the world there is increasing evidence not only of the desire to work for the long-delayed revival in world trade, but the intention to bring it about. We feel in this country of ours that we are building strongly for the future—for our own trade, and for world trade. The dogged determination which has enabled this Fair, amid so many difficulties, to grow from strength to strength; the courage and enterprise which its success denotes; these are surely favourable auguries for the future."

The official chemical industry section is at Olympia, and its principal features were described in THE CHEMICAL AGE last week. The Birmingham section also comprises many items of interest to the chemical and allied trades. The permanent buildings at Castle Bromwich provide a total exhibiting space of approximately 250,000 sq. ft. This is more than three times the space occupied in 1920. There are seven miles of stand frontage. The Fair buildings, under one roof, cover thirteen acres, standing in fifty acres of grounds, and this year a substantial addition has been made to the space allotted for exhibits outside the hall. The number of exhibitors is 1,042.

A novel feature of the Fair is the use of passenger carrying vehicles propelled by compressed coal gas provided by the Birmingham Tramways and Omnibus Department in collaboration with the Birmingham Gas Department. The filling station consists of a Belliss and Morcom 4-stage compressor, which is housed on the stand of Belliss and Morcom at the Fair, this being electrically driven and supplying gas at 5,000 lb. per sq. in. into storage receivers placed at a convenient point near one of the main roadways encircling the exhibition premises. The five storage containers are manufactured by the Chesterfield Tube Co., Ltd., each having a free gas capacity of approximately 1,650 cu. ft. at a working pressure of 5,000 lb. per sq. in., these five storage cylinders being connected in parallel and supplying vehicles at a working pressure of 3,000 lb. per sq. in., through automatic charging valves manufactured by Belliss and Morcom, Ltd.

The Duke of York made a tour of the Birmingham Fair. On the Bakelite stand he showed a keen interest in golf clubs with Bakelite heads, and at the British Oxygen Co.'s stand he watched metal spraying processes. From Sir Martin Melvin the Duke accepted a small statue of the Venus de Milo, on the understanding that it would be sprayed in bronze and forwarded to Princess Elizabeth.

Some of the Stands at Castle Bromwich

ASBESTOS Cement Building Products, Ltd., have a full display, on Stand No. 11 D/1, of "Everite" asbestos cement flue pipes and fittings for use with gas-fired appliances of all types. A large number of adaptors can be seen, these being specially made for many proprietary gas appliances in addition to the latest types of baffles, cowls and other anti-down draught devices. In addition to the range of flues for gas-fired appliances, a heavier range of material is also shown for slow combustion stoves, this being somewhat thicker in the wall, to prevent the possibility of any chilling in the flue, which might tend to check the smooth upward flow of the products of combustion. Various large diameter pipes and fittings are also shown up to 48 in. diameter, these being used in connection with industrial applications of gas and also for ventilating shafts. In construction of the stand this firm has incorporated many other materials which are now manufactured by them including "Turnall" asbestos wallboard, "Turnall" oak-grained asbestos panels, "Turnall" stipple-glaze decorated sheets and an item which has caused great interest amongst housing authorities, the "Everite" asbestos-cement draining board.

Atlas Preservative Co., Ltd.

THIS firm's exhibit is one of interest to those concerned with the economic upkeep of plant, buildings and equipment constructed of iron and steel or timber. Their stand is No. 17 L/1, and is given over to the display of mechanical and other scale models of typical structures treated with "Atlas Ruskilla" iron and steel preservative paint. It is claimed that this material will stand up to conditions which would render ordinary paints too short-lived to prove profitable. It forms a tough covering which resists the attacks of acid and alkaline fumes, steam, moisture and exposure to weather. An exhibit which attracts the attention of those resident overseas is "Atlas A" wood preservative, which renders any class of timber immune from attacks by insects, fungi and rot; it hardens the timber and makes it highly fire-resistive. It is simple to use and extremely economical.

Autocontrol Boilers, Ltd.

ON Stand No. 12 B/1 "Vesta" gas fired boilers are being exhibited by the proprietors, Autocontrol Boilers, Ltd. The "Vesta" boiler employs a new process of burning gas. A perfect mixture of gas and air is obtained by fixed air and fixed gas settings and burned under reduced pressure conditions in a special furnace, resulting in a flame temperature of 2,800° F. No free air or oxygen is admitted, therefore combustion conditions are always positive and perfect irrespective of climatic conditions. "Vesta" boilers are controlled by a thermostat in the case of hot water boilers and by an electric connection in the pressure gauge in the case of steam boilers. The thermostat can be fixed at a distance or in the return water-way.

W. and T. Avery, Ltd.

THIS year Avery's are exhibiting a number of working exhibits, on Stand No. 17 G/1. Machines shown for the first time include a new visible indicating universal testing machine, a dual-ratio counting machine and a new electrically illuminated visible weigher for retail shopkeepers. An industrial visible weigher is shown installed in a roller conveyor system and a visible self-indicating hopper scale is erected so that demonstrations can be given. Another continuous working exhibit is the Avery automatic grain weigher complete with elevator. This type of machine is used in flour mills and granaries throughout the world. Similar types are made for handling coal, pulverised fuel, chemicals, fertilisers and any dry free-running material. No operator is required in connection with these machines, which work continuously, being operated by the material flowing under gravity. Counting machines are represented by a unit count machine which weighs, counts and computes. Other exhibits

include a gravitometer for ascertaining quickly the specific gravity of liquids (a similar apparatus is available for ascertain the specific gravity of solid bodies), a modern petrol pump of the meter type; and a batch mixing machine.

Babcock and Wilcox, Ltd.

AN outstanding exhibit at Stand No. 16 K is a complete single pass Babcock and Wilcox superheater with flash welded tubes. This superheater is designed for a final steam pressure of 385 lb. per sq. in. and to deliver 228,000 lb. of steam per hour at a final temperature of 710° F. This is similar to the superheaters installed at Ham's Hall Power Station with the Babcock and Wilcox boilers, and a constant final steam temperature is maintained over a very wide range of load, *i.e.*, from below 80,000 lb. per hour to above 240,000 lb. per hour. Another outstanding exhibit is a working installation of the Babcock and Wilcox patent gravity bucket conveyor which is employed where the material to be handled is required to be elevated as well as conveyed in a horizontal direction. The material is fed into the buckets by means of a rotary type filler which comprises a cast iron hollow drum having five discharge openings corresponding to the conveyor buckets. The drum is mounted on a shaft and is rotated by double driving sprockets which engage with the studs of the conveyor chain. The ladders and gantries surrounding both the above exhibits are of Babcock and Wilcox interlock flooring. The storage system of pulverised fuel firing is represented by the exhibit of a Bailey feeder. This feeder is almost proof against flooding, and can feed pulverised coal in spite of, comparatively speaking, exceedingly high moisture content.

Bakelite, Ltd.

THE exhibit of Bakelite, Ltd., on Stand No. 20L/4, emphasises the use of Bakelite synthetic resin products with a comprehensive display of actual applications in a variety of industries. The exhibit comprises the following products:—Mouldings produced from Bakelite moulding materials, Bakelite laminated sheets, tubes and rods, Bakelite silent gear material, Bakelite insulating varnish, Bakelite lacquers, Bakelite oil soluble resins and varnishes made therefrom. A feature is the demonstrative display of the special new types of Bakelite moulding materials produced to give specific properties, such as high impact strengths, low dielectric losses, resistance to moisture, non-bleeding, non-blistering, etc. The use of these materials is broadening the field of applications for synthetic products and instances of novel application are shown. Situated in the centre of this stand there is a specially designed room showing how Bakelite materials are used as a modern decorative medium. Bakelite resin for the paint and varnish industry is receiving special attention. These new products present an entirely new scope for synthetic resin products.

Bellis and Morcom, Ltd.

THIS firm is exhibiting plant on Stand No. 18 G/2. Their latest development shown is a Diesel engine which has an output of 200 b.h.p. at 600 revolutions per minute. It is of monobloc design, being totally enclosed. One of its main features is the ease with which it is controlled, the system being absolutely fool-proof. The engine is direct coupled to a d.c. generator, but it is equally suitable for alternator or any other form of drive, and may be employed for both land and marine purposes. Another exhibit is a high pressure gas compressor as supplied to a number of centres in connection with gas traction. The compressor is used for charging the bottles which contain the gas at 3,000 lb. per sq. in., these bottles taking the place of the petrol tank now normally in use. An air compressor is being exhibited, and is typically representative of their reciprocating design, having an output of 350 cu. ft. of free air per minute. The valves employed are of the Rogler-Hœrbiger type, and are situated at the side of each cylinder where they are easily accessible. The output of the compressor is automatically controlled by a double beat valve on the intake, being operated by the pressure in the delivery.

Birmingham Battery and Metal Co., Ltd.

THE exhibit of this firm (Stand No. 16 H/1) is similar in most respects to the design of last year. As before it is constructed entirely from the firm's own productions. In front of the stand are large seamless copper and brass tubes of 6 in., 12 in. and 18 in. inside diameter such as are used for steam pipes and other engineering purposes, also for rollers in the paper and textile trades. There are six pillars, two of which consist of B.B. special finish copper housing pipes for water and heating purposes, whilst the other four are columns of cupro-nickel condenser tubes in 70/30 and 80/20 alloys, and aluminium-brass condenser tubes. The facia, round the front and sides of the stand, is of B.B. gilding metal. Other exhibits are B.B. brass and copper tubes in various lengths, and panels of copper, brass, phosphor bronze and gilding metal. On the main floor of the stand are exhibits comprising condenser tubes in 70/30 and 70/29/1 alloys, superheater tubes in solid copper and steel (copper coated), phosphor-bronze sheet for the paper trades, etc., condenser plates and ferrules for marine and land heating, ingots in copper and various brass alloys, compression joints for domestic heating, and special refrigerator tube in copper.

Frederick Braby and Co., Ltd.

ONE of the outstanding features of Braby's stand (No. 19 C), is the exhibit of mild steel drums. For many years past, this trade has been largely in the hands of Continental manufacturers, but during the last few years this firm has specialised in these goods. Among the various types of drums shown are returnable steel drums, *i.e.*, drums intended and designed to withstand journeys; "the one-time-shipper" or non-returnable drum, which is used by the oil and chemical trade particularly, and is exported to all parts of the world; and the open ended type of steel drum. In the main they are used by manufacturers of grease, fats, powders and other materials of similar consistency. This type of container can either be made in the light one-time-shipper style or alternatively in the heavy returnable type. Owing to the satisfactory service this class of drum gives, it is now being adopted by many manufacturers. Other exhibits include steel storage bins, lockers, tanks, air receivers, perforated metals, and small samples of black and galvanised sheets, "Venteolite" sheeting, metal-plywood and examples of Braby's "Eclipse" aluminium hollow-ware. An exhibit shown for the first time is the "Braby" pressed steel low temperature electric radiant heating panel.

British Commercial Gas Association

THE joint industrial exhibit, on Stand No. 11 B is a new feature of the Gas Industries Section and has been arranged by the British Commercial Gas Association and a number of leading gas undertakers. The exhibit includes a wide range of gas-fired equipment for industrial processes. Manufacturers are able to see working apparatus of all kinds either in miniature or full-scale models. There are oven furnaces for the heat treatment of steel and non-ferrous metals; a thermostatically controlled Bakelite moulding press with the latest type of low pressure gas heating equipment; a special furnace for the heating of billets for hot stamping; and samples of low pressure gas-heated soldering iron stoves. These are all shown working. Suitable pyrometer apparatus is also shown. Other apparatus includes a range of gas-fired furnaces, soldering stoves, large and small, automatic air heaters for use in factories and workshops and a small steam raising boiler. An interesting exhibit is a small melting furnace with a maximum gas consumption of 150 cu. ft. per hour and a maximum temperature of 1,600° C. An air valve controls the burner and the mixture of gas and air remains constant at all settings. Another is the gas and air blast forge furnace for rapid heating of steel forgings. Both gas and air are under separate valve control and a high combustion efficiency can be obtained. The rise in temperature of the furnace is rapid owing to the efficient combustion system used, and the possibility of use of excess gas with this system of combustion eliminates the scale formation due to flow of air.

British Road Tar Association

THE stand of the British Road Tar Association (No. 20 F) consists of a cinema theatre, accommodating 45 people, in which the Association's industrial and general interest talking films entitled "Coal Mine to Road" and "The Highway" are being exhibited. The first film shows that tar is an all British material, the production and utilisation of which gives

employment to hundreds of thousands of workers throughout the country. The general interest film, "The Highway," which is being shown for the first time to the public during the Fair, traces the development of roads and shows the progress that has been brought about by the use of tar.

British Thomson-Houston Co., Ltd.

THE British Thomson-Houston Co.'s stand (No. 20 J/1) is lit by over 600 standard Mazda lamps, and approximately half of the stand is devoted to Mazda lamp exhibits, and half to other B.T.H. electrical products. Among the latter are a few of the latest developments in B.T.H. electrical plant apparatus for all concerned in industry and commerce. One of the exhibits is a B.T.H. variable speed A.C. (shunt characteristic) commutator motor, with push button control and speed indicator on pedestal. This motor is in operation under the control of visitors. A range of B.T.H. fractional h.p. motors, including seven sizes (from 1/100th to 1 h.p.) is also represented.

The Bryan Donkin Co. Ltd.

THIS company, exhibiting on Stand No. 11 L/3, is showing several photographs, among which are many examples of Rateau turbo exhausting plants. They are showing a specially designed high speed rotary machine of the multi-blade type which can be used as a blower, exhauster or compressor for air or gas, and for which they claim greater efficiency, longer life and more silent working than other machines of that type. It is being made in various sizes up to 30,000 cu. ft. per hour and for pressures up to 5 lb. per sq. in. One of their high pressure double faced valves is shown with part of the body cut away to show the internal working of the valve. These valves are made to withstand pressures up to 100 lb. per sq. in. They are so designed that the bonnet can be removed and a new nut or spindle fitted whilst the valve is under pressure. They are also showing various types of gas pressure regulators for gas services, stoves, radiators, etc., an improved clean-easy type lubricator for gas exhausters and gas and air blowers, and an oil sprayer for the removal of naphthalene deposits in gas mains.

Cellactite and British Uralite, Ltd.

THIS firm has numerous exhibits on Stand No. 12 C/3, among which is Cellactite steel cored roofing. This is the modern alternative to corrugated iron or asbestos-cement for industrial roofing and side cover. It has a steel core completely enveloped in protective bitumen to which is subsequently applied on each side an imperishable asbestos-asphalte felt having all the endurance of a road asphalte. A new feature in Cellactite sheeting which is being shown is the rough texture finish in colour. Uralite, which is also being shown, is a flat board (not corrugated) and is composed almost entirely of high grade asbestos fibre. It is not an asbestos-cement sheet, which is merely incombustible in itself. The genuine Uralite will not crack under high temperature as does asbestos-cement, and it will confine fire to its source. Urastone non-corrosible flue pipes and fittings are shown in extensive range, including new cowls, baffles, etc.

The Chesterfield Tube Co , Ltd.

THE Chesterfield Tube Co., Ltd., are exhibiting on Stand No. 12 K/1 and 2, weldless steel cylinders for containing compressed gases, weldless steel steam pipes and steel headers for boilers, and also examples of their "Feroma" tubes manufactured from the latest types of corrosion and heat resisting alloy steels. Other interesting features are special lightweight nickel-chromium-molybdenum alloy steel cylinders for the storage of gas at high pressures, including the actual test cylinders used in the experimental work carried out.

George Ellison, Ltd.

THIS firm is showing, on Stand No. 22 L/1 and 2, an extensive range of high and low tension electric switchgear, oil and air break circuit breakers, motor control gear and accessories for substations, overhead lines, industrial works and mines; including the following: Truck and cubicle type substation switchgear units for 11,000 volts, 3-phase supplies, of welded steel construction with oil circuit breakers and the usual instruments; drawout unit type switchgear of the metal-clad unit type for the low tension side of transformer substations and industrial installations; distribution switchboard comprising oil circuit breakers, arranged in convenient groups, for installations where a number of power circuits are connected to one or two main feeder cables; control gear and starters for various drives of slipring and squirrel-cage motors; and cable couplings, limit switches, relays and other accessory gear for power plants.

Ellison Insulations, Ltd.

ELLISON INSULATORS, Ltd., Birmingham, are exhibiting conjointly with George Ellison, Ltd. The exhibit includes a selection of Tufnol tubes, rods and sheets for electrical insulation, and a variety of machined component parts and gear pinions made from the same material. Tufnol is made of paper or fabric laminations, thoroughly impregnated with synthetic resin and baked under great pressure. The manufacturing process results in a strong homogeneous material which can be worked with ordinary tools.

Evershed and Vignoles, Ltd.

A COMPREHENSIVE range of "Megger" insulation testing sets is shown on this firm stand, No. 21 G/2, including the latest development—the wee-Megger-tester, and the "Meg" combined insulation and continuity tester, another recent addition to the "Megger" group. The wee-Megger-tester retains all the features of the original "Megger" testing set, but is reduced in size and price to meet the demand for a cheaper and more portable instrument. The instrument consists of an ohmmeter and a hand driven direct current generator, the whole being contained in a single case. The ohmmeter is of true ratiometer type with a pressure and current coil rigidly mounted together and carried on spring mounted jewels. The magnet is of cobalt steel. The C. and S. indicator which is being shown is a simple device for showing at a distance variation in water levels or any mechanical motion, such as the position of gasholders, valves, dampers, steam pressure, vacuum, draught, etc. It consists of a transmitter fixed at the point from which the movement is to be transmitted, and an indicator which may be in the form of an instrument of any standard size, or a series of coloured lights.

Thomas Firth and John Brown, Ltd.

THIS firm is exhibiting on stands Nos. 14 F/1 and 14 G/1. The whole of one stand is devoted to Staybrite steels, and the best examples of their manipulation in the hands of manufacturers in many industries. The other side of the firm's exhibit demonstrates their standing in the heavy steel industry. Alloy steel castings for quarries and grinding mills, steel castings for general engineering purposes are displayed. A large seamless hollow forged boiler drum is also shown, carefully sectioned to show the advantages of the Firth Brown technique. Nitralloy steel and the nitriding process or hardening are demonstrated, showing that the engineer can now have available the hardest metal surface known.

Foster Instrument Co.

A WIDE range of electrical temperature measuring apparatus is being demonstrated by this firm on their stand, No. 12 L/1. This includes indicating and recording thermo-couple pyrometer outfits for industrial and laboratory use, together with optical and radiation pyrometers and electrical "Distance" thermometers; in connection with the latter instruments, special types of sensitive bulbs are now available having an extremely small time lag. A new "miniature" indicating thermo-couple outfit for use on small experimental furnaces is shown and while it retains the high degree of finish and accuracy associated with this firm's products, the price is quite low, bringing a high temperature outfit within the reach of all.

G. A. Harvey and Co. (London), Ltd.

THE development of the canning industry in this country has necessitated the use of various types of specially-designed plant, and G. A. Harvey and Co. (London), Ltd., who are exhibiting on Stand No. 9 K/3, have supplied this industry with many forms of plant, such as vertical and horizontal retorts, exhauster boxes, vacuum, drying, evaporating and

distilling plants, jacketed pans, cooling tanks, vacuum sealing tanks, etc. An exhibit of perforated metals and woven wire is of interest to many industries. These two products are used for the screening, grading, sifting or filtering of such diverse materials as coal, ore, stone, sand, gravel, cereals, food products, fruit juices, sugar and fine chemicals. Other exhibits comprise mild steel gutters, ventilators and gilled tubes. The last-mentioned are of interest to those concerned with heat transfer problems in connection with ventilating, drying, heating and cooling equipment.

High Speed Steel Alloys, Ltd.

A FULL range of products manufactured by this firm is on view, on Stand No. 15 B/3. These consist of pure metals and alloys of tungsten, vanadium, molybdenum, chromium, manganese, titanium, etc., also a number of alloys used in the non-ferrous industry. In addition a range of fine chemicals of the above metals are shown of various grades suitable for commercial and laboratory uses. The application of alloying elements in steels for a large number of branches of engineering are being demonstrated by a large number of exhibits lent by well known firms. Special examples show what has been achieved by the use of molybdenum alloy steels (Vibrac). A number of alloy steels suitable for use at high temperatures are shown. The continually increasing tendency to operate steam power plants at higher temperatures and pressures has resulted in the need for a steel possessing greater resistance to creep; an example of this is shown by a photograph of a large steam casting in molybdenum steel.

Imperial Chemical Industries, Ltd.

THE exhibits of I.C.I. on Stands Nos. 16 E/2 and 16 F/2 are concerned with metal degreasing, water softening and sterilisation, and case-hardening. In metal degreasing, of importance is the degreasing and cleaning by means of trichlorethylene. It is a simple, cheap, yet safe method of stripping the machine of all grease and dirt before overhaul or repair. One of the objects aimed at with success is the handling of small parts in such a way that these can be tipped into a plant without separation and emerge at the other end absolutely clean without any rumbling, rotation, separation or mechanical agitation whatsoever.

The proper conditioning of water is assuming greater importance. The I.C.I. exhibit is a joint one, arranged between I.C.I. (Alkali), Ltd., I.C.I. (Lime), Ltd., and I.C.I. (General Chemicals), Ltd., the former two dealing with water-softening and conditioning, the latter one with sterilisation. This exhibit is of especial interest to industries consuming large supplies of water, particularly power stations, paper mills, etc.; to trades having obnoxious effluents and to water engineers and others. The use of chemicals to soften and condition five main types of water for industrial purposes is illustrated by a detailed comparative exhibit, followed by specimens of the beneficial effects of using treated water on boiler tubes, in dyeing and calico printing. Working exhibits show the principles of the softening process on a small scale,

The case-hardening exhibit is organised on Stand No. 15 C/2 by the Cassel Cyanide Co., Ltd., a subsidiary of I.C.I., who are showing a selection from their extensive range of salt bath furnaces. The use of molten salt for the heat treatment of metals has been gaining steadily in popularity in recent years. It has the great advantage of not impairing in any way the surface of the parts which, in the case of bright finished material, is still bright after hardening. Not only are the results very satisfactory, but the process is cheap and rapid, particularly for the thinner cases. The cyanide process of case-hardening is particularly suitable for repetition work owing to the fact that a pyrometer can be immersed in the same molten bath which surrounds the work.

On Stand No. 13 F/1 Nobel Chemical Finishes are exhibiting a wide range of their products. Their stand this year makes a special feature first of the "Dulux" range of finishes, and secondly of the Nobel low bake and heat-resisting enamels, which have also a synthetic base or vehicle. The "Dulux" range includes air-drying and stoving finishes for brush and spray application by the roller coating process.

I.C.I. (Metals), Ltd., have arranged as their main feature a building embodying offices where the uses of non-ferrous metals for general decorative effect and utility are demonstrated. The various activities of the company are represented in separate sections, one devoted to strip and general metal, and another to plates, while others are devoted to rods, wire, tubes and other manufactures.

The Incandescent Heat Co., Ltd.

ON Stand 10 C this firm is showing a comprehensive range of natural draught gas-fired furnaces suitable for the heat treatment of ferrous and non-ferrous metals, alloys, etc., for temperatures ranging from 1,000° to 1,400° C., and which are representative of all the small types of towns' gas-fired furnaces manufactured by them. On Stand 9 K they are showing a collection of articles and metals, which have been heat treated in their furnaces. They have installed a number of plants for glass and ceramic industries and for the convenience of prospective clients.

George Kent, Ltd.

ON Stand No. 17 J/2, George Kent, Ltd., are showing examples of their latest types of meters and control apparatus of almost all kinds. These meters cover every branch of fluid metering. Among their exhibits is the master control panel as used on the automatic boiler control system which has been evolved by this firm. The temperature, pressure and flow controllers exhibited have not been shown before and they are interesting and of ingenious design. This firm is exhibiting again its Venturi meter which is used for the bulk measurement of fluids of all kinds, also weir and level recorders, trade water meters, oil meters and petrol meters.

Meldrums, Ltd.

THE chief item of interest on Meldrum's stand, No. 8 L/1, is one of their sprinkler mechanical stokers. This is shown attached to one flue of a Lancashire boiler, and is of the fixed grate pattern. A set of moving bars is shown, and an additional exhibit also shows their hand-rocking grate. Any of these alternatives can be provided with the "Meldrum" stoker to suit the particular fuel on the conditions under which the boiler is operating. This firm also exhibits one of its hand-fired furnaces. These are suitable for forced draught by means of either fan or steam jet. Their destructors are exhibited in the form of one of their No. 1 steel cased destructors and one of their circular cast iron pattern for smaller users. The steel cased pattern can be supplied in sizes capable of burning from 25 lb. up to 2 or 3 tons per hour. The smaller sizes are sent out lined ready for use. In their chemical department Meldrums, Ltd., are exhibiting a centrifugal acid pump of their latest design, which has a balanced impeller and gives freedom from leakage at the gland. Other exhibits in "Meldrum" acid resisting metal consist of cocks and valves, steam jet elevator, exhausters, compressors and other steam jet apparatus.

Pneulec, Ltd.

TWO of the machines demonstrated by Pneulec, Ltd., (Stand No. 19 F/1) are of completely new design, and have never been seen at any exhibition previously. They are a Jarr Rollover machine, and a special type of sand mixing mill. The sand mixing mill is both a milling and mixing machine, equipped with a runner for milling and beaters for mixing. These beaters have a constant agitating action on the sand, being positively revolved in the travel around the pan. The sand, therefore, is constantly broken down, and mixed up, and cannot become heavy and close as is the case with an ordinary mill.

The Power-Gas Corporation, Ltd.

AT Stand No. 11 J/2 the Power-Gas Corporation, Ltd., is exhibiting a sectional model of its completely automatic carburetted water-gas plant. The model gives a clear idea of the internal and external arrangements of the plant and the means adopted for automatic and continuous charging, automatic control, self clinkering, self-steaming, self-cleaning and labour-saving in ash handling. It includes a dry bottom generator and every essential part up to the wash box or the chimney, and makes a special feature of the ignition

arch carburettor recently introduced with such conspicuous success by its associates in America, The Semet Solvay Corporation, Ltd. One of the advantages of this carburetting system is its adaptability for gas or heavy fuel oils in combination with the back run and gas oil with forward runs, rendering it suitable for dealing with the available materials, economic price, and other conditions likely to be met with at home or abroad. They are also showing a model of a waterless Klonne gasholder. This model, which is to a scale of 1/60th full size, gives a good idea of the outside of these holders, which are of cylindrical shape. A portion of the side of the model is cut out and replaced by sheet glass, permitting a view of the top of the piston, the chain ladder, and the interior.

The Rheostatic Co., Ltd.

THE Rheostatic Co., Ltd., are exhibiting a number of new devices on Stand No. 22 J/1. Among them are their electrically operated valves, type "PMV." These are of wide utility for control of central heating installations and industrial processes in conjunction with suitable thermostats and represent another application of electricity in both domestic and industrial spheres. The following also, are being shown: Boiler thermostats, type "P," clamp-on boiler thermostat and also the type "WPS" immersion boiler thermostat; room thermostats for the control of electric room heating and also for the control of central heating; immersion thermostats for the control of all sizes of electric water heaters; and complete automatic oil burner controls.

Henry Simon, Ltd., and Turbine Gears, Ltd.

THE joint exhibit of Henry Simon (Engineering Works), Ltd., of Cheadle Heath, and of their subsidiary company, Turbine Gears, Ltd., on Stand No. 22 C/4, comprises interesting examples of conveyor units, automatic weighers, fans, soap making machinery, gears, gear units, flexible couplings, etc. On the section of the stand devoted to the products of Turbine Gears, Ltd., is shown a comprehensive range of gears of all types and several examples of complete gear units, including a speed increasing unit in operation; and a 50 h.p. unit for a coal conveyor is also on view as well as various worm gear units. Another exhibit of interest to engineers is that of the "Axien" patent flexible coupling which is now being sold by Turbine Gears, Ltd. Simon's well-known "Reform" automatic weighers are represented by two machines, one of which, with mechanical feed, is in actual operation. This machine has been specially designed for weighing non-free-running and moisture laden materials. Two interesting examples of soap making machinery are on view. Other exhibits are "Simon" fans, a range of conveyor troughing sets, elevator buckets, conveyor blading, etc.

Tecalamit, Ltd.

ON Stand No. 16 G/3 Tecalamit, Ltd., are showing numerous high pressure lubrication guns with assorted adjustable group nipple fittings. Of interest are the Brentford mechanical oil pumps. Their simple design and wide range of operating speeds, combined with perfect control of output make delicate gearing unnecessary. Some hand-operated lubricating pumps are being shown, in various sizes. These pumps give a pressure of 150 to 200 lb. per sq. in., being sufficient to distribute oil along pipe lines up to 50 or 60 feet in length. The regulators for use with these pumps are adjustable and should be set so that pressure is maintained through the pipe system, thus ensuring that the bearings furthest from the pump are not starved.

Thomas and Bishop, Ltd.

THOMAS and Bishop are exhibiting, as in previous years (Stand No. 17 M/5), Permac jointing materials, Flexo tinning compound, and Flexo "B" cement. Among their new exhibits are Kester solder, and Flexo belt dressing. Kester solder provides all the advantages of the solder and flux in one. It includes a complete series of self-fluxing wire solders, among which there are solders for every type of work that can be used by anyone with every assurance of perfect results. These solders are made of virgin tin and lead and contain the flux needed. This flux is proportioned exactly to the amount of solder and is automatically released as the solder melts. "Flexo" belt dressing was put on the market to meet the need for a thoroughly reliable British-made belt dressing at a low price, and prevents all belt troubles such as slip. "Flexo" is a definite belt food, and contains the right animal and other oils necessary for the belt.

United Steel Companies, Ltd.

THE Samuel Fox and Co., Ltd., branch of the United Steel Companies, Ltd., displays on Stand 14 D/3, cold worked steels in strip and wire form, including a special display of high class wires for the textile and domestic utilities industries and all varieties of strip. Amongst the latter are specimens of lacquered steel strip—an industry new to this country as this material was formerly all imported. The same branch is also showing a new nickelled steel strip and other forms of plated strip—and of stainless steel in cold worked forms. An innovation shown by Daniel Doncaster and Sons, Ltd., is the new "Valmax" valve steel, a development of the older silchrome steel, but with increased strength at high temperatures, and highly resistant to embrittlement. The Steel, Peech and Tozer branch is showing a new "Phœnix" all-British rapid machining steel, with specimens of parts machined at speeds of over 400 ft. per minute.

Charles Winn and Co., Ltd.

ON the engineering side of their business, Charles Winn and Co., Ltd., are showing, on Stand No. 20 C/1, a range of screwing, cutting off and tapping machines and allied tools; valves and fittings for steam, water, petrol, oil, etc., and fire extinguishing appliances. The valves and allied fittings exhibited comprise a selection of some of the more standard of their manufactures, including forged steel valves for very high pressure, monel metal valves and fittings for high temperatures, acid and other chemicals, etc. In this section are also magnetically operated valves for the automatic regulation of heating systems, control of oil, gas, etc., manufactured for the Magnetic Valve Co., Ltd., of London. These form a very interesting feature, the uses of these valve being almost unlimited.

Zinc Alloy Rust-Proofing Co., Ltd.

ON Stand No. 16 A/4, the Zinc Alloy Rust-Proofing Co., Ltd., are acting principally as a technical information bureau where full particulars are available in connection with the rust-proofing process of sherardising. A few representative articles are displayed on the stand. In addition to the ordinary sherardising finish there is a display of sherablak, the new rust-proof black finish, and also polished sherardising which forms an excellent substitute for chromium plate on small steel parts.

Miscellaneous

C. C. WAKEFIELD and Co., Ltd., are showing (Stand No. 15 D/1) Wakefield mechanical lubricators, a machine tool lubricator, Ayrlyne lubricators, grease guns, greasing outfits, penetrating oil squirts and tank equipment.

THE exhibits of Pegson, Ltd., on Stand No. 22 B/1, consist of two models of the well-known "Livewire" vibrating screen, the Pegson shaking table and the Pegson rammer which may be used for many purposes such as consolidating trenches, tamping setts, breaking concrete, and general demolition work.

A RECENT introduction in the field of concealed central heating systems is displayed on the stand of The Midland Metal Diecastings, Ltd. (No. 4 D/1). By special process this company manufactures a heating element, in which corrugated aluminium fins are firmly attached to copper tubes, resulting in the production of a convector from which there is rapid transfers of heat from the circulating hot water or steam.

MCKECHNIE BROTHERS, Ltd., on Stand No. 17 C/6, are exhibiting their "Tank" and "MKB" brands of extruded brass bronze and white metal rods and sections and stampings; gunmetal, phosphor bronze, brass, naval brass, manganese bronze, nickel silver and antifriction metal ingots; coating metals and diecasting alloys; terne metals; cupro nickel (granulated); and manganese copper (granulated).

ON Stand No. 14 E/1, Ley's Malleable Castings Co., Ltd., Derby, are exhibiting a number of their 'Black Heart" malleable castings. These embrace typical examples of castings for various branches of industry. Test bars can be broken on request and any potential buyer is invited to ask for sample castings which he is requested to test in any manner he thinks fit. Particular attention is directed to the machining tests which demonstrate the unrivalled machinability of Ley's "Black Heart" malleable iron.

ON Stand No. 7 G/3, Thomas Howse, Ltd., are exhibiting all their standard lines of industrial and decorative finishes for all purposes. In addition to these they have several new finishes on show, *i.e.*, the latest air-drying and stoving synthetic resin finishes, including "Infuselax" finishes; then "Ferret" brand stoving japans steel furniture enamels; anti-fungoid enamel; heat resisting and acid-proof enamels; new designs in crackle lacquers and prismatics.

THIS year the stand (No. 12 E/3) of W. C. Holmes and Co., Ltd., takes the form of a reception room equipped with models and drawings. There are no large exhibits of machinery, but interest centres principally round benzol recovery gas dehydration, and measuring of gas solid for industrial purpose.

HIGGS MOTORS are exhibiting, on Stand 19 L/3, a wide range of their manufactures. These include 2- and 3-phase induction motors of the squirrel cage and slip ring types and single phase motors of the split phase and repulsion start induction type, also direct current motors and fixed and variable voltage generators. They are also showing a range of electric motors from ¼ to 50 h.p.

Screening Equipment

AMONG the exhibits of N. Greening and Sons, Ltd. (Stand No. 20 B), are: Woven wire in all meshes, metals and gauge of wire; wedge wire in various metals and apertures showing all types of wedge sections; perforated plates in all metals showing a wide variety of perforations, and also showing plates curved to form screen barrels, etc.; wire conveyor belts of every description suitable for all types of uses; and every type of screening for chemical products.

AT Stand No. 18 F/3 F. Gilman (B.S.T.), Ltd., are exhibiting flexible drive machines of every kind for tube and surface scaling work, and in addition a complete range of machines is being exhibited for general utility work such as drilling, grinding, wire-brushing, sanding, polishing, etc. Their products are of interest to the chemical industry; a considerable number of machines have been supplied to chemical firms for removing chemical and other deposits from tubes and pipe-lines.

A SMALL gas-fired natural draught furnace is shown in operation by Lucas Furnaces, Ltd., on Stand No. 14 A/1, demonstrating how work can be treated on the continuous principle free from distortion and scale. The components to be treated are placed into containers to facilitate handling and introduced from a charging table through the heating chamber where they are gradually brought up to the required temperature. A high speed steel hardening furnace, in which steel can be treated quite free from scale, is also shown.

THE tensometer shown on Stand No. 19 D/5 by Tensometer, Ltd., is of interest. With this machine and its various accessories it is possible to carry out tensile, notched bar, and bend tests on steel, iron, non ferrous alloys and plastic materials without any sacrifice of accuracy and at a very low capital cost and at an almost negligible cost per test piece. All the results on the tensometer are read direct without calculation.

Industrial Instruments

ON Stand No. 16 J/3, the Cambridge Instrument Co., Ltd., is exhibiting a comprehensive selection of high-grade instrument for industrial use, comprising temperature measuring instruments, electrical CO_2 recorders, draught and pressure recorders, smoke density recorder, and other instruments for

A NOTEWORTHY feature in the industrial gas exhibit is a range of the new Bornkessel gas and air blast burners with very fine flames, suitable for glass blowing, glass finishing and similar operations. These burners represent a new development by Chance Brothers and Co., Ltd., of Smethwick.

engineering and electrical measurements. The exhibits include a number of new instruments of considerable interest.

THE Chaseside Engineering Co. is showing its mechanical mobile shovels, the exhibit being concentrated on the model "A" shovel, a machine that can tackle from 5 to 40 tons an hour of quarried stone, loose chemicals, coal, coke, gravel, metal scrap, sand or stiff tarmacadam, discharging it at any height up to 9 feet. Only about ¾ gal. of petrol is need per hour and the machine is sturdy, simple to drive and fool-proof. The low mounting of the winch, as the rear, ensures great stability.

A. REYROLLE and Co., Ltd., are showing a model of 132,000 volt outdoor metal-clad switchgear. It is an exact replica of equipment supplied to the Central Electricity Board, and it shows how the metal-clad principle is being applied to switchgear for the highest voltages.

J. H. HOLMES and Co., Ltd., who are associated with A. Reyrolle and Co., Ltd., are showing motors for many different purposes and other representative products. The motors include an induction-motor for general use, a totally-enclosed fan-cooled motor, a variable-speed commutator-motor, and a coal-conveyor motor, all of which are for alternating current. A direct-current generator coupled to a standard induction-motor is also shown.

THE Calorising Corporation of Great Britain, Ltd., a subsidiary of Babcock and Wilcox, Ltd., are exhibiting calorised pressure steel boxes and pots for case hardening, annealing, cyaniae, lead and salt hardening, also calorised solid drawn steel pyrometer sheaths; samples of similar articles, together with boiler furnace and superheater support castings in "Calmet" are also shown.

Welding Demonstrations

THE British Oxygen Co., Ltd., has a comprehensive display on Stands 17 J/3 and 17 K/3, where the products of the company are shown and its equipment demonstrated. The exhibit includes sections devoted to oxygen machine cutting, oxy-acetylene welding and hand cutting, brazing, lead burning and heating dissolved acetylene lighting, electric arc welding, metal spraying, Shorterising and other processes.

CHEMICAL plant, in solid silver, forms an important part of the display on Stand 15 D/6 of Johnson, Matthey and Co., Ltd., who are also showing solders for ferrous and non-ferrous metals, new process silver anodes, silver-lined copper catalysts and other chemical apparatus.

AT Stand No. 16 B/4 Thomas Locker and Co., Ltd., are showing "Durite" and "Tufite" woven wire screens; wire cloth, wire gauze and woven wire (in all metals, meshes and gauges); screen cloths for vibrating and shaking screens; perforated plates and sheets (in all metals, thicknesses and patterns); perforated steel trommels; conveyor belts; and the "Trayco" all-electric vibrating screen and electric vibrating conveyor and feeder.

Rubber in the Motor Industry

Some Recent Developments

A PAPER on "Some Developments in Rubber for Automobiles" was read by Mr. Colin Macbeth before the London Section of the Institution of the Rubber Industry on February 13, Sir Stanley Bois presiding.

Mr. Macbeth said that a recent analysis showed that on British passenger-carrying automobiles of medium price and power the weight of rubber products used per car was over 140 lb. He gave as an example a 15 h.p. car. Recent tyre developments, he said, indicated that there would be a general enlargement of tyre sections, which would increase the weight of tyres and tubes fitted to each car from probably 10 to 15 per cent. This would reduce the weight of the car, as the substitution of metal by rubber and fabric meant weight saving—fitting lower pressure tyres meant a reduction in unsprung weight due to greater cushioning value of the tyres.

Dealing with coach work, Mr. Macbeth pointed out that 28¾ lb. of rubber was used, which was roughly one-fifth of the total rubber parts used on the car. This substantial figure indicated that coachbuilders liked rubber.

Production and Uses of Solid Carbon Dioxide

Commercial Developments since 1925

A LECTURE on the production and uses of solid CO_2 was given before the Liverpool Section of the Society of Chemical Industry on February 17, by Dr. H. G. Littler, chemist in charge of the Imperial Chemical Industries plant at Billingham. Mr. E. Gabriel Jones, chairman of the section presided.

Dr. Littler said it was seldom a chemical compound could remain a well-known denizen of the scientific laboratory for nearly a hundred years without anyone suspecting it might have important industrial applications. Yet solid CO_2 was discovered 98 years ago by Thilorier and only produced commercially for the first time in 1924. This was more remarkable because its production was not difficult as industrial processes went, and its application as a refrigerant was obvious enough. During the interval between discovery and commercial production only two people, so far as he knew, gave serious thought to its commercial possibilities—Dr. Elworthy and Mr. Slate. Elworthy was a doctor in the British Army Medical Corps stationed in India at the time of his discovery and he patented the process. Now, 35 years later, his idea was being exploited commercially. Slate was impressed with its possibilities as a refrigerant and as a result the first plant for the manufacture of solid CO_2 was erected in Montreal. Failing in his efforts to replace ice with CO_2 as a refrigerant in railway cars, he turned his activities elsewhere. Solid CO_2 finally found its first field of usefulness in the ice cream industry and as "Dry-ice" the first sale took place in Schrafft's Stores, New York, in 1925. As a result, the production of dry ice in the U.S.A. rose from 170 tons in 1925 to 40,000 tons in 1930.

Cheapening the Process of Manufacture

Dry ice was first produced commercially by a method similar to that used in the laboratory. Liquid CO_2 was throttled to one atmosphere pressure and the white powder produced was hydraulically compressed into cakes. If one pound of liquid CO_2 is throttled in this way, about 0.3 pounds of solid is produced (the actual amount depends on the temperature of the liquid before throttling); thus, about 70 per cent. of the original liquid is evolved as gas in the throttling process. In the laboratory this gas is allowed to escape; but as pure CO_2 gas is a valuable material in industry the gas is collected and reliquefied. It was soon realised that since the production of dry ice involves a system having only one component (a very rare case in the chemical industry), thermodynamics of the process could be worked out in a remarkable degree of completeness. Thermodynamic analysis yielded surprisingly good results, and the process of manufacture was greatly cheapened. A number of different cycles are employed in modern plants, which differ little among themselves in efficiency, but are all over 30 per cent. more efficient than the original cycle used.

The two main uses of solid CO_2 were as a refrigerant and as a source of gaseous CO_2. Dry ice would not come into competition with water ice and mechanical refrigeration, as calculation showed that with an ideal engine working with an upper limit of 15° C. it required 15.05 times as much power to produce one pound of dry ice as to produce one pound of water ice. A pound of dry ice cost twenty times as much as a pound of water ice. The advantages of dry ice as a refrigerant in transport could be summarised as follows: (1) Low capital cost of installation; (2) low maintenance costs; (3) general utility of the refrigerated cars; (4) mobility of the cars; (5) lightness and (6) the effects of the evolved CO_2 gas.

Control of Temperature

The fundamental problem to be solved in its use as a refrigerant was the control of temperature. Blocks of dry ice evaporated at different rates depending on their size, so that evaporation fell off as the block sublimed. This meant that any space kept cool with it would have a minimum temperature when the blocks were first introduced and a maximum temperature when they had all but evaporated. To overcome these difficulties, a small bunker insulated on all sides but one was used whereby the heat is withdrawn from the refrigerated space and conducted by means of a plate of metal, to the dry ice blocks in the insulated bunker. As the dry ice chamber is insulated on all sides but one, the blocks of solid CO_2 evaporate at one surface only. This surface is practically constant and so a constant rate of evaporation is assured. At high temperatures dry ice was a relatively inefficient refrigerant, but a method had been worked out which partially overcome this defect.

The CO_2 gas evolved had two beneficial effects (1) the insulating value of the gas and (2) its bactericidal action. By piping the evolved CO_2 gas into the insulation, the heat leak into any refrigerated space could be reduced to a theoretical minimum limit of 60 per cent. of the heat leak obtained with air as the insulator. In regard to (2) fish kept in atmospheres containing CO_2 did not rot so quickly as fish kept in the same temperature in air. Dry ice is a convenient source of CO_2 and a great economy in transport cost is clearly brought about if approximately only the net weight of the CO_2 has to be handled instead of the heavy steel bottle normally used. The process of converting dry ice to liquid or gaseous CO_2 consists of supplying heat to the solid under pressure and an apparatus known as a liquefier is used for the purpose.

The CHAIRMAN asked whether there was much danger in handling this material. He had heard complaints of people's skin being affected when handling dry ice in connection with ice cream manufacture. Probably the persons who handled it regularly protected their hands in some way.

Dr. LITTLER said that if one handled solid CO_2 regularly all one needed was a pair of reasonably good thick gloves as insulators. They had men handling these blocks all the time and they simply used thick pairs of gloves.

Chemical Matters in Parliament

Apex (British) Artifical Silk Co.

IN the House of Commons on February 13, Mr. Rhys Davies (Lancaster, Westhoughton) asked the President of the Board of Trade the total amount of capital subscribed to the Apex (British) Artificial Silk Co., Ltd., 100 Carpenters Road, Stratford, now in voluntary liquidation; the total amount paid in interest to the shareholders; the total amount of capital repaid; whether he would cause inquiries to be made as to how the capital raised was spent; and whether he proposed to introduce any legislation which will afford investors greater protection in connection with the formation and conduct of companies of this kind.

In reply, Mr. Runciman said that according to the last available balance sheet of the company, the capital subscribed was £297,896, of which £3,613 4s. 8d. had been returned to shareholders in the voluntary liquidation. The Board of Trade had no information that any amount was paid in interest to shareholders while the company was in operation. Information as to the manner in which the cash capital of the company was expended was shown in the last audited balance sheet of the company which was presumably sent to the shareholders in accordance with the requirements of the Companies Act, 1929, and it had been open to the shareholders to raise any relevant questions with the voluntary liquidator who was appointed by them. The suggestion put forward would be noted for investigation when any amendment of the Companies Act was under consideration.

ACCORDING to Royal Decree 1488, issued by the Italian Government on November 10, 1932, the temporary import permit allowing nitro-cellulose lacquers and solvents to be used in the finishing of automobile bodies for export was extended for another year and fixed quantities of imports allowed to enter under permit were 45 tons of nitro-cellulose lacquers and a proportional amount of solvents. The decree regarding the importation of these products was first granted in Royal Decree law 1555 of August 12, 1927, and was later extended to October 15, 1932.

X-Rays and Crystal Structure

A Review of Twenty Years' Work

FOUR lectures on the analysis of crystal structure by X-rays are being given by Sir William Bragg, D.Sc., F.R.S., at the Royal Institution, Albemarle Street, London. They are essentially a review of the work of the past twenty years.

In the first lecture delivered on February 14, it was pointed out that methods of X-ray analysis have greatly enlarged the scope of crystallography itself, since the science is no longer restricted to studies of the exterior form as a basis for its theories but can now make use of the new knowledge of internal structure. The subject has also been widely extended by the discovery that the crystalline character is no longer a peculiarity of certain materials, but a general property, possessed by numbers of substances which have been hitherto supposed to have nothing crystalline about them, such as silk, hair, cotton and rubber. The recognition of persistent regularity in the association of atoms and molecules in the solid state opens up a new field of research into the connection between structural design and characteristic qualities.

The second lecture, on February 21, dealt with the study of the fine structure of crystals as throwing light upon the nature and modes of action of the various forces that bind atoms and molecules together. There are several distinct kinds of forces. The first kind, of an electrical character, is found in such inorganic crystals as rock salt, where the positively charged sodium atoms attract the negative chlorine atoms and vice versa. A second kind is of the very strong nature which is exemplified by the forces between the carbon atoms in diamond. A third kind of force occurs in the metals, where free electrons hold together the positively charged metal atoms. There are also the relatively weak forces that hold together the distinct molecules of an organic substance like naphthalene.

The third and fourth lectures will be given on February 28 and March 7, at 5.15 p.m. in each case. It is then that Sir William Bragg will discuss the application of the X-ray methods in metallurgy, including the investigation of structure and composition, both of pure metals and of alloys, leading especially to accurate determination of the relations between different phases of the same allied substances; the establishment of connections between the structure of a metal and its properties, modified it may be, by various kinds of treatment; and the examination of the texture of metals, especially in relation to the arrangement of the small crystals of which they are composed.

X-ray methods, which lead to the determination of the positions and groupings of atoms, have a special application. There are at present two ways in which the X-rays are employed. In the one, the readiness with which the X-rays determine the form and size of the unit cell in the crystal proves to be very useful in combination with facts concerning the molecule which have been discovered in other ways, as for example in such questions as the structure of cellulose, and various proteins. X-rays can also be employed to determine almost without the aid of previous knowledge the exact position of each atom. This is at present laborious, but will become easier when the first difficulties have been overcome.

Importance of Research in Industry

Views of Professor Gibbs and Dr. A. J. V. Underwood

SOME aspects of research in industry that are frequently overlooked were dealt with in an important letter to the "Times" on February 17 from Professor W. E. Gibbs, Ramsay Professor, and Dr. A. J. V. Underwood, hon. lecturer in chemical engineering at University College, London.

"For various reasons," they wrote, "industrial research is not undertaken in this country to anything like the extent that it is in competitor countries such as the United States of America and Germany. In some instances this neglect of research has been due to an excessive individualism on the part of manufacturers engaged in the same industry. A further factor has been the failure of some research organisations to justify the expectation of those who establish them. Generally they failed either because they were badly conceived or because they were entrusted to workers who, either by temperament or training, were not suitable for the work. A manufacturer has been known to establish a research laboratory much in the spirit of the man who mounts a beautiful mascot on the radiator of his car; it looks well, and might bring him luck! Another has regarded his laboratory primarily as a special show place with which to impress visitors or prospective customers. In many cases the failure of a research laboratory to be of real service to industry has been due to a lack of industrial training and outlook in the members of the research staff."

With the object of preventing a repetition of such mistakes, they submitted that all industrial research work should be undertaken in a spirit of frank inquiry. It should be carefully planned upon a comprehensive scale so as to include, in addition to purely utilitarian investigations of immediate importance, a good deal of research work of a more fundamental character, the results of which will benefit the industry in years to come.

The greatest possible care should be exercised in the choice of the scientific man to whom the work is to be entrusted. Scientifically, he must be highly efficient; at the same time, he must be industrially effective. He must be thoroughly familiar with all those important practical considerations, both engineering and economic, upon which the industrial value of his work will ultimately depend. Further, he should be a man of strong character who can be honest with his employer and also with himself.

Money expended upon research should be regarded as a long-term investment, the ultimate return upon which is quite incalculable. But a moderate expenditure with a well chosen research staff will generally produce more valuable results than a lavish expenditure with an unsuitable staff.

Where co-operative research is contemplated the grouping of the participating firms should be considered from the standpoint of their collective range of experience. Co-operative research by groups of firms engaged in the same industry does not always constitute the most logical arrangement. Recent years have witnessed the rapid growth and increasing importance of the science of chemical engineering, which is concerned with the study of unit processes which are common to many industries. Processes such as grinding, filtration, evaporation, drying, distillation, etc., are widely used in many industries outside the chemical industry. The same fundamental principles are applied in each industry, although the materials treated may vary widely from one industry to another. Research that is directed to the elucidation and improvement of such processes must necessarily be circumscribed in its outlook if it is confined to one industry. Such research, instead of being conducted by groups of firms engaged in a single industry, should be conducted upon a wider basis, so that the particular knowledge and experience which each industry has acquired may become available to other industries employing the same process.

THE experimental alkali plant of the Norsk Hydro-Elektrisk is now reported to be an ammonia soda ash development. If the process proves satisfactory, this firm expects to build a plant of 18,000 tons yearly capacity at Heroya, using as raw materials salt obtained from sea water, limestone from local deposits, and synthetic ammonia from its own works. The bulk of the initial output will probably be used for sodium nitrate manufacture in place of the imported soda ash which showed a decided increase to 42,240 metric tons during the first eight months of 1932.

Liquidation of Cosach

Sharenolders Elect Representative

SHAREHOLDERS in Cosach have elected Mr. George Graham to represent Class "B" shareholders before the Liquidating Commission. Mr. Graham is a vice-president of the company. Mr. Medley Whelpley, the president, excused himself as he does not speak Spanish. The appointment was well received in official circles. Pending Mr. Graham's arrival Senor Vidal de la Fuente will act for him.

It is officially confirmed that Don Jorge Matte Gormaz, ex-Minister of Foreign Affairs, has been elected president of the Commission.

Manufacture of Litharge

A New Electrolytic Method of Russian Origin

AN exceptionally high degree of purity is claimed for litharge produced by a new Russian method ("Nowst. Tchniki" (Moscow), No. 178, page 5), involving solution of the lead anode in a specially designed electrolytic cell, followed by separation of the lead hydroxide and dehydration of the latter by precipitation with an alkaline solution. After washing with water to remove the last traces of electrolyte, the litharge is ready for use. Calculations show electrolytic litharge to be cheaper than that produced by the ignition method, while risk of lead poisoning is reduced to a minimum since the whole process is carried out under water. Electrolytic litharge is regarded as a valuable raw material for optical glass owing to its freedom from metallic lead, which results in a higher degree of transparency.

Synthesis of Higher Alcohols

Catalytic Activity of Salts of Organic Acids

FOLLOWING on the observation that the potassium hydroxide employed as a catalyst during high temperature-high pressure reduction of carbon monoxide with hydrogen became partially converted into salts of organic acids, an investigation was made of the catalytic efficacy of the latter. Catalytic activity was actually found to be possessed by a whole range of salts. Among the interesting results to which attention is drawn in an account of the work by M. Strada in the December, 1932 issue of "Giornale di Chemica industriale ed applicata" (pp. 601-607) may be mentioned the greater duration of catalytic activity of potassium formate and potassium acetate as compared with potassium propionate or butyrate. The former were even superior in this respect to potassium hydroxide or carbonate. The acid radicle, however, has less direct bearing upon the yields and composition of the higher alcohols, the crucial factor here being the percentage of alkaline oxide in the molecule of the fatty acid salt.

Glasgow Oil Trade

Effects of Tariffs on Exports

THE annual dinner of the Paints and Oil Section of the Glasgow Chamber of Commerce was held at the Central Hotel, under the chairmanship of Mr. David M. Boyd. The Chairman, responding to the toast of the Section, said their trade was not under a bright star at present. There was, however, some room for expansion in the paint section, but if they turned to the oil side they found that trade was poor. The supply of oil was auxiliary to other industries, and when other trades suffered the oil trade suffered also. Bad as the home trade was, they had also suffered in the export trade because of the tariff which had been put on raw materials, and was handicapping them in competing for business overseas. These tariffs made all the difference between securing orders and not getting them. He understood that strong representations were being made with a view to securing a drawback system on the export of oil, and he hoped some such system would be introduced before long. Sir Steven Bilsland, in reply, said that on at least two occasions within the life of the section the future appeared to have lost all promise, but the courage, energy and enterprise of their forefathers rebuilt a greater prosperity out of what had seemed almost the ruin of their fortunes.

Air Pollution in Cities

Modern Methods of Control

THE turn in the tide toward industrial recovery will afford an exceptional opportunity to make progress in air purification, said Mr. H. B. Meller, head of the Air Pollution Investigation, Mellon Institute of Industrial Research, Pittsburgh, U.S.A., in an article on "City Air Pollution and Its Control in a Period of Industrial Depression," appearing in the current issue of "Aerologist—Indoor Air." Many industrial establishments are faced with the necessity of altering or replacing worn out or obsolete fuel-burning equipment. All new plants will have a chance to install most modern types of heat and power-making appliances, possible of nearly smokeless operation; and a wider choice of fuel is available. Also, there is recognition of the desirability of the small plant having the same sort of expert engineering guidance that the large plant has so profitably employed. The small plant owner is not expected to retain an expert continuously; his chief problem is to seek the advice ahead of making commitments. He will find the heating engineer of to-day will try to minimise air pollution as well as to deliver heat units most economically. Although the country is not burning as much fuel as in years of heavy industrial output, the amount of sooty smoke in the cities is very great. The largest volume of harmful dense smoke comes from unregulated residential furnaces and stoves. The type of ordinance generally found in cities of the United States is declared to be inadequate, in that it permits smoke of greater density than is necessary or desirable. Communities which hope to purify their air are advised to agree upon a workable programme of practicable performance before seeking legislation.

Low Temperature Carbonisation

Narrow Brick Retorts at the Fuel Research Station

SIMULTANEOUSLY with the publication of the annual report of the Fuel Research Board, the Department of Scientific and Industrial Research has issued Fuel Research Technical Paper, No. 35 (H.M. Stationery Office, price 6d. net), which brings up to date the story of the successful efforts to carry out the low temperature carbonisation of coal in brick retorts. This paper contains a description of the latest setting of two brick retorts. In these the coal is carbonised continuously in a vertical firebrick slot retort 7 in. wide at the top, widening to 11 in. at the bottom in a height of 21 ft. With the experience gained on cast iron retorts, the operation of the brick retorts proved successful from the very beginning. They have yielded a good type of low temperature coke and a satisfactory quantity of low temperature tar, together with an adequate return of gas. Judging by the experience of the Fuel Research Station, the plant is inexpensive to build. The pair of retorts erected at the station cost approximately £1,500, including the foundations and finishing at the collecting mains, but without any accessories such as gas mains, motive power, condensers, etc. Since the retorts are made of ordinary firebrick—the temperature they have to withstand is relatively low for this material—there appears to be no reason why the depreciation should be unduly high. In the experiments carried out on the older single retort, the firebricks were affected only slightly after two years' working.

The report gives details of the results obtained from a wide range of coals, including some of the most strongly caking coals in the country, carbonised in the retorts. Type and size of coal have a pronounced effect upon the throughput and to some extent upon the yield of tar. The longer the coal remains in the "nut" form the higher will be the throughput and in general the higher will be the yield of tar. That is to say, certain non-caking coals which do not break down during carbonisation will give a very high throughput, a good yield of tar, and a satisfactory coke.

IT is reported that Bombay University is shortly to have facilities for advanced chemical research. An initial sum of 550,000 rupees (£41,370) has been set aside for equipment and instruction personnel. The first year will be devoted to general studies as a background for specialised work in textile chemistry or chemical engineering to be undertaken throughout the second year.

News from the Allied Industries

Soap

FOLLOWING THE CLOSING DOWN of Gossages' interest at Widnes, a new company has been formed—The Widnes Soap Co.—to acquire the buildings of the Pith and Size Co. at Farnworth and carry on business as manufacturers of soap, candles, etc. The capital is £20,000 in £1 shares.

Sugar

A SUGAR BEET FACTORY to cost £400,000 may be erected on the outskirts of Pembroke Dock. The Town Clerk is reported to have stated that the scheme was one to which the Government ought to give every consideration in view of the closing down of the dockyard.

Iron and Steel

THE NATIONAL FEDERATION of Iron and Steel Manufacturers reports that 286,600 tons of pig iron were produced in January, as compared with 284,500 tons in December, 330,000 tons in January, 1932, and a monthly average of 855,000 tons in 1913. The January output of pig iron included 74,600 tons of hematite, 145,000 tons of basic, 76,800 tons of foundry, and 8,300 tons of forge pig iron. Furnaces in blast at the end of January numbered 62, two more than at the beginning of the month.

Coking

IT IS OFFICIALLY ANNOUNCED that the Pease and Partners' scheme of arrangements recently sanctioned by the Court, has become operative and that after conferring with the parties named in the scheme, the advisory committee has appointed the new board, which consists of Mr. James Frater Taylor, Mr. Howard James Walker, Mr. James Richardson Glass, the Rt. Hon. Lord Gainford and Sir Richard Arthur Pease, Bart. At the first meeting of the new board, Mr. James Frater Taylor was appointed chairman.

Mineral Oil

A PRIVATE CONFERENCE IS IN PROGRESS in London, attended by all the principal oil-producing countries except Russia. The object of the conference is to cut down oil production in order that prices may be stabilised. The present meetings follow previous world oil conferences in Paris last December and in New York last June. General agreement between the Roumanian oil interests and the international representatives of the industry was reached at the New York conference. Roumania agreed to limit her output to 18,500 tons a day for the first three months of the year, and the great question which the present conference will decide is whether or not that agreement will end on March 31. The chairman of the conference is Mr. I. B. Aug. Kessler, joint managing director of the Royal Dutch Co.

Artificial Silk

SNIA VISCOSA, the Italian ravon undertaking, during 1932 made a net profit of 22,305,630 lire, after carrying to amortisation 21,500,000 lire. For the previous year the net profit was 23,541,737 lire. The dividend is again to be on a 6 per cent. basis. At the end of December last liquid funds amounted to 255,979,000 lire, against 248,150,000 lire a year previously.

EARNINGS OF COURTAULDS, LTD., for the past year show a satisfactory increase on the total reported for 1931. In their preliminary announcement, the directors state that the net profit amounts to £1,452,043, which compares with £1,101,588 secured in the previous year. By declaring a final dividend on the ordinary shares of 2½ per cent., tax free, making 4 per cent. for the year, the directors have exceeded expectations, the general opinion being that the distribution would be ½ per cent. less. Moreover, the payment has been fully earned, the balance carried forward being raised from £147,344 to £230,387. The dividend is 1 per cent. below the rate paid for the previous year, but the higher distribution then made involved a drain on the contingencies reserve to the extent of £450,000, while the balance in hand was reduced by more than £48,000. Altogether, therefore, reserves were depleted by practically £1,500,000 last year, whereas they are now increased by £92,000.

China Clay

WITH THE DESPATCH of 57,644 tons of china clay, 3,022 tons of china stone, and 1,337 tons of ball clay the opening month of 1933 has started well as regards shipments. Though the volume falls short of the record trade done in November last it exceeds the corresponding months of either 1931 or 1932 by several thousand tons which is a good omen for the future of the industry. The ports of Charlestown and Par have shown considerable activity since the introduction of the motor lorry and the local transport organisation have done much to facilitate the prompt loading of vessels at these docks. The equipment at either of these docks is nothing comparable to that at Fowey where in normal times the average monthly shipments were from 60 to 70 thousand tons.

Analysis by Colorimetric Methods

Organic Reagents and Specific Reactions

THE systematic study of methods for the detection and determination of small amounts of substances by colorimetric means is a comparatively recent development, said Mr. Norman Strafford, F.I.C., head of the Analytical Section of the Research Department of I.C.I. (Dyestuffs Group), in an address delivered to the Leeds section of the Institute of Chemistry, on February 20. Whilst a few well-known colorimetric methods date back as far as 1837, the reactions used prior to 1900 were either of a very obvious nature or else were more or less the results of chance discoveries. In the present century advances have been extraordinarily rapid, and new organic reagents have been introduced as a result of a deliberate and systematic search by investigators such as Feigl. In many cases, still further investigation has led to the application of the reagent to quantitative determinations.

The colour reactions obtained by modern organic reagents possess the advantage of extremely great sensitivity, saving of time, simplicity of technique, and in many cases avoid the necessity of preliminary separation. Where separation cannot be avoided, organic reagents and solvents often provide a simplified method. They find their chief application in the determination of metallic radicles, their chief features being that they form coloured complexes with a limited number of metals. There are few cases, however, where a given reagent is entirely specific for one metal only. Specific action may sometimes be attained by various artifices such as the suppression of the reaction of an interfering ion by the formation of an un-ionised inorganic complex, or alternatively of a complex ion which does not react with the reagent. In other cases, a preliminary separation of the ion to be determined may be necessary. This may be achieved either by the organic reagent-solvent method, by distillation with hydrochloric acid as in the case of mercury and arsenious chlorides, or by classical methods such as sulphide precipitation. Some organo-metallic complexes in suspension in an aqueous medium (*e.g.*, the nickel dimethylglyoxime complex) may be drawn to the interface between the aqueous solution and an organic solvent, such as ether. The aqueous solution containing interfering coloured water-soluble complexes is then discarded, and the complex, suspended in the organic solvent, can be recovered by suitable methods. In other cases the complex may be dispersed to a colloidal solution in the organic solvent and then determined colorimetrically.

In the organic field, colour reactions are given as a rule by a group of substances containing the same active radicle rather than by a single compound, and truly specific reactions are comparatively rare. Where it is desired to determine only one particular substance, preliminary separation may be an important feature. An interesting example of this is the destruction of the interfering substances, as employed in the determination of traces of pyridine in nicotine, where the nicotine is destroyed by oxidation whilst the pyridine is unaffected. Discussing the technique of colorimetric determinations, the lecturer drew attention to the advantages of photo-electric colorimeters which permit of greatly increased accuracy owing to elimination of visual errors.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE following market report is based on information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

CHEMICALS generally remain firm in the London market, with a steady demand. No more than a quiet to moderate business has been reported during the past week in any section of the Manchester chemical market, and although the textile industries continue to take fair deliveries of the leading heavy products against contract commitments, there is a feeling that operations in the dyeing and finishing establishments will slacken off unless there is an improvement in the orders for cotton goods. Meanwhile, chemical prices are generally steady and only in odd instances is there sign of uneasiness. General chemical buying in the Scottish market during the wek has had a tendency to dulness.

General Chemicals

ACID, CITRIC.—LONDON: 10d. per lb. less 5%. MANCHESTER: 9¾d.

ANTIMONY OXIDE.—SCOTLAND: Spot, £24 per ton, c.i.f. U.K. ports.

ARSENIC.—LONDON: £22 14s. c.i.f. main U.K. ports for imported material; Cornish, nominal, £23 f.o.r. mines. SCOTLAND: White powdered £27 ex wharf; spot, £27 10s. ex store. MANCHESTER: White powdered Cornish, £23 10s. at mines.

CARBON TETRACHLORIDE.—£42 to £47 per ton.

LEAD, ACETATE.—LONDON: White, £34 per ton. Brown, £1 per ton less. SCOTLAND: White crystals, £34 to £36. Brown, £1 per ton less. MANCHESTER: White, £32; Brown, £31.

NICKEL AMMONIUM SULPHATE.—£53 per ton d/d.

NICKEL SULPHATE.—£53 per ton d/d.

POTASSIUM CHLORATE.—3¾d. per lb. ex wharf London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £37. MANCHESTER: £38.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SULPHUR.—£12 per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9. Ground American, £10 ex store.

VERMILION.—Pale or deep, 4s. 5d. to 4s. 9d. per lb.

The prices of other general chemicals remain as reported in THE CHEMICAL AGE of January 28 (pages 84-85).

Pharmaceutical and Fine Chemicals

ACID, CITRIC.—9½d. per lb.

IODINE, RESUB., B.P.—14s. 8d. to 18s. 9d. per lb.

IODOFORM, B.P. CRYST., PRECIP., OR POWDER.—17s. 7d. to 21s. 7d. per lb.

IRON AMMON. CITRATE, B.P.—1s. 10d. per lb.

POTASS. CITRATE, B.P.—1s. 8d. per lb.

POTASS. IODIDE, B.P.—13s. to 15s. 6d. per lb.

SOD. CITRATE, B.P.C. 1911, 1s. 5d. per lb.; B.P. 1932 and U.S.P. 1s. 9d. per lb.

SODIUM IODIDE, B.P.—14s. to 17s. 1d. per lb.

Intermediates and Dyes

IN the following list of Intermediates delivered prices include packages except where otherwise stated:—

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

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

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

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

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.

o-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.

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

p-CRESOL 34.5° C.—1s. 9d. per lb., in ton lots.

DICHLORANILINE.—2s. per lb.

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

DINITROBENZENE.—8½d. per lb.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 9d. per lb.

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, £10 15s. in

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

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

o-NITRANILINE.—5s. 10d. 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. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.

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

o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 6d. per lb., 100%.

Coal Tar Products

ACID, CARBOLIC (CRYSTALS).—9d. to 11d. per lb. Crude, 60's, 1s. 11d. to 2s. per gal.; 2% water, 2s. MANCHESTER: Crystals, 9½d. to 9¾d.; crude, 2s. 4d. SCOTLAND: Sixties, 1s. 7d. to 1s. 8d.

ACID, CRESYLIC.—99/100, 1s. 7d. to 1s. 8d. per gal.; Refined, 2s. 8d. to 1s. 9d.; Pale, 98%, 1s. 5d. to 1s. 7d.; Dark, 1s. 2d. to 1s. 3d. LONDON: 98/100% 1s. 3d. Dark, 95/97%, 11d. SCOTLAND: Pale 99/100% 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4¾d. per gal.

BENZOL.—At works, crude, 10d. to 11d. per gal.; standard motor, 1s. 6¾d. to 1s. 7d.; 90%, 1s. 7d. to 1s. 8d.; pure, 1s. 10d. to 1s. 11d. LONDON: Motor, 1s. 7¾d. SCOTLAND: Motor, 1s. 6¾d. to 1s. 7¾d.; 90%, 2s. 0¾d. to 2s. 1¾d.

CREOSOTE.—Standard for export, 4¾d. to 5d. nett per gal. f.o.b. for Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4¾d. London. MANCHESTER: 2¾d. to 3¾d. SCOTLAND: Specification oils, 3¾d to 4¼d.; washed oil, 4d. to 4¼d.; light, 3¾d. to 4¼d.; heavy, 4¼d. to 5d.

PITCH.—Medium soft, £4 17s. 6d. to £5 per ton. MANCHESTER: £4 12s. 6d. to £4 17s. 6d. f.o.b. LONDON: £4 10s. to £4 12s. 6d. f.o.b. East Coast port.

PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 3s. to 4s

REFINED COAL TAR.—SCOTLAND: 4¾d. to 5s. per gal.

XYLOL.—1s. 10d. to 2s. per gal.; Pure, 1s. 11d. to 2s. 2d.

TOLUOL, 90%.—1s. 10d. to 2s. 1d. per gal.; Pure, 2s. 3d. to 2s. 5d.

The prices of other coal tar products remain as reported in THE CHEMICAL AGE of January 28 (pages 84-85.)

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Purchases of sulphate of ammonia for export continue on a substantial scale, but the price remains steady at £5 12s. 6d. per ton for February shipment f.o.b. U.K. port in single bags, and £5 15s. per ton for March shipment. The home price remains at £6 7s. 6d. per ton for February and £6 10s. per ton for March/June, delivered in 6-ton lots to consumer's nearest station. The recent spell of severe weather will undoubtedly stimulate the demand for top-dressing of cereals, grassland and vegetable crops. Practically all wheat will be dressed with sulphate of ammonia this season, and a larger consumption is anticipated in the sugar beet districts. It is reported that deliveries of large quantities are now being made over the whole of England and in Scotland, and it is expected that the volume will increase considerably during the next month.

NITRATE OF SODA.—£8 16s. per ton for February/June.

NITRO-CHALK.—£7 5s. per ton. Forward bookings are again on a heavier scale than last season and indicate that this fertiliser is rapidly becoming the standard top-dressing for late season use throughout the country. A big demand is expected on vegetables and soft fruit in addition to the ordinary agricultural requirements.

CONCENTRATED COMPLETE FERTILISERS.—Since the introduction of these fertilisers in 1931 they have steadily grown in popularity and are now widely used throughout the country. These fertilisers are graded to meet the requirements of various crops on different types of soils. They are offered at the following prices and analyses:—

PERCENTAGE OF CONSTITUENTS.

	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Insol.	Potash.	Price per Ton. £ s. d.
No. 1 ..	12.5	12.5	—	15.0	10 14 0
No. 2 ..	10.4	10.4	—	20.8	10 16 0
No. 4 ..	10.4	20.8	—	10.4	10 12 6
No. 5 ..	8.0	16.0	5.5	16.0	10 9 6
No. 6 ..	7.5	26.0	6.0	7.5	12 0 0
No. 7 ..	6.5	22.5	3.0	13.0	10 12 6

The above prices are for delivery to farmer's nearest station in 6-ton lots packed in 1 cwt. bags supplied free by the sellers.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

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

Applications for Patents

PRODUCTION OF SILICOFLUORIDES. E. G. Abel and Brander Fabwerke Chemische Fabrik Ges. Feb. 14. 4533.

PRODUCTION AND USE OF DYESTUFFS. British Celanese, Ltd. Feb. 17. (Feb. 17, '32.) 4925.

DEHYDRATING PHENOLS, ETC. Chemische Fabrik von Heyden Akt.-Ges. Feb. 18. (Germany. Feb. 20, '32.) 5090.

AZO DYES, AND APPLICATION THEREOF. S. Coffey and Imperial Chemical Industries, Ltd. Feb. 14. 4522, 4523.

PULVERISING MACHINES. L. St. J. Colley. Feb. 16. 4806.

CHEMICAL COMPOUNDS, ETC. H. Dreyfus. Feb. 17. 4928.

PRESERVATION OF RUBBER. E. I. Du Pont de Nemours and Co. Feb. 15. 4641.

MANUFACTURE OF AZO DYESTUFFS. E. I. Du Pont de Nemours and Co., M. A. Dahlen and H. Jordan. Feb. 15. 4642.

APPARATUS FOR CONCENTRATING SOLUTIONS BY CIRCULATION. Escher Wyss Maschinenfabriken Akt.-Ges. Feb. 14. (Switzerland, Feb. 25, '32.) 4530.

REMOVAL OF HYDROGEN SULPHIDE FROM GASES. C. J. Hansen. Feb. 13. (Germany, Feb. 11, '32.) 4380.

MANUFACTURE OF STABLE DIAZONIUM COMPOUNDS. I. G. Farbenindustrie. Feb. 13. (Germany, Feb. 13, '32.) 4419.

HARDENING ALBUMINOUS SUBSTANCES. I. G. Farbenindustrie. Feb. 16. (Germany, Feb. 16, '32.) 4788.

MANUFACTURE OF AZO DERIVATIVES. Imperial Chemical Industries, Ltd. Feb. 13. 4399.

TEXTILE ASSISTANTS. Imperial Chemical Industries, Ltd. Feb. 15. 4638.

PRODUCTION OF CHROME PIGMENTS. J. Y. Johnson (*I. G. Farbenindustrie*). Feb. 16. 4793.

MANUFACTURE OF AGENTS FOR IMPROVING LUBRICATING OILS. J. Y. Johnson (*I. G. Farbenindustrie*). Feb. 17. 4938, 4939.

MANUFACTURE OF ALKYL HALIDES. T. Kane and E. H. Strange. Feb. 13. 4386.

APPARATUS FOR DISTILLATION OF ZINC, ETC. F. Krupp Grusonwerk Akt.-Ges. Feb. 14. (Germany, Oct. 6, '32.) 4564. (Germany, Nov. 22, '32.) 4565 (cognate with 4564).

REFINING AND STERILISATION OF LIQUID HYDROCARBONS. A. Neumann. Feb. 13. 4336.

PRESS FOR DEHYDRATING COLLOID MATERIAL. L. Robin and M. Van Roggen. Feb. 13. (France, Feb. 17, '32.) 4410.

DEHYDRATING COLLOID MATERIAL. L. Robin and M. Van Roggen. Feb. 15. (France, Feb. 18, '32.) 4678.

MANUFACTURE OF DYESTUFFS. Soc. of Chemical Industry in Basle. Feb. 16. (Switzerland), Feb. 18, '32.) 4786.

MANUFACTURE OF DYESTUFFS, ETC. Soc. of Chemical Industry in Basle. Feb. 17. (Switzerland, Feb. 18, '32.) 4973.

MANUFACTURE OF ZINC CHLORIDE. Grasselli Chemical Co., and A. W. Wahlgren. Feb. 15. 4640.

TREATING SUBSTANCES CONTAINING PROTEIN MATERIALS. Wallerstein Co., Inc. Feb. 16. (United States, April 19, '32.) 4760.

Specifications Accepted with Dates of Application

DISTILLING OR CONCENTRATING LIQUIDS. South Metropolitan Gas Co. H. Stanier, J. E. Davis, and F. Rumford. Dec. 1, 1931. 387,459.

AERATION OF LIQUIDS OR DISPERSION OF GASES OR VAPOURS THEREIN. Distillers Co., Ltd., and J. Lockey. Jan. 7, 1932. 387,486.

METHODS OF DEODORISING FISHES. Dr. K. Miyashita and U. Yamashita. Jan. 18, 1932. 387,493.

MANUFACTURE OF PIPERIDINE PENTAMETHYLENE DITHIOCARBAMATE. Robinson Bros., Ltd., and F. C. Rawstron. Jan. 20, 1932. 387,496.

DEHYDROGENATION OF HYDROGENATED HETEROCYCLIC COMPOUNDS. J. Y. Johnson (*I. G. Farbenindustrie*). Feb. 4, 1932. 387,507.

FILTER LAYERS FOR PHOTOGRAPHIC PURPOSES. I. G. Farbenindustrie. March 9, 1931. 387,519.

SOLVENT RECOVERY DEVICE FOR SPREADING, COATING, LACQUERING, OR IMPREGNATING MACHINES. A. Boecler. March 12, 1932. 387,521.

PREPARATION OF A NEW TYPE OF FIBROUS CELLULOSE ACETATES. Boehringer and C. F. Soehne Ges. March 24, 1931. 387,533.

PRODUCTION OF PLASTIC MASSES, VARNISHES, PUTTY MASSES, AND THE LIKE. Deutsche Hydrierwerke Akt.-Ges. March 28, 1931. 387,534.

PROCESSES OF MAKING CATALYSTS FOR POLYMERISING VENYL COMPOUNDS. Canadian Electro Products Co., Ltd. April 25, 1930. 387,335.

EXTRACTION OF DISSOLVED OR SUSPENDED LIQUIDS AND SPARINGLY-SOLUBLE ORGANIC LIQUIDS IN PARTICULAR, CONTAINED IN SMALL QUANTITIES IN EFFLUENT WATER. Carbo-Norit-Union Verwaltungs-Ges. May 2, 1931. 387,541.

CORROSION-PROOF ALUMINIUM ALLOYS. A. Strasser and Dr. W. Germann. May 17, 1932. 387,562.

MANUFACTURE OF DYESTUFFS. I. G. Farbenindustrie. May 26, 1931. 387,565.

PROCESS FOR REGENERATING WASTE SULPHURIC ACID. H. Frischer. Feb. 25, 1932. 387,569.

ESTERIFICATION OF ORGANIC ACIDS WITH SEPARATION OF THE ESTERS IN HIGHLY CONCENTRATED FORM. Invention Ges. für Verwaltung under Verwertung Chemischtechnischer Patente Ges. June 13, 1931. 387,573.

RECTIFICATION OF ALCOHOL. Usines de Melle and H. M. Guinot. July 6, 1931. 387,589.

PROCESS OF PRODUCING PURE LIQUID AMMONIA FROM AMMONIA LIQUOR. R. Zaniboni. July 28, 1931. 387,596.

PROCESS OF PRODUCING PURE HYDROGEN FLUORIDE. I. G. Farbenindustrie. Sept. 2, 1931. 387,614.

CORROSION-RESISTANT AGE-HARDENING ALUMINIUM COMPOSITE METALS. Durener Metalwerke Akt.-Ges.,and K. L. Meissner. Sept. 12, 1931. 387,615.

MANUFACTURE OF ESTERS FROM ALDEHYDES AND OF CATALYSTS SUITABLE FOR USE THEREIN. Dr. A. Wacker Ges für Elektro-Chemische Industrie Ges. April 25, 1932. 387,621.

APPARATUS FOR EVAPORATING SOLUTIONS AND PARTICULARLY FOR OBTAINING SALT. Escher Wyss Maschinenfabriken Akt.-Ges. Nov. 12, 1931. 387,631.

MANUFACTURE OF ALIPHATIC ANHYDRIDES. H. Dreyfus. July 27, 1931. 387,692.

MANUFACTURE OR TREATMENT OF PRODUCTS OR ARTICLES HAVING A BASE OF CELLULOSE DERIVATIVES. H. Dreyfus, July 30, 1931. 387,686.

MANUFACTURE AND TECHNICAL APPLICATION OF PRODUCTS FROM UNSATURATED FATTY ACIDS OR THEIR ESTERS. A. Carpmael (*I. G. Farbenindustrie*). July 31, 1931. 387,693.

ALLOY CONTAINING ZIRCONIUM AND TUNGSTEN FOR THE PRINCIPAL CONSTITUENT. Y. Kamishima. Aug. 7, 1931. 387,699.

MANUFACTURE OF TITANIUM OXIDE. Titanium Pigment Co., Inc. Aug. 14, 1930. 387,720.

COATING ABSORBENT MATERIALS. J. Y. Johnson (*I. G. Farbenindustrie*). Sept. 3, 1931. 387,736.

CONSTRUCTION OF LEAD CHAMBERS FOR THE MANUFACTURE OF SULPHURIC ACID. R. Moritz. Sept. 3, 1930. 387,737.

PROCESS OF MANUFACTURING 2-MERCAPTOARYLTHIOZOLES. Naugatuck Chemical Co. Sept. 22, 1930. 387,738.

MANUFACTURE OF ACID-WOOL DYESTUFFS OF THE ANTRAQUINONE SERIES. A. Carpmael (*I. G. Farbenindustrie*). Oct. 13, 1931. 387,765.

PROCESS FOR OBTAINING FAST TINTS ON THE FIBRE. Soc. of Chemical Industry in Basle. Jan. 15, 1931. 387,823.

PRODUCTION OF BITUMEN EMULSIONS. H. A. Gill (*Ges für Terrstrassenbau*). Jan. 18, 1932. 387,825.

MANUFACTURE OF PHENOL FROM CHLOROBENZENE. Dr. F. Raschig Ges. Jan. 26, 1931. 387,832.

PROCESS OF PRODUCING ALLOYS OF BERYLLIUM AND ALUMINIUM. E. Bäggli and E. Burger. Oct. 14, 1932. 387,849.

Chemical Trade Inquiries

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

British India and Burma.—A Mohammedan firm in Bombay is desirous of obtaining agencies on either a commission, purchasing or consignment basis for Northern and Western India for chemicals and drugs, disinfectants and lubricating oils. (Reference No. 276.)

Canada.—A manufacturers' agent at Vancouver desires to obtain the representation of United Kingdom manufacturers of gelatine. (Reference No. 279.)

Finland.—An agent in Helsingfors desires to obtain the agency for Finland of United Kingdom manufacturers of colours (red and yellow oxides). (Reference No. 295.)

Lithuania.—The British Consul at Kovno reports that the supply service of the Lithuanian Railway Administration is calling for tenders to be presented in Kovno by March 2, 1933, for the supply of 1,100 tons of creosote. (Reference No. F.X.1705.)

Norway.—A commission agent established at Oslo wishes to obtain the representation of United Kingdom manufacturers of paints, building materials and laboratory glasses, on a commission basis. Correspondence may be in English. (Reference No. 299.)

Brazil.—A firm in Sao Paulo wishes to obtain the representation of United Kingdom manufacturers of lead; chemical products, including bandages. (Reference No. 310.)

From Week to Week

A FIRE BROKE OUT last week at the chemical works at Caroline Park, Granton, Edinburgh, of A. B. Fleming and Co., Ltd. The roof was burned off and the contents of the top floor destroyed.

THE COUNCIL of the Iron and Steel Institute announces that Mr. Kenneth Headlam-Morley has been appointed secretary in succession to Mr. G. O. Lloyd, who will retire shortly, after an association of about thirty years with the institute. Mr. Headlam-Morley will take up his duties about the end of June.

THE REPORT OF THE PROCEEDINGS at the ordinary general meeting of the Lautaro Nitrate Co., Ltd., held on December 30 at Valparaiso, Chile, and the statement presented to shareholders of Cosach at its meeting on the same day have just reached this country.

AFTER BEING CLOSED DOWN for two years work has been resumed at the Arrow Fuel Works, Newport, Mon. The works, which are owned by the British Briquettes, Ltd., will absorb about 100 fuel workers for the first few weeks, after which it is hoped all the workers normally employed will be taken on.

SHORTLY AFTER DISCHARGING A CARGO of palm oil from the West Coast of Africa at the Bromborough Dock for Lever Bros., Ltd., a fire broke out in a hold of the oil tanker Tasmanic on February 16. Twenty men who were cleaning out the tanks were trapped, one being killed and eight others injured.

THE DIRECTORS of the Imperial Chemical Industries have appointed Mr. J. B. Gandy, manager of their Silvertown Works. Mr. Gandy has been with the firm seventeen years. He was manager of the Sandbach works until they were dismantled, and afterwards was in charge of the Middlewich works.

THE COLUMBIA ALKALI CORPORATION announces the appointment of Mr. H. W. Gleichert as manager of special products sales, succeeding Mr. Ray A. Giddings, who leaves the organisation to accept the office of secretary of the Calcium Chloride Association. Mr. Gleichert will devote his attention to the promotion and sale of calcium chloride for the Columbia Alkali Corporation.

A DAY AND NIGHT SERVICE—Sundays and Bank Holidays included—is to be maintained by Bell's Asbestos and Engineering Supplies, Ltd. The scheme is instituted in order that any industrial concern may be able to obtain instant attention in the event of a breakdown or through shortage of materials of the type supplied by this firm.

CONSIDERABLE PROGRESS HAS BEEN MADE by the Crook Chemical Works during the past fortnight. Most of the preliminary work in connection with the new industry is almost complete and it is learned that the works will be in full swing in the course of a few days. The management has decided to vacate the premises in the Market Place for a more commodious building in Bridge Street, formerly the mineral water factory of A. B. Rutherford.

"SOME ASPECTS of the Corrosion of Metals" was the subject of an address delivered last week by Mr. C. E. Beynon, of the research department of the University of Wales, at Swansea, to a joint meeting at Swansea of the members of the local section of the Institute of Chemistry and Society of Chemical Industry. Following Mr. Beynon's address there was a general discussion of electro-chemistry practices.

A WOLVERHAMPTON FIRM of paint and ink manufacturers, Mander Brothers, Ltd., sold to a customer in Chile, one of the countries where the export of currency is forbidden under strict regulation, a quantity of ink. Being unable to pay them in any other way, their customer sent them a bundle of seventeen Chilean rugs. These they have now sold for an amount covering the sum owed to them. This is another example of the return to barter in trade.

THE ANNUAL PRESENTATIONS of long service awards to the employees of the Imperial Chemical Industries at Winnington, Sandbach, Middlewich, Lostock, Silvertown, and Fleetwood, took place at Winnington, Northwich. In 1918 Brunner Mond and Co. instituted a scheme whereby employees, on completing twenty-five years' service, received a silver watch, thirty-five years' service a gold watch, forty years' service a gold medal, and fifty years' service a chiming clock. On this occasion two chiming clocks, forty-one gold medals, forty-six gold watches, and 141 silver watches were presented.

THE SECOND ANNUAL DINNER of the Scottish section of the institution of the Rubber Industry was held at Glasgow last week, presided over by Mr. A. Ryan. Proposing the toast of the "Rubber Industry," Professor F. J. Wilson said that the uses of rubber were now very varied, but the industry was ever seeking new outlets for its product. Replying to the toast, Mr. Eric MacFadyen, president of the Institution, said that the use of rubber was being extended everywhere. Mr. William Watson, of the Scottish National Development Association, who proposed the toast of the "Scottish Section," said that it could be claimed that there was no British industry more progressive than the rubber industry, and to-day it was being exploited to the uttermost.

A NEW FACTORY for the packing of chemical products has been established by Saorstat United Chemicals at Marshall Lane, Thomas Street, Dublin.

THE COAL UTILISATION COUNCIL has published a booklet on the aims and policy of the Council. The work of the Council falls into two sections, research and propaganda, both of which are dealt with fully. Up to three copies are given to individual applicants free.

IRISH RADIUM PRODUCTS, LTD., has recently established a large factory at Waterford for the manufacture of chemical polishes and similar products. Most of the capital for the company was subscribed locally.

TO MARK HIS RETIREMENT from the post of manager of the Clarence Works of Dorman Long and Co., Ltd., Mr. E. D. Morgan was presented with a grandfather clock on February 21 at the head offices of the company, at Middlesbrough.

THE TITLE of Thew, Partridge and Co., Ltd., Lustra Works, Liverpool, has been shortened to Thew's, Ltd. There has been no change in the personnel of the company, the alteration in title being simply a matter of convenience.

A MEETING of the Chemical Society of Ulster was held in Queen's University, on February 16—the President (Mr. C. L. Wilson,) in the chair—when a paper was delivered by Miss A. Hopkins on "The Alkali Industry." Miss Hopkins gave a descriptive account of the industry and the allied industries of salt mining and purification and soap manufacture.

LECTURING AT STOCKTON on February 15 on the romance of the chemical industry at Billingham, Capt. A. Hayton Cowap, a director of the Synthetic Works, said that Billingham with its coal supplies within nine or ten miles and its beds of anhydrite and salt underneath and adjacent was the most efficient site for a nitrogen factory in the world.

SIR JOHN CADMAN, chairman of the Anglo-Persian Oil Company, and Mr. William Fraser, the deputy chairman, accompanied by certain of the expert advisers, will leave shortly for Teheran. It is hoped that the visit may facilitate a settlement of the dispute regarding the cancellation of the company's concession. Meanwhile, the conversations at Geneva are suspended until next May at the earliest.

REGARDING A RUMOUR that the business of Pullar's Dyeworks was shortly to be transferred to London, it is stated that while considerable alterations are being made and a re-organisation of the business is being carried through by officials from London, there is no truth in the rumour that the Perth works of the firm are to be stopped. Pullars are associated with the London firm of dyers and cleaners, Eastman and Son.

DR. J. H. PATERSON lectured on "Electric Welding" at a meeting of the Tees-side branch of the North-East Coast Institution of Engineers and Shipbuilders at Middlesbrough on February 16. Dr. Paterson outlined all processes of welding, emphasising the importance of a theoretical study of the craft. He said that welded tanks were cheaper, lighter, and stronger than the old type, and that welding had resulted in tank manufacture being revolutionised.

THE TRADE MARKS COMMITTEE, under the chairmanship of Viscount Goschen, has begun its investigations, and persons and associations who wish to submit suggestions or to give evidence before the committee are invited to communicate with the Secretary, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25 Southampton Buildings, W.C.2. The committee was appointed by the Board of Trade to report whether any, and if so what, changes in the existing law and practice relating to trade marks are desirable.

AS THE RESULT of the explosion of two gasoline vulcanisers in a Chinese rubber factory in East Shanghai eighty-one persons were killed, fifty seriously injured, seventy slightly injured and ten are missing. Many of the seriously injured are in a critical condition. There were two explosions. The first was followed by a fire, while the second blew out the wall and ceiling of the boiler room, precipitating 160 girl workers from the upper floor into the flames below. The cause of the catastrophe has not yet been established. The owner of the factory has disappeared.

Obituary

ALEXANDER WATERS, of William Waters & Co., Clippens Chemical Works, Paisley, last week at Paisley.

THOMAS GEORGE, at Pontardawe, Swansea Valley, last week, chief works chemist of Gilbertsons, Pontardawe, for 30 years. Mr. George was a well-known authority on steel alloys.

LEWIS SAMUEL PETERS, at Torquay on February 6. A well-known St. Austell china clay merchant, Mr. Peters was for many years works overseer in the china clay works of Parkyn and Peters. He was 68 years of age.

WILLIAM MAJOR, civil engineer for many years to the Coppie Works. Mr. Major erected the Tondu and Bargoed by-product works, and was also responsible for the erection of several by-product works in England. Aged 55.

Sensible Heat Distillation, Ltd.

No Return to Unsecured Creditors or Shareholders

THE statutory first meetings of the creditors and shareholders of Sensible Heat Distillation, Ltd., were held at the London Bankruptcy Court, before Mr. H. P. Naunton, assistant official receiver, on February 21. The chairman said that the accounts filed under the liquidation showed total liabilities £31,998 (ranking £10,678), assets £21,310 (absorbed in debenture claims of £29,551); and a total deficiency of £160,649 with regard to contributories, the issued capital being returned at £138,971. There was no possibility of any return being made to the unsecured creditors or the shareholders.

The official receiver said that the company was promoted in June, 1924. Practically the whole of the company's expenditure until May, 1925, was on the construction of distillation plant at Barugh, near Barnsley. Its further business had consisted of testing various qualities of coal, etc., from different parts of the country and abroad and the erection of powdered fuel plant. The plant was ready for testing in February, 1926. It had, however, never been put into operation, and apparently was not a commercial success. In January, 1928, a prospectus was issued, and £65,000 of new money was brought into the coffers of the company between December, 1928, and the following April. In November, 1930, debentures for £25,000 were issued. Subsequent issues increased the debenture debt to £29,551 in November last, when Mr. J. H. Senior, C.A., was pointed receiver on behalf of the bondholders. Apart from numerous losses in connection with associated companies and the cost of the experimental plant at Barugh, the company had spent about £100,000 on general research work, etc.

Voluntary Liquidation

Allen Craig and Co. (London) Ltd.

THE statutory meeting of the creditors of Allen, Craig and Co., Ltd., chemical manufacturers, St. Dunstan's Buildings, St. Dunstan's Hill, London, E.C.3., was held on February 20, at the Institute of Chartered Accountants. Mr. W. T. Allen, managing director, stated that the company was incorporated on July 5, 1921. In 1925 he was attending to the outside business of the company and doing extensive travelling and at that time there were changes in the directorship. In 1926 another of the directors resigned and in the following year the company moved to its present address. After that date it was found that the company's books were hopelessly in arrear and the directors sought the assistance of chartered accountants to get balance sheets made up. Soon after the company removed to the new offices the business increased and the directors still did not know the position as the books had not been then completely written up. In 1928 the company incurred a loss of over £4,000 through the failure of a radio company and the position had been seriously affected by the suspension of the gold standard, it being pointed out that the company did a big business abroad. A further loss was sustained owing to the failure of a Belgian house, and it was necessary for the company to find further capital. Believing that the business of the company was good, he persuaded a friend of his to put up money and become a director, and that gentleman had advanced £12,000 to the company in all. At a meeting of the shareholders held that day, resolutions had been passed nominating Mr. D. Lewis, Kennans House, Crown Court, Cheapside, London, E.C., and Mr. J. R. Stephens, 4 London Wall Avenue, E.C., as joint liquidators.

Mr. Stephens stated that a statement of affairs had been drawn up which showed that there were unsecured trade liabilities and expense creditors amounting to £26,311, and there were unsecured cash creditors for £17,000. The bank were fully secured creditors for £4,545, and held securities valued at a similar amount. The net assets amounted to £2,526, or a deficiency of £40,795 so far as the creditors were concerned. The deficiency as regarded the contributories would be increased by a further £10,000, making the total deficiency £50,794.

Mr. Stephens said that the deficiency account showed that at July, 1930, there was a debit on profit and loss account of £30,000, and there had been a loss up to date of £9,411. The amount written off the assets was £3,202, and off goodwill £8,000. The company had been doing a big business and making large gross profits, but its overhead expenses had always been too high. Mr. Stephens pointed out that the chairman had drawn a salary of £1,000 per annum. In reply to a question he stated that the profit on contracts and the commission on sales from July 1, 1930, to February 16, 1933, was £14,152. The expenses had amounted to £23,000, and there had been a loss for the period of £9,411. The salaries were £9,303; commissions £3,677; directors' expenses £427; general expenses £1,235; whilst motor and travelling expenses had absorbed £2,665.

A resolution was proposed that the voluntary liquidation of the company should be continued with the two liquidators suggested, but an amendment was carried to the effect that Mr. Dudley Lewis should act as sole liquidator, with a committee of inspection.

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 March 8, 1933.

Griffex. 535,833. Class 1. Chemical substances used for scientific research and in photography. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2; October 18, 1932. (By consent.)

Brooko. 537,368. Class 4. Distillates of petroleum, mixed with American turpentine, for use in manufactures as a substitute for turpentine. Brooks Trading Co. (London), Ltd., 127-128 Terminal House, 52 Grosvenor Gardens, London, S.W.1; December 9, 1932.

Company News

International Petroleum Co.—A dividend of 25 cents, United States currency, per share, is announced payable on and after March 15.

Salt Union.—A dividend is announced of 9 per cent. on the ordinary shares; the sum of £20,000 is placed to contingencies, and £15,800 is carried forward.

Crossley Brothers.—The report for the year 1932 shows a net loss of £30,533, which, deducted from £43,817 brought forward, leaves a credit of £13,284 to carry forward.

Courtaulds, Ltd.—For the year 1932 the gross profit amounted to £1,659,050, against £1,101,587 in 1931, an increase of £557,463. The ordinary shares are to receive a final dividend of 2½ per cent., tax free, making 4 per cent., tax free, for the year, a reduction of 1 per cent. The directors have written off or reserved in respect of continental investments and advances a sum of £207,007, while the carry-forward is raised from £147,344 to £239,387.

Bradford Dyers' Association, Ltd.—During 1932 a loss was incurred of £54,030, after providing £177,198 for depreciation and after crediting surplus provision for income-tax. Including interest on debenture stock, £58,150, investments contingency fund amount transferred £1,024, and dividend on preference stock for the year, £127,462, the total debit was £240,666. To meet this loss, £250,000 has been withdrawn from reserve and added to the credit of £24,187 brought in, and £1,024 profit on investment realised, leaving a surplus of £34,545 to go forward. The loss for the year 1931 amounted to £12,215, after providing £190,379 for depreciation and after crediting surplus provision for income-tax.

Forthcoming Events

Feb. 27.—The Institute of Plastics Industry. Smoking Concert. 7.45 p.m. Swan Hotel, Hammersmith Broadway, London.

Feb. 27.—University of Birmingham Chemical Society. "Clay." Dr. H. W. Webb. 5.30 p.m. Chemical Lecture Theatre, Edgbaston, Birmingham.

Feb. 28.—Institute of Fuel (East Midlands Section.) "Survey of Modern Tendencies in Boiler Design." F. Dransfield. 7 p.m. Technical College, Green Lane, Derby.

Feb. 28.—Royal Institution. "Analysis of Crystal Structure by X-Rays: A Review of the Work of Twenty Years." Sir William Bragg. 5.15 p.m. 21 Albemarle Street, London.

Mar. 1.—Institution of the Rubber Industry (West of England Section). "Elimination of Waste." W. G. Martin. Town Hall, Trowbridge.

Mar. 1.—Society of Public Analysts. Annual General Meeting. 8 p.m. Burlington House, Piccadilly, London.

Mar. 2.—Students' Chemical Society of the Manchester College of Technology. "X-Ray Investigations and the Solid State." Dr. J. West. 5 p.m. Large Chemical Lecture Theatre, E.17.

Mar. 2.—Institute of Metals (Birmingham Section). "Spectrographic Analysis." E. H. S. van Someren. 7 p.m. University, Birmingham.

Mar. 2.—Society of Chemical Industry (Bristol Section). Annual Meeting. "The Laboratory and the Board Room." R. D. Littlefield. 7.30 p.m. University, Bristol.

Mar. 2.—Chemical Society. 8 p.m. Burlington House, London.

Mar. 2.—Institution of the Rubber Industry (Midland Section). "Steam." G. A. Williamson. Grand Hotel, Birmingham.

Mar. 3.—The Chemical and Physical Societies of the University College of South Wales and Monmouthshire. "Britain's Coal Problems." Professor W. A. Bone. 7 p.m. University College, Cathays Park, Cardiff.

Mar. 3.—Oil and Colour Chemists' Association (Manchester Section). Joint meeting with the Society of Chemical Industry. "The Accelerated Weathering of Paints and Varnishes." Dr. V. G. Jolly. 17 Albert Square, Manchester.

Mar. 3.—The Physical Society. 5 p.m. Imperial College of Science, South Kensington.

Mar. 4 and 11.—Royal Institution. "Detection and Production of Swift Particles." Lord Rutherford. 3 p.m. 21 Albemarle Street, London.

New Companies Registered

English Glue Manufacturers, Ltd., Thames House, Millbank, London, S.W.1. Registered on February 15. Nominal capital £100 in £1 shares. Manufacturers, importers and exporters of and dealers in glue, gelatine of all descriptions, phosphates, and any kindred substances and their intermediates, manufacturers of and dealers in chemical manures and fertilisers, bone crushers, oil and colour men, etc.

N. W. Chemical Company, Ltd. Registered on February 15. Nominal capital £500 in £1 shares. Manufacturers of any chemical ocmpounds, whether patented or otherwise, manufacturers, importers and exporters of and dealers in chemicals and things capable of being used in the manufacture of soap, solvents, cleaning materials, etc. Directors: N. E. Willis, 17 Swinnow Avenue, Bramley, Yorks., and Herbert Brodrick.

Palsco, Ltd. Registered on February 14. Nominal capital £1,000 in £1 shares. Chemists, druggists, drysalters, oil and colour men, etc. A subscriber: Victor E. Davey, 77 Central Park Road, East Ham, London, E.6.

R. H. Linton, Ltd., 19 Devereux Court, Strand, London, W.C.2. Registered on February 3. Nominal capital £500 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, plaster of Paris, etc. Directors: R. H. Linton and C. H. James.

Whitehall Paints, Ltd., 118 Weston Street, Bermondsey, London, S.E. Registered on February 10. Nominal capital £1,000. Objects: To adopt an agreement with J. G. Bearn, F.I.C., and B. C. Lethbridge, and to develop and turn to account the business of a paint manufacturer carried on by the said J. G. Bearn and comprised therein. Directors: C. F. Cook, J. G. Bearn and J. W. Lewer.