The Chemical Age

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Notes and Comments

Chemical Industry and Fuel Research

THE close association of the chemical industry with the study of the use of fuel was strikingly demonstrated at the annual meeting of the Institute of Fuel on Monday, when Sir Harry McGowan, chairman and managing director of Imperial Chemical Industries, Ltd., was installed in the presidential chair and Dr. Friedrich Bergius presented the Melchett memorial lecture. The founder president of the Institute was the first Lord Melchett, who was Sir Harry's predecessor in the chairmanship of Imperial Chemical Industries, Ltd. Dr. Bergius, on whom the Institute with great satisfaction bestowed the Melchett Medal, carried out the pioneer work which led to the modern development of the hydrogenation of oil from coal. Upon the foundation which he laid, Imperial Chemical Industries, Ltd., has based a great mass of further research and experimental work, as a consequence of which it is to-day in process of erecting a new large plant at Billingham for the production of oil from coal.

Sir Harry McGowan's work in the chemical industry has lain on the commercial and financial sides, but experience has taught him something of the vital connection between research of all kinds on the one hand and commercial and financial prosperity on the other, and it was in the light of this experience that he based his presidential address on the value of research to the fuel industries. He pointed out that research in one industry cannot ignore the results of research in others, for all economic facts, separate though they may appear to be, are intimately connected, so that their position in relation to one another makes up the circumstances in which we produce and work. A change in any part of this multi-dependent structure inevitably brings about changes in other parts, so that he who would be in the forefront cannot limit his range of vision to his own industry, but must be broadly aware of major developments in other fields. This is particularly the case with the fuel industries, for fuel is consumed always in conditions which are partly the result of physical, chemical and engineering developments. Every change in the one predicates alterations in the other. Research in the fuel industries is therefore no simple subject, but rather one which, if considered from the point of view of cost, may be thought to open up such a vista of illimitable expenditure that there may well be hesitation before fresh work is undertaken. Sir Harry McGowan, however, has no fear that the fuel-producing industries of this country will take a short view of this problem.

Dr. Friedrich Bergius

DR. BERGIUS has very properly been complimented by the Institute of Fuel by the award of the Melchett Medal. His pioneer work has obviously been of great value, in forcing forward the use of hydrogen, at high pressures, in unlocking coal into oils. The part he has himself taken is not clear. It seems to have been largely that of propagandist and keeping the money chest supplied. Unlike many inventions, it came at a propitious time and was at once played with by others. The address he gave was disappointing, being little more than an account of the difficulties to be overcome by the inventor. A real history of the invention, written while the facts are available—it cannot be said "to the fore," because much of the work has been hidden—is very desirable. The astonishing thing to the chemist is that the hydrogenation of coal should prove to be so easy—in the main an engineering problem; further, that the products should be so simple. The most illuminating passage in the address is the statement:—

> "In the case of the liquefaction of coal, the problem was one of introducing the finely divided coal continuously into the high-pressure plant and this was of really fundamental importance for the development of the process. During the laboratory experimental stage, we did not allow this difficulty to worry us too much but eventually several years were necessary for working out a really practicable method for its accomplishment."

A good illustration this of the difference between practice and theory—of the distance separating idea from accomplishment. Of the why and wherefore of the hydrogenation process, as yet, we know nothing: the action of the promoters used is entirely outside our ken at present. As usual, science comes in mainly after the event—to explain what has been done in practice. Research must be founded upon imagination and what we most need to-day is the imaginative mind. Given ideas to work upon, we can do almost anything.

German Hydrogenation Scheme

THE formation of the Lignite Petrol Co. in Germany has aroused an unusual degree of interest in commercial and political circles. The company has been formed under the auspices of the Ministry of Economics with the object of producing oil from the hydrogenation of lignite. The I. G. Farbenindustrie and nine other leading German lignite producers are the shareholders and the share capital amounts to RM.100,000,000.

Most of the country's consumption of petrol, lubricating and gas oil at present has to be imported from abroad, and the object of the Lignite Petrol Co. is now to set up a huge lignite hydrogenation plant, the gradual extension of which will enable Germany in a few years' time to cover her motor fuel supplies from domestic sources. So far the talk of German politicians and economists, including Dr. Schacht, about self-sufficiency, has not always been taken very seriously abroad. The present case, however, should be ample proof that Germany is determined even at the cost of heavy sacrifices (petrol from lignite is about five times as expensive as petrol from mineral oil), to rely in an increasing degree on her domestic resources.

The company represents in the industrial sphere a complete novelty in the way in which State management is combined with private property. According to a recent Decree, the German Minister of Economics has the power to link German lignite producers together in a cartel with the object of financing a company for the hydrogenation of lignite. When the process of plant construction requires additional capital the Government will incorporate other producers into the cartel, and the amount of their respective financial contributions will be fixed by the Government. Altogether the estimated capital expenditure will amount to RM. 200-250,000,000. The board of the company is not elected by shareholders, but appointed by the Government. At the same time, the Minister of Economics has appointed a Reich Commissioner for the company who alone is responsible for the management. Shareholders, it is true, are still the owners, but management rests completely with the State. In the industrial field, this is the first obvious case of full-fledged State Socialism in Germany, and as such its importance should not be minimised, as it is expected to be followed by similar steps in other industries.

A Committee to Taste Chocolate

THE responsibility of the food manufacturer in ensuring that his goods maintain a definite standard of purity and quality in spite of the varying qualities of the ingredients that nature supplies has been tremendously increased since so large a portion of the chemical profession has turned its attention to the study of the purity of food. If he has spent thousands of pounds a year on making his brand names known he cannot afford to allow the quality of his goods to vary. Incidentally, that is why the public can always rely upon nationally advertised branded goods. Cadbury Brothers, Ltd., may be taken as an example of a firm that takes the utmost care in stabilising quality. Every Wednesday there is a meeting of the tasting panel, the members of which have been chosen for their keenness of palate. Every now and then they are subjected to tests to ensure that their palates are still efficient in the appreciation of flavours and the detection of errors in mixing or quality standards. The panel may have to sample 32 different chocolates. We are told that the members go without lunch that day; so the job is not quite so enviable as most small boys would imagine. There is also a cocoa panel which keeps guard over the quality of cocoa and drinking chocolate and the recommendations and findings of the two panels go before the quality control committee that sits every Friday. The importance of this body may be judged from the fact that it has a special department and a secretary of its own. The committee consists of a director in the chair, the head chemist and one of his assistants, and representatives of the experimenting, costs, inspection office, labels and packing and buying departments.

The committee may have to test as many as 50 samples of new and regular stock lines, and it may take three months before a new chocolate is approved as good enough to carry a Cadbury trade mark. Of course, new lines are not introduced every week, but the committee is kept busy, for samples from production are continually being tasted against the control samples to ensure that a standard quality is being maintained. Should a batch be found in the opinion of the committee to be better than the control it immediately becomes the standard to which all future batches must be matched. An important feature of this committee's work is to see that any lines introduced will keep satisfactorily as regards flavour and consistency so that the consumer gets the chocolate or confectionery in an ideal condition.

The Alert Industrialist

THE chairman of the Hull and District Seed Crushing Association is reported to have expressed the fear that the seed crushing industry is being threatened by whale oil. The crushing of seeds is an occupation of quite hoary antiquity, having been commenced in the fourteenth century because of the shortage of whales. When the small size of even the largest ships of that time is considered, it is evident that the catching of whales must have been a distinctly interesting pursuit. Now, after 500 years, modern methods have led to such an abundance of whale oil that the old industry is threatened. The continual need for watchfulness in business trends is thereby emphasised. The alert business man will endeavour to foresee whether the industry upon which his concern is based is likely to retain its markets and to take steps to meet whatever contingencies may arise. The change in the products manufactured by many factories erected in the first place purely for the making of munitions is perhaps an outstanding example of what can be done. The directors are the guardians of the shareholders' money and watchfulness is as necessary for them as it is for the sentinel to an army. The difficulty to-day is that the older industries are threatened on all sides by newer ones, and that synthetic products, or products from other fields, have taken the place of the established goods.

Research is one method of staving off disaster, but even research is not omnipotent and in many instances a change in products manufactured is the only possible step. The firm that depends upon one type of goods is in a weak position to-day. The kaleidoscopic changes of the twentieth century force the industrialist who hopes to survive to watch for chances of extending his markets and his products. Research has not, of course, yet said the last word even in the industry of seed-crushing. It is a moot point, depending upon the trend of prices, whether crushing is preferable to chemical extraction by solvents. When the product of oil seed crushing is to be used for edible purposes, no solvent yet suggested is ideal. If chemical means can be found of cheapening the operation, the industry, which is of considerable importance, will be enabled to resist the present threatening competition.

Research in the Fuel Industries

Sir H. McGowan gives an Appreciation of its Value in his Presidential Address to the Institute of Fuel

IN his presidential address to the Institute of Fuel on November 12, Sir Harry McGowan said that the word "fuel" covered a wide variety of products, among which were wood, peat, coal, coke, semi-coke, coal gas, crude oil, Diesel oil, petrol, and natural gas. The important characteristic of all fuels other than wood or peat was that they were wasting assets. Science as yet knew no means of reproducing the supplies consumed. Our main national asset was coal, on which our industrial prosperity had been based. In Great Britain, coal was largely used in its raw form for domestic power and heating purposes.

Wasteful Domestic Uses

" What," Sir Harry asked, " has been done in the way of research into the domestic use of coal?" Though a certain amount of development had been carried out on fire grates and so on, he suggested that the effort expended on the use of coal by the household consumer was totally disproportionate to the value of the product used. The ordinary open-hearth grate burning coal, in spite of its many excellencies, let loose sulphur fumes and smoke which did an immense amount of damage to structural materials and a hypothetical amount of damage to health. There was also semi-coke, which was produced by the low temperature carbonisation of coal. At one time this process had been expected to do great things and to make great fortunes, but though the process was, with some notable exceptions, a success in itself, it had not yet been appropriately fitted into the complex structure of demand for various products. The householder accordingly was not yet able to obtain a fuel for his grate which would give the present satisfaction of coal and yet leave him with a clear conscience as regards his civic responsibilities.

Oil was actually invading the home, while whole suburbs of cities in France were heated by a high-pressure hot-water ring main based on coal, thereby achieving an astonishing measure of fuel economy. Though processes of a like character were making a certain headway in this country, they were still insufficiently considered in the working out of town planning schemes.

Improved Industrial Use of Fuel

The state of affairs was very different in the industrial use of coal. Whereas formerly the manufacturer was content to buy coal as coal, and not to worry about its ash content, calorific value, water content and so on, this was now all changed. Coal was now bought mainly on its effective heating value, and the specific nature of modern demands had brought on to the market a much better coal than was previously thought to be obtainable. In the power field there were ordinary coal, powdered coal and colloidal fuel. The modern boiler plant was an incomparably more efficient machine than the plant of 35 years ago. Powdered coal was comparatively a new-comer in the field, enabling lower grade material to be burnt in the most economical manner. Powdered coal plants were especially efficient in the very high temperatures they would rapidly attain and their quick adjustments to varying loads.

" How many people," Sir Harry asked, " give a thought, on a winter afternoon when, say, about two o'clock, the sky becomes overcast and they turn on their electric light—how many of them give a thought to the sudden and tremendous strain upon the power stations?" Powdered coal enabled this strain to be met, and in this form coal had by its recent developments succeeded in resisting the further invasion of oil. In the absence of powdered coal, oil would have supplanted coal over an even wider field than it had done already.

Powdered Fuel for Diesel Engines

Colloidal fuel had not achieved the success it appeared to deserve, but it frequently happened that an invention supposed to be no good eventually turned out a great success. For example, Diesel's original idea of driving an internal combustion engine on powdered coal. Various technical difficulties forced him to turn over to using heavy oil. Sir Harry suggested that this fact merited the most serious attention of the coal industry at the present moment. A Diesel engine using powdered fuel would necessarily attain a very high efficiency, and might easily go a long way towards restoring the disproportionate consumption of oil as against coal. He would submit to the Institute of Fuel that the development of an efficient powdered fuel Diesel engine would be one of the most striking ways of restoring coal to its old supremacy.

Need for a National Gas Grid

Great Britain was a pioneer in the gas industry, and to-day leaders of the industry were turning their attention to the prosecution of research on a wide front. It was difficult to hold the scales fairly between gas and electricity, but Sir Harry saw no reason why they should not progress side by side as friendly rivals. Some industrial operations could be far more economically undertaken by gas. For example, gas was storable, while electricity was not. Despite the fact that we had a huge electric grid system over the whole country, there was only one reasonably sized gas grid (in the Midlands), and as yet nothing to compare with the big German high-pressure gas grids. A national gas grid might fulfil many useful functions without injuring the interests of electricity.

The oil industry had the whole world for its market, and used all the very latest methods of geo-physics. The industry had solved tremendous problems in distillation, cracking and utilisation. The great strides which oil had made in the domestic field were due largely to the admirable service and research propaganda which might be cordially commended to the coal industry.

Production of Oil from Coal

The production of oil from coal was an excellent example of both pure and industrial research. " Dr. Bergius," said Sir Harry, " was responsible for the former, for pioneering the way, but industry has followed up his work by research on the very largest scale." The expense had run into millions of pounds, but he was convinced the money was well spent. " My own company," went on Sir Harry, " erected and ran, for a very considerable period, experimental plant making about 30 tons of petrol a day. The results were so satisfactory that we decided, as the public know, with the assistance of the Government, to proceed on a much larger scale. The results may be incalculable. To the British mind, practice is more potent than theory, and if our example at Billingham proves successful, as I am certain it will, a lively interest by the public at large may be confidently expected."

The last fuel was natural gas, of which there was none in this country, although no less than 25 per cent. of the electricity produced in Vienna was derived from natural gas drawn from the ground a few miles from that city.

Encourage Research by Prizes

The briefest review was sufficient to show that the fuel industries presented an uneven front of research. It was easy to criticise, but the critic should always ask himself the question, " What would you do?" Sir Harry suggested that the example of the recent great air race to Australia should be taken into consideration, and that there were two methods of procedure, the first by prize, and the second by levy. There was nothing new in the former. As long ago as the 18th century the discovery efforts of seamen and merchant adventurers were held up by difficulties in navigation arising from the lack of a chronometer. The Government of the day did not hesitate to offer what at the time were enormous financial prizes. The result was the development of the Harrison chronometer, and a revolution in navigation. The Melbourne air race suggested the same procedure. It needed the stimulus of the prize of the air race to Australia and the remarkable performance of an American machine carrying passengers and mails to stir public opinion in this country.

Could not the fuel industries also be helped by prizes? There were in Great Britain to-day first-class marine architects who maintained that it was possible to build a ship without funnels and with a far better fuel performance than anything at present at sea. What would happen, for example, if a prize of, say, £100,000 were offered for a ship to be driven, say, alternately by coal and oil, so that when coaling at cheap coal ports she would fire coal, and at cheap oil ports would fire oil. Specific requirements regarding cargo space, passenger accommodation and the like could be stipulated. Sir Harry suggested that an offer of this kind might result in the evolution of a ship which would give the United Kingdom again its old lead in shipbuilding, and revive a large demand for coal at the same time. There were many other problems, the solution of which would also receive a great stimulus from direct financial reward.

A Fuel Development Committee

As regards the possibilities of a levy, Sir Harry said that the coal industry should be well acquainted with the levy principle, for it was that which financed the Miners' Welfare Fund. He found it difficult to over-assess the good which might accrue to the fuel industries by a research organisation conducted on really generous lines through the mechanism of a financial levy. He envisaged the raising of a sum of about a quarter of a million pounds annually, which might be entrusted to a " Fuel Development Committee," governed by an administrative council composed of representatives of the industry and well-known scientists. This body could divide its work between active technical research, market research, and systematic public education and propaganda. As regards the first, the amount of money available would enable full-scale trials to be made of improvements, and thus avoid any development of the practice which was current to-day, by which new processes were tried out by the flotation of new companies to develop patents before adequate work had been done to test them. That was a most wasteful method.

Market research would cover research into bunkering and a most intensive study of the demands of foreign and home buyers, the co-ordination of distribution at home and abroad, and the like. Under the head of propaganda a great deal more could, in Sir Harry's opinion, be done to bring home to the general public the results of modern fuel research. In some cases local demonstrations would serve; in others, it would be necessary to use large-scale examples, even if necessary to develop a whole new building area.

Sir Harry concluded by saying that he had no fear that the fuel-producing industries of the country would take the short view. He felt confident that the industry would benefit by the increased rapidity of development that was becoming noticeable and contribute by its energy and initiative in the realm of research to the general improvement in the well-being of the community.

Sir WILLIAM LARKE proposed a vote of thanks to Sir Harry McGowan for his address and supported what had been said in regard to research. He expressed the view that we are now passing through a new industrial revolution, one that was not often commented upon, but one which he believed might be defined as the era of new products. All the research now being carried out in various industries was having repercussions in a very wide field. Progress in the past with regard to fuel developments had been slow, not because the limits of development of the engineer in the uses of fuel, and in higher temperatures and pressures had been reached, and not because the limitations of the engineer and the physicist or the fuel expert had been reached, but because of the limitations of the materials with which they had been provided.

Sir Harry McGowan's Travels

Mr. W. M. SELVEY seconded the vote of thanks to the president and, commenting on the question of market research, said that this involved going out into the markets of the world if the desired results were to be obtained. Few men in industry had done this more than Sir Harry McGowan, but yet it should not be overlooked that such travelling involved a great deal of inconvenience and discomfort. The work done by Sir Harry for the fuel industries in particular was of the very first importance and the Institute was showing how much it appreciated that work by asking him to accept such honour as was at its disposal, *viz.*, the presidency.

Sir HARRY McGOWAN, acknowledging the vote of thanks, said he had been very much impressed by what Sir William Larke had said as to what was going on in the steel industry, and he certainly definitely resented expressions of opinion which were given from time to time inferring that the steel trade was inefficient, and that nothing was being done to make it efficient. That was a most unfortunate state of mind to get into and was a thoroughly defeatist attitude to take up.

On the motion of Mr. T. Hardie, seconded by Dr. R. Lessing, a hearty vote of thanks was accorded Sir William Larke for his services as President during the past year.

Sir WILLIAM LARKE, acknowledging the vote of thanks, said that anything that he might have done for the Institute had been more amply repaid by its progress and by the position it had established among the learned and technical societies not only in this country but of the world. Moreover, much of that progress was owing to the enthusiasm and energy of the secretary, Mr. Pope.

The Duke of Kent Attends the Annual Dinner

THE Duke of Kent attended the annual dinner of the Institute at the Connaught Rooms on Monday evening and presented the Melchett Medal to Dr. Friedrich Bergius. Sir Harry McGowan, president, was in the chair.

The DUKE OF KENT, in proposing the toast of the Institute, said that although it was incorporated only in 1927 it had, as well as its position in this country as one of the leading scientific institutions, many international affiliations; as many as 29 countries were represented in its memberships. Their first Melchett medallist was a German industrialist; their second a Swedish scientist; their third an American industrialist; and their fourth an English professor. They were now giving their medal to a German scientist. His work had laid the foundations of a new fuel industry, the hydrogenation of coal, which was being more developed in Britain than in any other country in the world.

Sir HARRY McGOWAN, in reply, said that the Institute was founded on research, and in that he believed had set an example to the country. Industrialists were becoming more and more research-minded. Dr. Bergius had discovered by research that coal could be hydrogenated into various kinds of oil. In Germany his process had for years been used in extracting petrol from brown coal, and oil-producing companies in the United States were now distilling their heavy oils by methods founded on his discovery. His (the chairman's) own company, Imperial Chemical Industries, was now engaged in building a plant at Billingham which they hoped would produce 150,000 tons a year of petrol from coal and creosote, beginning in the New Year. They were spending £3,000,000 on that enterprise and in the building of the plant more than 12,000 people were being employed directly and indirectly.

Dr. BERGIUS was then presented with the Melchett Medal, and in reply briefly expressed his thanks for the honour which had been conferred upon him.

Sir WILLIAM LARKE proposed " The Visitors," and Mr. OLIVER STANLEY, Minister of Labour, replied.

National Physical Laboratory

PAPERS published from the National Physical Laboratory during October include:—

" The freezing point of platinum." By F. H. Schofield, B.A., D.Sc. "Proceedings of the Royal Society, A," *146*, 792.

" Distortion of the crystal lattice of α-Brass," By W. A. Wood, M.Sc. " Nature," *134*, 572.

" Lanolin Rust Preventers." 2nd Edition. By C. Jakeman. D.S.I.R. Engineering Research Special Report No. 12. H.M. Stationery Office, price 6d. net.

" Two designs of flowmeter and a method of calibration." By G. Barr, B.A., D.Sc. " Journal of Scientific Instruments," *11*, 321.

Building Up a Large-Scale Industry

Dr. Friedrich Bergius Outlines an Inventor's Difficulties

Dr. Friedrich Bergius, Melchett Medallist, 1934.

It is a mistake to believe that the inventive idea in itself is necessarily the source of a new industrial development, based on inventive activity and technical advancement, said Dr. Friedrich Bergius, at the commencement of the Melchett Lecture, delivered to the Institute of Fuel, in London, on November 12. It is quite possible that the economic or commercial necessity for the production of a new material may not only be a stimulant to inventive thought, but may indeed act as a compelling force.

In his laboratory at Hanover he worked simultaneously upon high-pressure hydrogenation in relation to both coal and oil, and the master patents of both these processes date back to the year 1913, but he was led to the inception of the fundamental laboratory experiments along entirely different paths. At that time the consumption of light hydrocarbons was already increasing rapidly. The quantity of petrol available in crude oil was no longer sufficient to cover requirements. Cracking processes gave strongly unsaturated petrols, accompanied by considerable losses in the form of gas and coke. The accumulation of hard coke-like residues in the plants gave rise to manipulative difficulties, and improved methods for the conversion of heavy oils into petrol were therefore indicated.

Cracking of Heavy Oils

In the year 1910, some friends in the petroleum industry suggested that Dr. Bergius should study the problem of the more rational cracking of heavy oils, making use of the tools of the physical chemist for this purpose. Simple consideration of the chemistry of the processes involved in the cracking of oils sufficed to show that the hydrogen, which was separated from the fluid oil in the form of gaseous hydrocarbons, would have to be replaced, if the resulting product were to have a saturated character and if the formation of asphalt, poor in hydrogen, leading to coke formation, were to be avoided. The Le Chatelier principle indicated that an increased partial pressure of hydrogen, during the splitting up of the petroleum oils, must have a beneficial effect. A good laboratory technique, which permitted the reactions to be carried out under high pressure and exact control of the thermal conditions prevailing at these high temperatures, led to the discovery that, during the cracking process under high pressure, hydrogen enters readily into combination with the products formed during the cracking of the oil.

Oil hydrogenation by means of hydrogen under pressure was, to a certain extent, an invention which had its origin in a commercial and economic need, the development of which was brought about through the scientific knowledge and technical possibilities available at that time. It may therefore be called an "invention to order."

Coal Hydrogenation

In the case of the hydrogenation of coal, the conditions were entirely different. Experiments of a purely scientific nature on the formation of coal from vegetable matter led to theories regarding the chemical structure of coal. From these theories it could be deduced that coal, under certain conditions—including the adsorption of hydrogen—might be converted into materials of lower molecular weight with relatively high hydrogen content, which must bear a close resemblance to mineral oils. The hydrogenation of coal, which was carried through as a result of these reflections, was thus the outcome of scientific researches which, to a certain extent, had as their by-product the discovery of the possibility of the liquefaction of coal. The experiments relating to the chemical nature of coal formation were not instituted with the idea of transforming coal into oil. Oil hydrogenation could have been discovered in a well-organised scientific industrial development laboratory possessed of the necessary means and apparatus, and in charge of an administrator who had the problem clearly before him. It is much less probable that the reaction of coal hydrogenation could have been discovered by such an organisation, as it is hardly to be expected that an industrial undertaking would turn its plant and staff on to the problem of investigating how vegetable matter became converted into coal in the course of millions of years.

Among the many members of boards of directors of large concerns known to Dr. Bergius in various countries, scarcely one would have been prepared to supply adequate financial assistance for studying such impracticable problems, and the few who might have acted otherwise are men who themselves, in some way or other, are possessed of the mentality of the investigator. Such men, however, if they brought a proposal of that nature before their co-directors, could seldom reckon on their colleagues being with them in heart and soul.

Conditions Twenty Years Ago

The majority of modern inventions, within the realms of industrial mass production, passed their development stage in a period during which the economic structure of industry was very different from that which it is to-day. Then, 20 years ago (and about two decades are necessary to carry such inventions through from the laboratory to the real industrial stage), the industry undertakings were not united into such mighty concerns as obtain to-day. A larger number of medium-sized undertakings, which, though not so strong financially, were more elastic and flexible in their decisions, interested themselves in the development of partially worked out inventions and new ideas that had originated outside their own walls. With the advent of the huge trusts, the number of firms interested in the development of inventions has decreased considerably, with the result that to-day the inventor has not the same opportunity of finding one or another among a large number of industrial undertakings willing to take up and carry through the development of his thoughts and works. The very structure of these large concerns brings its own difficulties, because what may appear of use to one department may seem to be undesirable for commercial reasons to another department. On the other hand, due to the increased capital strength and the accumulation of experience from the most diverse fields, possibilities have been opened out which were not previously available. Even these great financial forces, however, are not capable of shortening to any desired degree the period of development of a large-scale process.

Once more the liquefaction of coal can be quoted as a typical example. In spite of the fact that the basic chemical and technical discoveries were worked out for the most part nearly 10 years ago; that continuous working on the semi-technical scale with bituminous coal had been accomplished without trouble; that the problems of temperature control, heating, introduction of the raw material into the plant and the evacuation of the products were solved; and that the two greatest chemical concerns in the world were directing their powerful resources towards the solution of the problem, nevertheless, another decade had to pass before the process could be said to have been carried through to its final stage.

An Ever-Present Danger

Time is necessary to ripen those new ideas which must continually arise during the development of any important industrial process; they must be studied and worked out. One ever-present danger is that of the work being abandoned, not because of the insuperable difficulties which technique offers, but because it seems impossible to obtain the finance necessary to carry on the work further. The life history of an invention is similar to that of a human being, in that the years of childhood are the most free from trouble. As long as basic ideas, such as the detailed conditions of reaction and the exact knowledge of proportions, are being rapidly pushed forward on a small scale in the laboratory the fundamental problem is solved, because the demand on personnel is relatively small and the cost of the necessary materials not too great. At this stage, in addition to the development work, careful consideration has to be given to the patent situation for safeguarding the discoveries that have been made, and, further, the necessary means have to be found for running the laboratory work.

The fate of an invention up to this point is fairly independent of outside influences. Comparatively few people are necessary for carrying out laboratory experiments, and, moreover, the technical plant for work on the small scale is relatively cheap. It is frequently the case that an inventor has at his disposal for his type of work laboratories which are kept up by public money and endowments. Most inventors can carry on through this stage, if they have faith in their discovery and are prepared to make sacrifices in order to develop it. The counter-forces of the outside world do not begin to make themselves felt as long as an invention remains far removed from its final state of development. The strongest of these counter forces is the resistance emanating from those in control of already established industries. It is very seldom that an invention of any note does not meet with some resistance from those already established, and that a new method of manufacture does not, in some way or other, come up against existing processes. In the early stages, information about a new development seldom penetrates beyond a narrow circle of technical people, and even those who hear of it do not take all too seriously the optimistic inventor, busy creating in his laboratory.

The Opinions of Experts

Eight years after the coal liquefaction reaction became known, Dr. Bergius found reputable experts working in the same narrow domain, who claimed that the chemical reaction therein involved was not practicable. These experts had not succeeded, when repeating the experiments, in so regulating the temperature that the correct conditions of the experiments were reproduced. Opinions expressed by the best of experts on new technically difficult subjects are not entirely to be relied upon. This negative mistrustful attitude of the outside world is naturally extremely unpleasant and discouraging to the inventor; but, on the other hand, it is in a way a protection which sometimes functions better than that offered by a good patent. If his claims are not believed and he himself is not taken seriously, then nobody takes the trouble to go closely into his work, nor is the realm covered by his patents unduly attacked. However, if soon after the invention is published, other workers become interested and commence research on the same subject, then the big danger looms up of parallel patents being taken out, which may jeopardise the invention at this early stage.

Good patent protection is of the very greatest importance for ensuring the further development possibilities of an invention. In the later development stages, ample financial means are necessary to convert the laboratory experiments into a technical process and, if the patent protection of an inventor is insufficient and weak at this stage, then he has very little prospect of raising the necessary finance.

When the basic laboratory experiments have attained a certain measure of success, the first serious crisis in the life of the invention arises. It has to be decided at this point whether that which has been found to be possible in the laboratory can also be carried out on a technical scale. Much serious thought has to be given to the vital question of whether the experiences gained in the laboratory are translatable to the larger scale. The next step, namely, the increased semi-technical experimental plant, needs for its erection and working a considerable sum of money. The work of the chemist must be complemented by that of the mechanical engineer as well as the large number of collaborators necessary for constructing the plant and watching over it during continuous running. It is to be assumed from the very beginning that a considerable period of time will be necessary to construct a plant and to run it and, moreover, that the personnel who are going to work it must learn all there is to know about it. The possibility, a strong one, is always present that the first plant when completed must be modified or added to from time to time and even reconstructed. Before the means for this development stage can be obtained, there is a basic point to be cleared up, namely, the evaluation of the economic prospects of a new process, as far as laboratory experiments can indicate.

The Need for Foresight

Another great difficulty arises here. The development of a large industrial process from the laboratory stage goes through many different intermediate steps on the way, and experience has shown that these require a number of years. How far can it be estimated, a decade ahead, what the markets for the products of the process are going to be? The uncertainty in this direction is so great that it is almost impossible to make such reliable calculations as will embrace all the factors which come into play relating to the economic carrying through of the process. Regarded only from this point of view. there would scarcely ever be justification for investing in a new technical process.

One question, which is always asked of the inventor, is how can he prove that his process is an economic one? This not only relates the early stage of an invention, but can also apply up to that stage at which practical full-scale trials have gone so far as to allow of the calculation of reasonable depreciation, based on the actual running of an installation. For this reason the cool calculator, the sceptic, can only decide on the value of a new process when it has been working for years on the industrial scale. If only the cool calculator and the sceptic had to make the decision as to whether an invention was sufficiently valuable to continue the development on to the big scale, inventive thoughts would very rarely bear fruit in industry, and only then if the development were so simple that the truth of the practical value could be demonstrated by the most primitive means. With inventions which have for their object production necessarily on the large scale this is naturally never the case.

The Mind of the Supporter

The mind of a supporter must be attuned to the thoughts of the inventor, otherwise the best inventive faculties will remain barren. The inventor must not only have ideas, he must know how to influence others with those ideas and also with his optimism, so that they will be ready to bring material aid to the development of his invention. This applies not only to the lonely inventor who, with only himself to rely upon, must from one source or another find new means for carrying on his process, but it also applies to those who are exploring new paths within an already established economic undertaking.

In any new chemical problem to-day difficulties are sure to arise regarding the nature of the plant to be employed. It is for that reason necessary that the mechanical engineer should work in harmony with the chemist, so that the closest collaboration can be realised between these two groups of technicians, amongst whom considerable tension and difference of opinion are liable to arise in industrial works. In Dr. Bergius's experience, it is a good thing for the mechanical engineer to work with the scientific chemist in his laboratory, so that each may have the opportunity of learning the lines of thought and methods of working of the other. Such problems as the mechanical and chemical resistance of the different parts of the plant can only be worked out after long and tedious trials, whilst the exact heat control of large masses in particular demands scientifically controlled conditions which, without doubt, need inventive talent for their solution.

A technical invention must hasten on in advance of the times; otherwise, when the work of the inventor has come to fruition, it will be found to be out of date, for, as already stated, so far as a large-scale industrial process is concerned, 10 or 20 years are required in which to prove it.

The PRESIDENT (Sir Harry McGowan), proposing a vote of thanks to Dr. Bergius, said that the presence of Dr. Bergius illustrated the fact that science knows no boundaries. Whatever political anxieties there might be existing between our country and Germany, they did not prevent him saying that we welcomed Dr. Bergius here from our hearts. Indeed, he would go farther and without prophesying, say, he felt that as time went on associations of this kind, producing an economic welding, might in time make war seem grotesque and fantastic. One of the burdens of Dr. Bergius's address was the desire for more support, moral and financial, from industrial leaders, for the inventor With that he was in complete sympathy but it should be borne in mind that in this country during the past few years many industrial undertakings had gone through very bad times and those in charge of big industrial enterprises had had to scrutinise very meticulously all expenditure and had to wonder from time to time, whether money spent in research of a practical character or an academic character would be reflected in the profit and loss account.

It was a matter for satisfaction to know that during the past few years in this country we had become more research minded and on that depended a solution of many of the problems, not only in this country but in the world. Dr. Bergius, by his pioneer work, had attracted the attention of the world and had obtained results which in time might, even in this country, become epoch making and it was a great pleasure to propose a hearty vote of thanks to him for his lecture.

Dr. W. R. ORMANDY, seconding the vote of thanks, suggested that the address might well be called an " address to directors "—to those directors who were not always technical.

The vote of thanks was heartily accorded, and Dr. Bergius, in acknowledging it, said he had not been appealing in his lecture so much for a larger measure of financial assistance for invention as for a greater appreciation on the part of directors of the psychology of invention.

Dr. F. K. R. Bergius, Melchett Medallist, 1934

His Work on the Technical Development of Hydrogenation

DR. FRIEDRICH KARL RUDOLF BERGIUS was born on October 11, 1884, at Goldschmieden, in the province of Breslau in Silesia. At an early age he had the opportunity of studying chemical methods of working and chemical technical processes in his father's factory, from which he gained an insight into industrial and scientific matters which stood him in good stead in later years.

His chemical studies began at the University of Breslau in 1903 under Landenburg, Abegg and Herz, and was continued in 1905, after a year of military service, at Leipzig, under Hantzsch. In 1906 he began the thesis for his doctorate, entitled " Absolute Sulphuric Acid as a Solvent," which he completed at Breslau in the laboratory of Abegg, after which in 1907 he was appointed as lecturer in the University of Leipzig. The extraordinarily industrious life in the laboratories of Hantzsch and Abegg decided him to concentrate his energies on scientific subjects. After working for a year at the Nernst Institute in Berlin, he spent a further six months on research work during the year 1909 at the Haber Institute in Karlsruhe. The work he carried out at that time on the chemical equilibria of gas reactions, and particularly the synthesis of ammonia, gave an important impetus to his later undertakings which he began at Hanover in 1909. There he joined the Institute of Physical Chemistry of the Technische Hochschule, which was at that time under the direction of Bodenstein. Beginning his researches with a thorough examination of the problem of the dissociation of the peroxygen compounds of calcium, with the help of his collaborator he devised a practical laboratory method for working under pressures up to 300 atmospheres.

In the year 1910 he fitted out a private laboratory at Hanover which extended the range of the high pressure technical work, as the necessary apparatus was not available in the laboratories of the Technische Hochschule. Gradually this laboratory was extended, workshops and space for large-scale experiments were added and a number of co-workers engaged. The work carried out there was partly of a practical, partly of a theoretical nature, and the results are to a great extent described in a monograph published in 1911, and also dealt with in his Nobel Prize lecture. The most important result of this work was the discovery during the years 1912 and 1913 of the hydrogenating effect on coals and oils of hydrogen under high pressure. It was not always an easy matter to find the means for carrying on the work at this laboratory. In the years 1912 and 1913 he had already found it necessary to increase considerably the scale of the experiments from laboratory to semi-technical, and for this reason, in 1914, he accepted the proposal already made by Dr. Karl Goldschmidt to transfer his laboratory to the Essen works of the firm of Theo. Goldschmidt A.-G.

In the year 1911 he was appointed to a lectureship in applied physical chemistry at the Technische Hochschule in Hanover and lectured on technical gas reactions, equilibrium laws and metallurgy. The outbreak of war, and with it the intensified work on the problem of the liquefaction of coal, rendered the continuation of his lecturership impossible.

During the war years the technical development of the hydrogenation processes was intensively studied and the construction of a relatively large plant for this purpose was begun at Rheinau, near Mannheim. At the same time, in addition to other purely technical studies, a further development of high-pressure work was being developed in Essen from a laboratory scale to a large technical works—namely, the manufacture of glycol from ethylene chloride. The food shortage, from which Germany suffered worst of all during the war, led to work being started on the conversion of wood into sugar. After 15 years of study, this has now been advanced so far that during 1932-33 an industrial wood saccharification plant was constructed on the site of the old Rheinau works. This plant has shown, in the course of an uninterrupted and trouble-free year of trial, that the process of wood hydrolysis is realisable from a technical and commercial standpoint. The work is now in hand for the enlargement of the plant to a yearly output of 6,000 tons of crude sugar and the plant should be ready for starting in the early summer of 1935.

German Pigment Producers Report Improvement

THE Sachtleben A.-G., of Cologne, producers of lithopone, barium sulphate, and other barium pigments, reported continued increased trade this year, following the expansion in 1933. The Sachtleben A.-G., by controlling the rich baryte deposits in the Meggen district of Germany, led in German lithopone output, furnishing around 20,000 metric tons, or over one-third of total German production in 1933; together with the I. G. Farbenindustrie and joint subsidiaries it furnished around seven-eights of the domestic production. Sachtleben declared a 9 per cent. dividend upon 12,500,000 marks of capital stock in 1933. German domestic sales of lithopone and other pigments in 1933 were increased by the acceleration in domestic activity and the marked stimulus given to house repair and construction by the aggressive recovery measures of the Government, reported to have enabled work in this sphere valued at over 2,000,000,000 marks. German lithopone exports likewise continued the 1933 expansion this year, although the prices reached a low level because of intensified foreign competition. German lithopone exports rose to 8,334 tons in the first 7 months of this year, from 7,473 in the same period of last year.

Asphaltic Bitumen Emulsions for Road Purposes

Stability, Cold Weather Behaviour and Breakdown

BITUMINOUS emulsions have been largely developed for road purposes in the course of the last ten years, although one of the earliest patents for the manufacture of emulsions dates back to 1903, said Dr. F. H. Garner, in a paper read before a joint meeting of the Yorkshire Section and the Road and Building Materials Groups of the Society of Chemical Industry, at Leeds on October 29. Actually, it is only during the last five years or so that a number of the essential properties of bituminous emulsions for road purposes have been recognised and much intensive research work has been concentrated on such aspects as the mechanism of the breaking of emulsions on the road, whereby the bitumen is liberated in its original condition to act as a binding agent for the road material. The advantages which are claimed for asphaltic bitumen emulsions are that since they are applied cold the use of special heating plant is rendered unnecessary. Further, that their application is less dependent on weather conditions and thus enables economy in labour to be attained by reason of the ability to even out the year's programme, keeping the same road gang steadily employed.

The Principal Processes

The production of asphaltic bitumen emulsions involves the mixing of bitumen and water together in the presence of emulsifying agent or stabiliser, but in order to ensure that the emulsions produced are of uniform quality and entirely satisfactory for road purposes it is essential to employ carefully designed machinery. Each stage of the process, from an examination of the raw materials to supervision of conditions of manufacture and inspection of the emulsions produced, must be very carefully followed by chemists skilled in the art. The two principal types of processes for the manufacture of emulsions are first, the batch process, in which the bitumen, emulsifying agent and water are mixed together in a vessel fitted with a mechanical stirrer. When emulsification is complete the batch is pumped out and a further set of ingredients introduced into the mixer. The second process involves the use of a colloid mill, such as the Premier, Hurrell, or Hatt-Dussek, in which the asphaltic bitumen and aqueous components are fed continuously to the mill, the quantities being suitably regulated according to the percentage of bitumen which it is desired to obtain in the finished emulsion.

In considering the properties of bitumen emulsions there are two aspects to consider: (1) The methods of investigation which really come under the heading of physical or chemical research and are concerned with the general process of emulsification and manufacturing problems. (2) The essential properties of emulsions from the point of view of their behaviour when actually employed on the road. Under the first category are such methods as size frequency analysis of emulsions and investigations of the asphaltic bitumen as regards ease of emulsification. Dealing with the latter aspect the most important properties to consider are water content (which is determined by distillation with a suitable solvent in a modification of the Dean and Stark apparatus, as standardised by the Institution of Petroleum Technologists), the presence of large particles in the bituminous emulsions (which is of importance in so far as their suitability for spraying is concerned), and storage stability.

Definition of Stability

Reference should be made to the confusion which has arisen in time past between stability on storage and stability on the road or breakdown. It has been decided by a technical committee of the Road Emulsion and Cold Bituminous Roads Association, which has been responsible for the initiation of a great deal of research into the properties of bituminous emulsions, to recommend the use of the word "lability" as a method of distinguishing the latter property. No satisfactory test has yet been standardised which enables the stability of the emulsions in storage over a period of three months or so to be reproduced by means of laboratory apparatus in the course of a few hours or a few days. A method has, however, been adopted in the B.S. Specification 434-1931, which effects a classification of emulsions by means of a short period test in which the emulsions are placed in 100 c.c. stoppered glass cylinders for 7 days. The emulsions are then examined by passing through a sieve in order to determine the proportion of the binder which has coagulated. For the determination of stability of emulsions on storage over a long period the only satisfactory method is to store a barrel of the emulsion of 30-40 gal. capacity, over a period of three months, and then determine the percentage of water present in a sample of the sieved emulsion.

Owing to the content of water in asphaltic bitumen emulsions it will be appreciated that solidification occurs when such emulsions are cooled to temperatures much below zero centigrade. Emulsions can be prepared by the use of special emulsifiers which will withstand relatively low temperatures but in general such emulsifiers decrease the lability of the emulsion to such an extent that sufficiently rapid breakdown does not take place on the road. This particular question, however, is not of great importance in Britain since protection of the drums under cover during periods of very low temperature is all that is required.

Low Viscosity

Another very important property of emulsions is that of viscosity since it is primarily on account of the low viscosity of these materials that they have been developed in competition with other materials which require heating prior to use. The viscosity of the emulsion must be controlled within fairly narrow limits since the viscosity must not be so high that it cannot be sprayed or applied satisfactorily. Hence the upper limit of the viscosity depends on the type of machine and pressure employed. On the other hand, if the emulsion is too fluid it may run off the road surface before sufficient time has elapsed for the emulsion to break. For surface dressing higher viscosity emulsions can be used than for grouting purposes, for which it is essential that the emulsion shall penetrate easily into the compacted road material.

A considerable amount of work during the last few years has been directed towards the investigation of the mechanism of breaking of emulsions on the road, and a number of methods of test developed. The four factors which may contribute to the breakdown of emulsions are (a) chemical reaction between the emulsifier and soluble salts assumed to be present in the aggregate, (b) adsorption of emulsifier on the stone or road surface, (c) evaporation of the water present in the emulsion with the result that a certain point is reached where the bitumen particles coalesce and the emulsion is broken, and (d) loss of water by capillary forces. It is considered that the third process mentioned above is by far the most important to be considered in connection with the breakdown of emulsions on the road.

Evaporation of Water

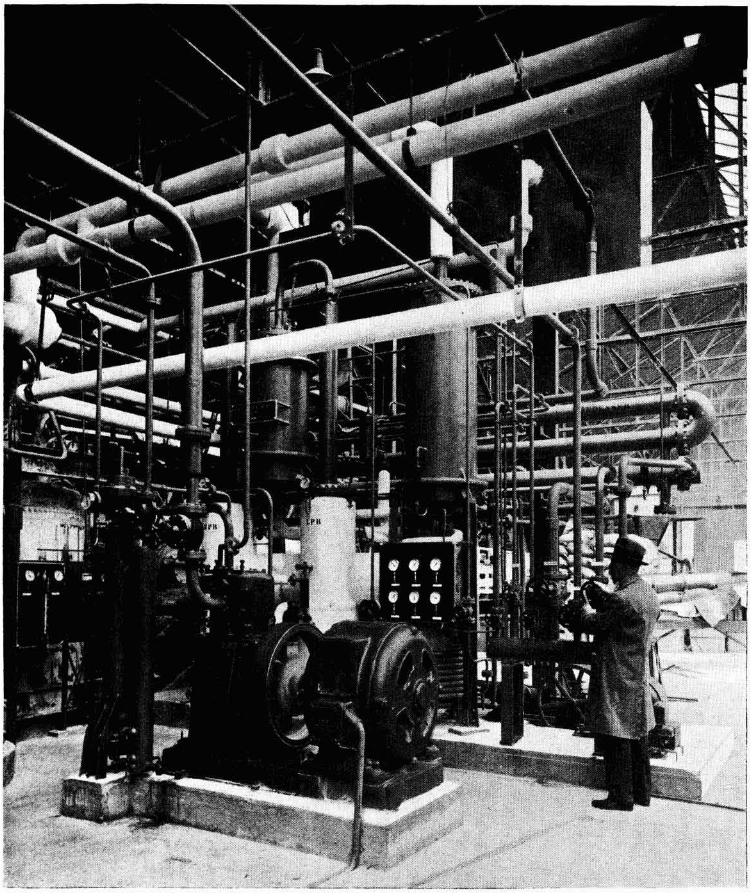
A method of test for the determination of lability of bitumen emulsions based on the fact that evaporation of water is the most important factor has been put forward by a technical committee of the Road Emulsion and Cold Bituminous Roads Association which depends on the determination of water content at which the bitumen coagulates.

Investigation of the methods outlined above on the properties of emulsions in connection with road use, namely, water content, sieve test, short and long period storage stability tests, behaviour of emulsion at low temperatures, viscosity determination and lability, or rate of breakdown on the road, have been made by an informal committee consisting of representatives in Germany, Holland, Denmark, France and England, and a very satisfactory measure of agreement in carrying out these tests on the same sample of emulsion has been obtained. A resolution was put forward at the 7th International Road Congress at Munich in September last, which was adopted, stating that these seven methods of test constitute an adequate minimum from the point of view of the road engineer.

Manufacture of Solid Carbon Dioxide in Scotland

Western Chemical Co's New Plant

THE Western Chemical Co. (Paisley), Ltd., has taken the iniative in Scotland in establishing the manufacture of solid carbon dioxide for use as a refrigerant. The product, with the trade name "Cardice," is being supplied to brewers, ærated water manufacturers, and ice-cream makers, and is also being used in the ordinary way for the refrigeration of foodstuffs. A Maiuri patent plant has been installed and it is anticipated that during the peak demand of the summer months three shifts of men will be employed on the process.

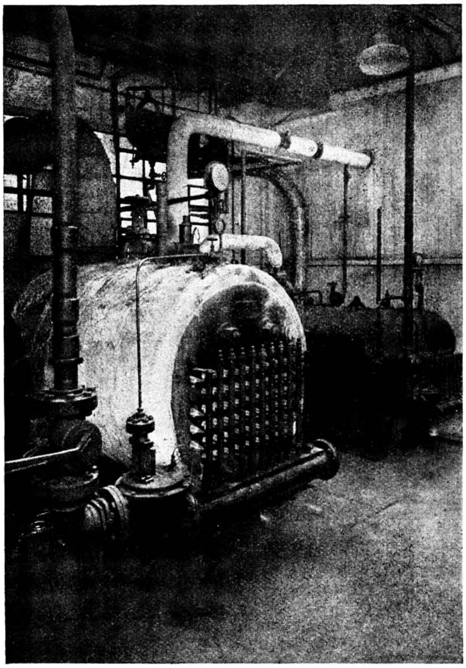


A general view of the Solid Carbon Dioxide Plant recently installed by the Western Chemical Co. (Paisley), Ltd.

Cardice consists of carbon dioxide (CO_2) liquefied and frozen into solid block form. In view of its application to the refrigeration of foodstuffs, particular care is taken to ensure the purity of the gas, which is produced in the Paisley works from magnesite. From gas holders it is pumped through a liquefying plant, in which an ammonia absorption refrigrating machine provides an easy means of attaining the low temperatures, between $-76°$ and $-94°$ F., necessary for liquefaction. It is also of interest that by the Maiuri process it is possible to render the gas liquid at the unusually low pressure of eight and a half atmospheres. From the liquid receiver, which has a storage capacity of nine to ten tons, the liquid is passed through a snowing valve into the Maiuri hydraulic presses. When the cylinder of the press is filled with snow, hydraulic rams acting at either end of the cylinder force the snow into a solid block. Both square and round section blocks are produced by the plant installed at Paisley.

The extremely low temperature of Cardice, $-79°$ C., makes it of particular value for special purposes and for use with hard-frozen foods. Its high heat-absorbing capacity, combined with the density of the chemical product, gives it a large refrigerating capacity in small spaces, a feature which is of considerable importance from the point of view of transport. The product is entirely volatile, leaving no water or residue of any kind, and for that reason it is already widely employed in the ice-cream industry and in the transportation of meat, as well as for the storage of milk and other perishable goods. Notably successful results have been obtained in experiments in the preservation of fish.

A wide range of applications is available for the new product, and at present experiments in that direction are being conducted by the Carbon Dioxide Co., Ltd., which distributes Cardice.



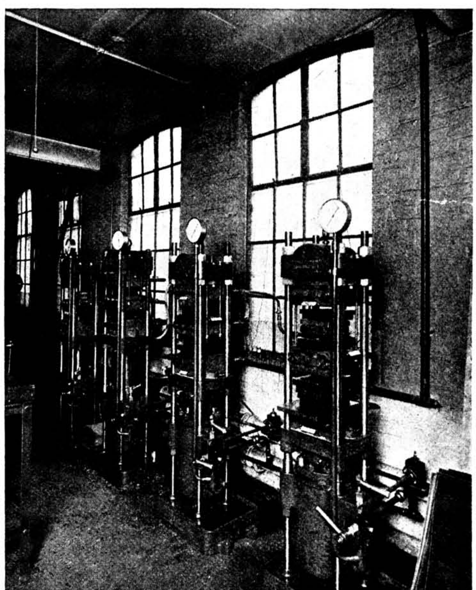
Two gas fired boilers with control valves on the gas supply (Telegraph Condenser Co., North Acton).

Use of Gas in the Plastic Moulding Industry

THE advantages of gas as a heating medium in the plastics industry are set out in an informative booklet on " Town Gas for Plastic Moulding " just issued by the British Commercial Gas Association. The plastics industry has developed with enormous rapidity in recent years and it has still probably not more than touched the fringe of its market. In moulding plastic products of all kinds maintenance of the plastic material at the correct temperature at low capital and operating costs is one of the chief conditions of success. Operating technique varies widely with the types of resin used and other factors, but in the majority of cases town gas offers marked advantages and there are many installations throughout the country now using gas, either direct or for steam raising.

Some moulders have a preference for steam, which is the more suitable heating medium for certain purposes, such as shellac moulding, where it is necessary to cool the mould in the press after moulding, cold water being easily circulated through the steam channels for this purpose. In many moulding shops, however, the steam is raised by a gas-fired boiler which saves labour for stoking as well as fuel storage and other overhead costs and enables a constant steam pressure to be simply and reliably maintained. In some cases it is not possible to maintain the correct temperature by means of steam. In such cases it is usual to put a gas ring burner round the base of the mould.

A gas fired boiler for supplying steam at 75 lb. pressure to presses moulding thermoplastic powders (D. H. Bonnella and Sons, Ltd., Osnaburgh Street, N.W.)

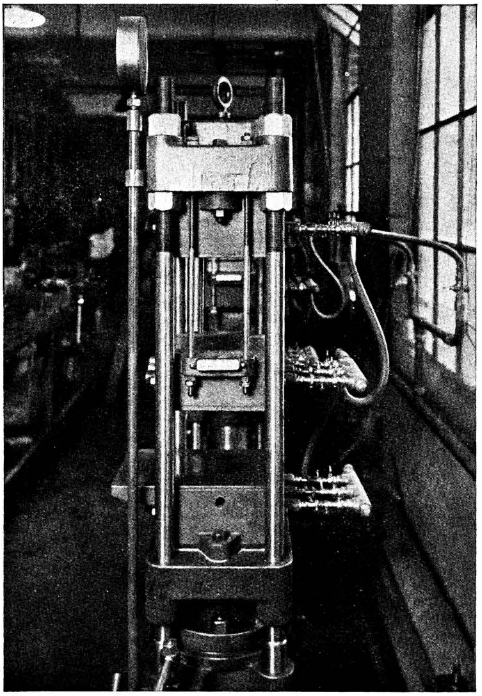


A row of presses fitted with gas heated platens at the works of A. F. Bulgin and Co., Ltd., Barking.

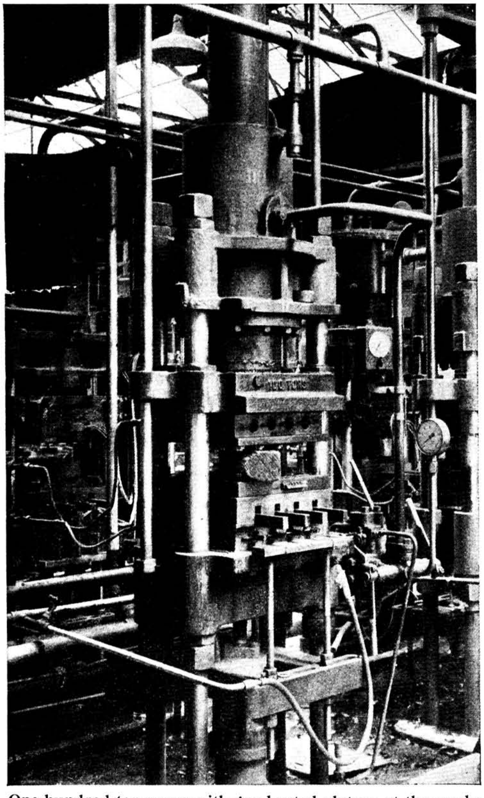
In using gas for platen heating there is a wide choice both of burner and platen design, and both the gas and air may be used either at low or high pressure, so that individual requirements and preferences can nearly always be met. With well-designed burners and platens it is possible to regulate the temperature of the latter to ± 5° F., and there are many shops where this, or even better, is achieved under ordinary working conditions. Thermostats are not often used, but if more accurate control than this is needed, they will give it. Apart from platen heating, gas finds numerous smaller applications in the plastics industry. Thermoplastic resins based on gilsonite or similar materials are usually made up in the works where they are used, and each works has its own favoured formula. In nearly all cases, however, the resin-base has to be mixed with the filler (usually asbestos), and in this country the trough mixer rather than the roll method is commonly preferred. In nearly all cases these mixing machines are heated by gas burners, and, owing to the large number of firms employing this method, the aggregate consumption of gas is very large. Gilsonite-base resins also have to be heated prior to placing in the mould, and for this purpose gas-heated hot-plates or rotary ovens may be used.

Again, oven-curing of gilsonite-base moulded products in order to increase their tensile strength is a common feature, and for this purpose gas is suitable as a fuel, while smaller quantities are also used for warming thermosetting powders prior to moulding. In some cases, also, parts moulded from phenol powders are subsequently stoved in gas-fired ovens in order to increase their dielectric strength.

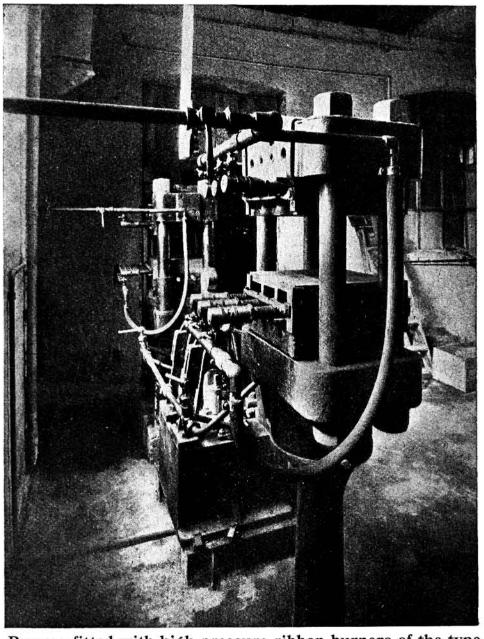
Copies of " Town Gas for Plastic Moulding " (No. 4 of the Industrial Uses of Gas series) can be obtained from the British Commercial Gas Association, 28 Grosvenor Gardens, London, S.W.1. We are indebted to the Association and to the firms concerned for the loan of the accompanying illustrations.



Side view of one of the presses and method of gas supply at A. F. Bulgin and Co.'s works at Barking.



One hundred ton press with gas heated platens at the works of the Gramophone Co., Ltd., Hayes.



Presses fitted with high pressure ribbon burners of the type used by Ebonestos Insulators, Ltd., Rollins Street, S.E.

Works Equipment News

A New Design of Bunsen Burner

ALTHOUGH the Bunsen burner is probably the most indispensable single item of scientific research equipment, little recent scientific investigation so far appears to have been made as to its design or manufacture. Indeed, such burners as generally used have remained substantially unaltered since their introduction nearly a century ago. The appearance of an entirely new type of burner is therefore a matter of interest to all laboratory workers or persons interested in scientific equipment.

Scientific workers, especially those engaged on critical work of any kind involving the careful control of heating, will recognise the inconvenience caused by a ragged flame (due to a faultily-constructed or badly-centralised jet), and by the fact that existing types of burner, being at the mercy of fluctuations in the gas supply, are always liable to "strike back" and burn at the jet. The usual adjustable sleeve type of air control, besides being insensitive, has an inevitable tendency towards incorrect adjustment, and anything in the nature of a small controllable flame can only be obtained by the common practice of fixing an adjustable screw-clip to the flex. Amal, Ltd., the well-known firm of carburetter and motor accessory makers, have now applied their unique experience in the design of jets and nozzles of all kinds to the manufacture of a Bunsen burner which is designed to eliminate these objectionable features. Careful attention has been given to the correct burner proportions necessary for maximum combustion efficiency, and, generally speaking, the new burner combines the outstanding features of both the Meker and the original Bunsen types.

The accompanying illustration shows the burner head removed, revealing the adjustable jet, which is perhaps its most interesting feature. The orifice has been carefully placed so that the gas flow is concentric with the air tube, and contains a needle valve, which is capable of almost vernier adjustment by the external screw to maintain the maximum gas velocity according to the volume of gas consumed and the pressure available. There is thus no need for an air regulator, the taper needle (the tip of which is shown in the photograph in its extreme uppermost position in the ejector) being sufficient to give an accurately controllable flame.

The burner is designed on the venturi principle, which serves the double purpose of retarding the point at which the flame will flash back on to the ejector, and of increasing the velocity of the gas flow, so enabling it to suck in more air through the seven holes at the base. The flame can thus be turned down almost to invisibility by the needle valve without flashing back, and at the same time can be relied upon to give exceptional heating efficiency when full out. The combustion head is perforated with a large number of small holes, so that the flame consists of a cluster of perfectly aerated small cones.

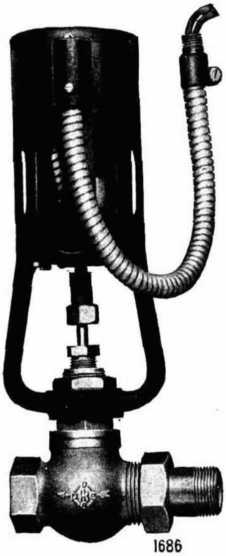
The burner illustrated is 5½ inches in height, with a head of 1 inch diameter; a slightly larger size, 7 inches in height with a 1½ inch diameter head, is also manufactured. The former has an effective consumption range of 1.3 to 14 cu. ft. of gas at 3 inches pressure, sp. gr. 0.476—a range which testifies to the nicety of control possible with this burner. Another admirable feature is the insulated hooked metal holder. Everyone knows how hot the base of a burner becomes, especially when working under gauze, and a device which enables it to be comfortably removed or held is to be welcomed.

Sterilisation by Chlorine and Ammonia

THE use of chlorine gas has now been standard practice for a number of years past for the continuous sterilisation of town water supply, swimming baths, condenser cooling water, sewage, sewage effluents, and general trade waste. An important newer development is the "Chloramine" process, in which ammonia is used in conjunction with chlorine gas. The Paterson Engineering Co., Ltd., has now issued a special booklet on the "Chloramine" process, which it operates in conjunction with the "Chloronome" apparatus for the continuous controlled addition of chlorine gas. Ammonia, it will be remembered, forms a loose chemical compound with chlorine, which has powerful sterilising properties, practically equal to free chlorine, and also possesses several advantages under certain conditions. For the treatment of water there is usually employed approximately 0.5-1.0 parts of chlorine per million, and the ammonia required is roughly 25 per cent. of the chlorine, that is an amount not exceeding 0.2 parts per million; the ammonia can be used as gaseous ammonia, a solution of ammonia in water, or a solution of ammonium salts.

Essentially the advantages of ammonia and chlorine as compared with chlorine only, include somewhat increased efficiency of the sterilising process, apparently due to action of the ammonia on the colloid material of the cell which reduces the resistance to chlorine penetration, slightly less consumption of chlorine, and more satisfactory bacteriological purification when the raw water varies greatly in quality, with no taste given to the final pure water. This slight taste may result in certain cases even with the most accurate control of the chlorine gas, being due to the compounds formed by the action of the chlorine, both in the way of oxidation and chlorination, upon the organic impurities present.

A notable example of the Paterson "Chloramine" apparatus is installed at the Hampton Works of the Metropolitan Water Board, London. In this case the ammonia is supplied as ammonium sulphate solution, the supply being controlled by a needle valve with graduated micrometer dials. The complete chlorination and ammonia installation has to treat four different supplies of water, representing a total of about 50,000,000 gallons per day. The liquid chlorine is delivered in large steel drums each containing about 15 cwt., which are run into the sterilising house on trolleys on to a permanent weighbridge and to the manometer type "Chloronomes" used, connected by flexible copper pipes, so as to keep a record of the weight of the chlorine. The "Chloronome" apparatus, which is supplied in two modifications known as the "Pulser" and "Manometer" types, consists of a panel having pressure gauges, control valves, and two reducing valves, so that the continuous supply of chlorine, controlled with great accuracy by means of one valve only, is not affected by a varying pressure in the chlorine cylinders or drums.



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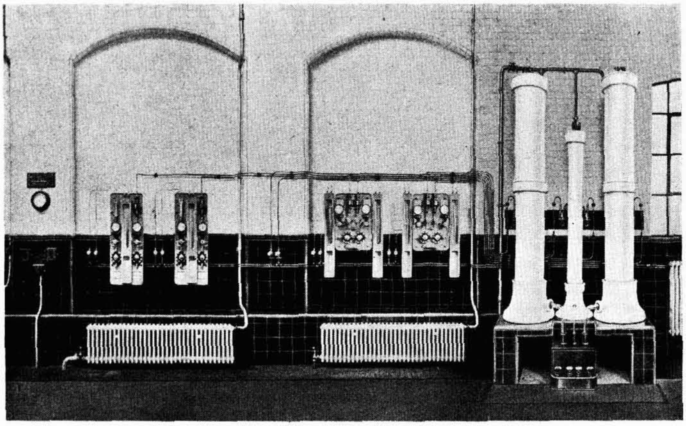
The Drayton Heat Motor Type Electrically Operated Valve.



Paterson " Chloronome " equipment at the Hampton Works of the Metropolitan Water Board (London) operating in conjunction with the " Chloramine " process.

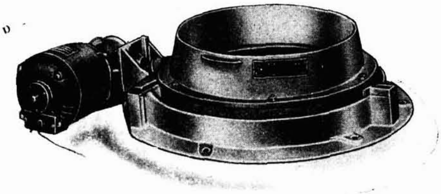
An Improved Heat Motor Valve

EXHAUSTIVE investigations and numerous tests carried out by the Drayton Regulator and Instrument Co., Ltd., have made it possible to improve the Drayton heat motor valve to such an extent that it is now suitable for almost all applications in heating and industrial installations where snap acting valves are not imperative. In the latest type opening and closing time is reduced to between 3 and 5 minutes. The maximum energy consumption (valve permanently closed) is 17 watts per hour; in normal working, when valve is probably open half the time, this consumption is considerably reduced.

These Drayton heat motor valves do not hum or click; as they are gradual acting, they do not cause water hammer. They can be used with hand switch for remote control, or by means of mechanically operated switch. They are, however, of greatest interest for use in conjunction with thermostatic switches for the automatic control of various types of heating plants.

A New Vibrating Sifter

A NEW mechanical vibrating sifter of robust construction, which ensures precise sifting of all classes of wet and dry chemicals, has been introduced by Jas. Gray and Sons. This " Olympia " sifter was originally designed for enamel and glazes, and is protected by patent. The machine is cast in aluminium and is supplied with a lawn 18 inches diameter. Additional upper parts can be supplied to facilitate the easy and rapid changing of the lawns. Each machine is complete with a reciprocating vibrator and a ¼ H.P. electric motor for A.C. or D.C. electric supply.



The " Olympia " Mechanical Vibrating Sifter for almost every kind of dry and wet chemical.

Modern Stainless Steels

THE group of steels which have been given the general name of "stainless" embraces a series of highly alloyed materials exhibiting a diversity of properties and with many and varied uses. These steels have evolved from the original stainless or rustless steel containing about 13 per cent. of chromium, which was discovered just prior to the Great War, and which was first developed in Sheffield for the making of table cutlery. During recent years metallurgists have been engaged on developing these special steels, particularly as regards their resistance to chemical attack and to atmospheric corrosion; several grades have been standardised in specifications by government departments and by certain associations of manufacturers. Samuel Fox and Co., Ltd., who are associated with the United Steel Companies, Ltd., have developed a series of stainless steels, which have been given the general name of " Silver Fox." This series includes the standardised materials, and also a number of useful alloys with resistance to certain specific types of corrosive attack, all of which are described in a brochure recently issued by the makers. " Silver Fox " stainless steels, it is stated, have been designed to overcome many of the difficulties associated with the use of stainless steels, particularly as regards ease of manipulation and resistance to the attack of various types of corrosion and to weld-decay. These steels are made by the high-frequency electric process, are uniform in structure and remarkably free from non-metallic inclusions.

PHOSPHORITE mining is to be resumed in Germany in order to lessen the country's dependency upon foreign raw materials. The mining of this commodity was actually begun in 1868, in the field located on the Lahn River, but was brought to a stop in 1893 when the Florida phosphate deposits were discovered. Mining was resumed in 1915, to meet war demands, but was given up after the world war, when foreign competition made itself strongly felt.

GREATER production of barium minerals in 1933 resulted in increased output of barium pigments by Great Britain. For the year, 66,000 tons of barium minerals were produced, as compared with 56,600 tons in 1932. The improvement in the industry was attributed mainly to crude barytes, the supply from the mines having risen from 26,507 tons in 1931 to 39,943 tons in 1933. Production of ground barytes increased from 1,077 tons for 1931 to 7,623 tons in 1933. Approximately six-sevenths of Great Britain's supply of barytes comes from the counties of Ayrshire, Devonshire and Shropshire.

Notes and Reports from the Societies

Iron and Steel Institute

New Vice-Presidents

THE Council of the Iron and Steel Institute has elected the following as vice-presidents of the Institute: Mr. W. H. Hatfield, Director of Research at the Brown-Firth Research Laboratories, and director of Thomas Firth and John Brown, Ltd.; Sir William J. Larke, a director of the British Iron and Steel Federation; and Lt.-Col. Sir Maurice H. L. Bell, director of Dorman, Long and Co., Ltd. (elected an hon. vice-president).

Society of Public Analysts

Election of New Members

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on November 7, the President, Mr. John Evans, being in the chair. Certificates were read in favour of: Arthur J. Amos, Harry R. Fleck, Walter Lee, Edward B. Parkes, Francis C. Storrs, James Thompson, and Robert S. Watson.

The following were elected members of the Society:—As honorary members: Gilbert T. Morgan, F.R.S., Jocelyn F. Thorpe, F.R.S. As ordinary members: Victor C. Branson, Roydon G. Cowdell, Joseph Davies, Frank A. Hatch, Herbert L. Hind, Alexander Marr, Daniel D. Moir, Teunis Potjewijd, Magnus A. Pike, Water J. Rees, James Sandilands, William W. Taylor, William P. Thistlethwaite, Frederick Thomas, and Dennis G. Tompkins.

Quantitative Spectroscopy

A discussion on "Quantitative Spectroscopy and its Analytical Applications" was opened by Dr. J. J. Fox, who was followed by Mr. F. Twyman (speaking on apparatus), Dr. S. Judd Lewis (on methods of spectroscopy), and Mr. D. M. Smith (on the application of spectroscopic methods to metals).

Dr. J. J. Fox gave an outline of the development of spectroscopy from the time of Stokes and Hartley to the present day, and explained why the early methods had been largely replaced by methods based on the determination of extiction coefficients. He described the similarities between the ultra-violet spectra of pairs of allied substances, such as atropine and tropic acid, and finally discussed the scope for the use of methods of determining emission and absorption spectra.

Mr. F. Twyman described the construction of the different types of spectroscope and their accessories. The modern instrument now chiefly used was the spectrograph, in which the ultra-violet spectrum was recorded on a photographic plate.

Dr. S. Judd Lewis gave a detailed account of his ratio-quantitative system, applicable to either soluble or insoluble substances. After conversion into sulphate the substance was mixed with spectroscopically pure ammonium sulphate and burned in an arc under standard conditions. The spectrogram was then compared with those given by standard-ratio powders in which the proportions of major elements and impurities had been accurately determined. By way of illustration of the applications of spectroscopy, Dr. Lewis cited several instances of its use in criminology and discussed the value of such spectrographic evidence. He also showed that the presence of a small amount of tea-seed oil in olive oil could be detected by determining the absorption spectrum of the mixture.

Mr. D. M. Smith, describing the development of spectroscopic methods for the examination of metals, showed the advantages of the use of the photographic method, which recorded lines occurring in the ultra-violet spectrum. Synthetic spectra showing the effects of increasing amounts of particular impurities were used as standards, and graphs were made connecting times of exposure with the composition of the metal. Numerical values were assigned to the intensity of the lines in the spectra. The logarithmic sector method was also used in quantitative work.

Institute of Fuel

The Training of Boiler House Employees

THE first informal meeting of the Institute of Fuel for the 1934-35 Session will be held in the Restaurant at Bush House, Aldwych, London, W.C.2, on Thursday, November 22, at 6.30 for 7 p.m., when Mr. John Bruce, A.M.I.E.E., of the County of London Electric Supply Co., Barking, will open a discussion on the subject of "The Training of Boiler House Employees." Mr. George Patchin, A.R.S.M., Principal of the Sir John Cass Technical Institute, will take the chair.

Chemical Engineering Group

Low Temperature Carbonisation

THE next meeting of the Chemical Engineering Group will take place on Friday, November 23, at the rooms of the Chemical Society, Burlington House, London, when a paper on "The Chemical Engineering Aspect of Low Temperature Carbonisation" will be read by Colonel W. A. Bristow, M.I.E.E. Colonel Bristow will deal with the various problems involved in the distillation of coal at low temperatures and the refinery of the products both from an engineering and from a chemical aspect. He will also speak of the difficulties encountered in the erection of the plant. The chair will be taken by the chairman of the Group, Dr. W. R. Ormandy.

The Royal Society

Nominations for Officers and Committee

THE following names have been put forward for election as officers and council of the Royal Society for the ensuing year: President, Sir Frederick Gowland Hopkins; Treasurer, Sir Henry Lyons; Secretaries, Sir Henry Dale and Sir Frank Smith; Foreign Secretary, Professor A. C. Seward; other members of council: Professor E. D. Adrian, Dr. E. J. Butler, Dr. W. T. Calman, Mr. D. L. Chapman, Professor A. W. Conway, Professor W. H. Eccles, Professor T. R. Elliott, Mr. P. P. Laidlaw, Sir Gerald Lenox-Conyngham, Professor J. C. McLennan, Dr. F. H. A. Marshall, Sir Charles Martin, Professor G. T. Morgan, Professor R. Robison, Dr. Herbert H. Thomas, Professor E. T. Whittaker.

Specific Heat of Gases

A paper on the determination of the specific heat of gases at high temperatures by the sound velocity method, was read by Mr. G. C. Sherratt and and Mr. E. Griffiths, F.R.S., at a meeting of the Royal Society, on November 15. The experiments recorded in this paper carry the determination of the specific heat of carbon monoxide by the sound velocity method up to a temperature of 1,800° C. By working with more than one frequency and correcting the data for the effect of frequency on the velocity of sound in the gas, the specific heat in the temperature range 1,000° to 1,800° C. is found to be in good agreement with that deduced from spectroscopic data. Specific heats based on sound velocity measurements in various gases have not hitherto been found to be in accord, even at moderately high temperatures, with those obtained from spectroscopic data. It is probable, in the light of the present work, that the discrepancy is due to the fact that observers have based their conclusions on measurements made with a single frequency, but it is now known from practical and theoretical considerations that the velocity of sound in a gas is not necessarily independent of the frequency.

Corrections can be applied to the published values of specific heats of gases at various temperatures, which are based on sound velocity measurements, when more accurate data become available as to the periods of relaxation of the vibrational specific heats of the different gases.

The Chemical Society

Manchester : Vitamin A

AT a meeting of the Chemical Society held at Manchester University on November 10 Mr. A. E. Gillam described experiments which had been carried out at Manchester by Professor I. M. Heilbron, Dr. H. W. Thompson, and himself, in the study of the nature of the vitamin A. He disputed the theory of Professor Karrer, of Zurich, that there are two forms of the vitamin.

The method of examination followed was a chromatographic analysis of rich vitamin A concentrates obtained from halibut liver oils. When the oils or their concentrates were treated with antimony trichloride in chloroform a characteristic blue colour was obtained, the intensity of the colour being roughly proportional to the vitamin A present. From the nature of the absorption spectrum of this colour, said Mr. Gillam, it was originally thought that the concentrates of the vitamin contained two separate colour-producing substances (chromogens); but, as richer and richer concentrates were prepared, it appeared that what were thought to be two separate chromogens were actually both characteristic of the vitamin itself.

About two years ago Professor Karrer, of Zurich, claimed to have separated these two chromogens, which he regarded as different forms of the vitamin, and named alpha and beta vitamin A respectively. In Manchester an examination was made of the red colour which developed in a vitamin A concentrate from halibut liver oil when this was absorbed on columns of suitable powders such as aluminium oxide or slaked lime. It was found that the vitamin concentrates could be separated into five fractions, one at least of which (the red colour) was produced by decomposition of the vitamin itself. In repeating Karrer's work at the same time, it was found that his so-called beta vitamin A was identical with the best material previously prepared in this country and abroad, and that there was thus no evidence that the vitamin occurred in more than one form.

Mineralogical Society

Election of New Officers

AT the anniversay meeting of the Mineralogical Society, held on November 1, the following were elected officers and members of council:—President, Sir Thomas H. Holland; vice-presidents, Mr. Arthur Russell, Sir William H. Bragg; treasurer, Mr. F. N. Ashcroft; general secretary, Mr. W. Campbell Smith; foreign secretary, Professor A. Hutchinson, editor of the Journal, Dr. L. J. Spencer; ordinary members of council, Professor P. G. H. Boswell, Professor H. L. Bowman, Dr. L. Hawkes, Mr. J. B. Scrivenor, Mr. T. Crook, Dr. W. F. P. McLintock, Mr. L. R. Wager, Dr. A. K. Wells, Professor A. Brammall, Mr. C. W. Mathews, Dr. T. C. Phemister, Dr. H. H. Thomas.

Colour reactions in the micro-chemical determination of minerals were the subject of a paper by Mr. J. Adam Watson. Most of the elements occurring in minerals can be determined qualitatively by highly sensitive colour reactions carried out in solutions prepared from minute quantities of the minerals. Solution is effected either with hydrochloric acid or by fusing in a bead of sodium carbonate in a loop of platinum wire. The basis of the work is mainly Dr. F. Feigl's "Qualitative Analyse mit Hilfe der Tüpfelreactionen," published in 1931.

Personal Notes

THE Administrators of the Beilby Memorial Fund, consisting of the Officers of the Institute of Chemistry, the Society of Chemical Industry and the Institute of Metals, have announced the award of one hundred guineas each to Dr. William Hume-Rothery, M.A. (Oxon.), Royal Society Warren Research Fellow, and to Dr. Ernest Albert Rudge, F.I.C.

DR. HUME-ROTHERY, who is 35 years of age, took a First Class Honours in Chemistry at Oxford, and then worked at metallography for three years at the Royal School of Mines under the direction of Sir Harold Carpenter, F.R.S., after which he returned to Oxford for independent research work at the Old Chemistry Department, University Museum, where accommodation was found for him by Professor F. Soddy, F.R.S. He was elected to the Armourers' and Brasiers' Company's Research Fellowship in Metallurgy in 1929, and to his present Fellowship in 1932. His published work includes a book on the electrical properties and theories of metals and alloys, papers on valency relations in alloy structures, and determinations of equilibrium diagrams of metallic systems. He has introduced new conceptions and generalisations into the study of alloys, and has provided much new information as to the nature and properties of alloys.

DR. ERNEST ALBERT RUDGE is 40 years of age. He graduated B.Sc. (London) with first class honours in chemistry in 1915, and thereafter was engaged as an analytical chemist first by Johnson and Sons, at their smelting works, and then as an analytical and research chemist in the Osram Robertson Lamp Works. After the war he obtained an appointment with the Morgan Crucible Co. until July, 1919, when he was appointed a lecturer in chemistry at Cardiff Technical College. In 1917 he was elected an Associate of the Institute of Chemistry; early in 1929 he obtained the degree of M.Sc. (London) for research on "Titanium Cyanonitride: A Blast-Furnace Product," and was elected a Fellow of the Institute in the same year. Since 1930, Dr. Rudge has made a special study of the uses and behaviour of timbers in South Wales industries, and of the causes and circumstances of decay in industrial timbers. This year he has been awarded the degree of Ph.D. for a thesis entitled "The Decomposition of Timber under Industrial Conditions."

MR. C. T. KINGZETT, F.I.C., has removed from Weybridge to "Weylands," Pyrford Road, West Byfleet, Surrey.

MR. DAVID HETHERINGTON, who was in the employ of R. Sumner and Co., Ltd., wholesale chemists, Liverpool, for the past 48 years, died on November 6, aged 67.

SIR ANDREW MCFADYEAN has joined the board of the Rio Tinto Co., Ltd., and with the Hon. R. M. Preston, has been appointed a joint commercial director.

ALDERMAN C. A. CRITCHLEY, wholesale chemist, who has been elected Mayor of Blackburn for the second time, is a former president of the North-East Lancashire Chemists' Association.

SIR JAMES C. IRVINE, Principal of St. Andrews University, is to preside at the Ramsay Chemical dinner at Glasgow, on December 7. Sir James Lithgow will propose the toast of "The Profession."

MR. HILL HAMILTON BARRETT, of Glasgow and Shawfield Works, Rutherglen, left £311,264, of which £305,056 is personal estate in Great Britain. Glasgow institutions will benefit to the extent of £3,050.

MR. CHARLES LUMSDEN, B.Sc., North Berwick, has received an appointment as an analyst with the Burma Oil Co., in Rangoon. He was a well-known figure in North Berwick and graduated at Edinburgh University, where he took his degree last year.

MR. A. J. GILLIAN, general secretary of the Chemical Workers' Union, who was elected a member of the Southwark Borough Council on November 1, has been appointed chairman of the council's public health and sanitary committee.

BY-PRODUCT sulphuric acid production by Polish metallurgical plants increased in the first half of 1934 to 85,378 metric tons (50 degrees Be.), as compared with 80,806 tons in the corresponding period of 1933. Concurrently, domestic consumption fell to 55,786 tons from 62,534 tons, while exports rose to 11,248 tons from 4,868 tons.

Far Eastern Chemical Notes

Japan

ACID FAST DYES WILL BE MANUFACTURED by the recently formed Nippon Kagaku Toryo K.K. (capital 250,000 yen).

PRODUCTS ARE TO BE MADE FROM WASTE RUBBER by a new Yokohama firm, Nippon Saishi Gomu Kogyo K.K. (capital 3 million yen).

DIVIDEND RESULTS OF JAPANESE RAYON CONCERNS are given in the "Chemische Industrie," November 10, where distributions ranging from 10 to 30 per cent. on the part of seven companies are revealed. Details are also published of the activities of several newcomers in this field. The Nippon Boseki Jinzosen-i K.K. is now producing no less than seven tons staple fibre daily, while the initial daily capacity of the Kinkua Jinken K.K. amounts to four tons rayon and two tons staple fibre. The largest of all Japanese rayon concerns, Teikiku Jinken K.K. has decided to erect a new factory which will be run by a new affiliated concern with a paid-up capital of 5 million yen.

IN ORDER TO EXPAND ITS CAUSTIC SODA OUTPUT from 200 tons to 800 tons per month, and with a view to engaging in transparent viscose foil manufacture, the Asahi Denki Kogyo K.K. has increased its capital from 3 million to 5 million yen.

Manchuria

CONSTRUCTION OF NEW CELLULOSE FACTORIES in Manchoukuo is contemplated by the East Manchuria Rayon Company, an affiliated concern of the Okura Company. The new factories are located in Kirin and Lungchingtsun.

SHALE OIL PRODUCTION is receiving close attention in Fushun, the factory originally erected with a contemplated annual output of 75,000 tons crude oil being now doubled in capacity. At a later date this will be followed by a second expansion of capacity to 300,000 tons per annum. The enterprise is owned by the South Manchurian Railway Company who are also considering the construction of a coal liquefaction plant.

Continental Chemical Notes

Roumania

PRODUCTION OF CARBON BLACK from natural gas at the Medias plant of the Sonametan concern will commence on February 1, 1935, and is expected to satisfy the entire internal demand while leaving a surplus for export.

Norway

THE ANNUAL REPORT OF THE NORSK HYDRO for the year ending June 30 discloses a considerably reduced net profit of 54,000 kronen (1.74 million kronen last year). No dividend is distributed and the disappointing result is mainly ascribed to the losses sustained by the A/S Rjukanfoss.

Austria

A NEW MOTOR SPIRIT, Coreth, recently marketed in Austria contains 36 per cent. crude alcohol, 28 per cent. lignite tar oil, 20 per cent. gas oil, 10 per cent. wood alcohol oil, 4 per cent. water and 2 per cent. binding agent of undisclosed composition.

Poland

A NEW COMPANY WITH A CAPITAL OF 10,000 ZLOTY, intending to produce soaps and cosmetics, has been formed at Warsaw under the style of "Varden."

Germany

COMPOUNDS OF THE TYPE OF VITAMIN A can be produced by a recently patented process based upon condensation of acetylene with dihydroionone (German Pat. 601,070).

Russia

AMONG RECENT RUSSIAN DEVELOPMENTS reported in the "Chemische Industrie," of November 10, are the starting-up of the cadmium plant at the "Elektrozink" factory at Ordschonikidze (240 kg. cadmium produced up to the end of October); production of liquid sulphur dioxide from waste gases at the chemical combinate in Czernoretschje; a new process for light-fast sulphur dyestuffs for viscose rayon; and the proposed hydrogenation of shale bitumen to yield motor spirit.

News from the Allied Industries

Paper

THE APPLICATION FOR FINANCIAL ASSISTANCE which has been received by the British Government from the newly-founded Kenya paper pulp industry, has been referred, like all other similar applications, to the Colonial Development Advisory Committee, which was set up in 1929. A special sub-committee of this Advisory Committee is now considering the application and is in very close touch with the industry.

Sugar

THE PROPOSED SUGAR MARKETING SCHEME was drastically criticised on November 13 at a luncheon attended by the "food group" of Members of Parliament and by manufacturers engaged in sugar-using industries. The scheme, which is put forward by five groups of 22 companies of sugar manufacturers and refiners, proposes to confer on them now and for ever the sole right to supply sugar to the United Kingdom market. They would relieve the Treasury of the annual sugar-beet subsidy of about £3,000,000, and recoup themselves by a levy of ¼d. per pound on all sugar sold. This levy would cost consumers not £3,000,000, but over £4,500,000. Mr. J. G. Mathieson said that the industries using sugar consumed 500,000 tons of the 2,000,000 consumed annually in this country. They included the canning industry and the makers of jam, biscuits, cake, condensed milk, ice cream, chocolate, and confectionery. Altogether they directly employed over 175,000 insured persons, some four times as many as were employed in sugar production. They would have to bear a quarter of the proposed levy, which would increase the total imposts on sugar to 11s. 8d. per hundredweight, about 60 per cent. of its total cost. It was not now contended that beet sugar could ever compete on equal terms with cane sugar. Indeed, Sir Daniel Hall, Chief Scientific Adviser to the Ministry of Agriculture, had said that the fostering of beet-sugar production had become of doubtful expediency.

Glass

ANOTHER GLASS FURNACE has been lighted at the Barnsley works of Wood Bros. Glass Co., making five furnaces in commission. This is the first time that five furnaces have been producing at one time at the works. Moreover, three shifts a day are being worked. At the Barnsley and Wombwell works of the company, about 600 workpeople are being found employment, and if the present rate of new business continues, the number will probably be increased to 700 before the end of the year.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Complete Specifications Open to Public Inspection

CADMIUMISING STEEL WOOL, and the resulting product, process. E. H. Miller and W. S. Leeson. May 5, 1933. 8918/34.

SULPHURIC ACID, purification.—E. I. du Pont de Nemours and Co. May 2, 1933. 11111/34.

NON-KNOCKING BENZINES, production.—International Hydrogenation Patents Co., Ltd. May 5, 1933. 12281/34.

HYDROCARBON OILS, treatment.—Standard Oil Co., Indiana. May 3, 1933. 13025/34.

ACID RESINS and acid tars, treatment.—H. W. Kunze. May 4, 1933. 13027/34.

CONDENSATION PRODUCTS of carbenium compounds, manufacture. I. G. Farbenindustrie. May 2, 1933. 13248/34.

GLYOXYLIC ACID, manufacture.—I. G. Farbenindustrie. May 4, 1933. 13249/34.

ORGANIC SULPHUR COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co. May 2, 1933. 13305/34.

THICKENED MINERAL OIL PRODUCTS, production.—Kerasin, Ltd. May 2, 1933. 13317/34.

CUPRIFEROUS DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 3, 1933. 13401/34.

SOLUBLE STARCH, manufacturing.—Duintjer Wilkens Meihuizen and Co. Naamlooze Vennootschap. May 5, 1933. 13422/34.

TREATING STARCHES with oxidising agents, method.—Dr. W. Seck. May 4, 1933. 13591/34.

ACYL OCTAHYDROFOLLICLE HORMONES, method for the production. Schering-Kahlbaum A.-G. May 5, 1933. 13788/34.

CRUDE EXTRACTS of the germinal gland hormones and isolating the latter therefrom, method of purifying.—Schering-Kahlbaum A.-G. May 5, 1933. 13789/34.

Specifications Accepted with Dates of Application

TREATING ACID SOLUTIONS, methods.—W. W. Triggs (Chemical Construction Corporation, T. C. Oliver and S. F. Spangler). Jan. 28, 1933. 418,894.

COLOURING ORGANIC MASSES capable of being moulded.—J. Y. Johnson (I. G. Farbenindustrie). March 20, 1933. 418,667.

PHOTOGRAPHIC EMULSIONS, sensitisation.—I. G. Farbenindustrie. April 26, 1932. 418,745.

SULPHUR DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co. May 4, 1932. 418,746.

DYES ON THE FIBRE, production.—E. I. du Pont de Nemours and Co. April 30, 1932. 418,827.

HYDROCHLORIC ACID and apparatus therefor, manufacture.—Chemical and Metallurgical Corporation, Ltd., and S. B. Casson. May 3, 1933. 418,992.

AZO DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co. May 4, 1932. 418,997.

CONCENTRATED NITRIC ACID, production.—Lonza Elektrizitätswerke und Chemische Fabriken A.-G. June 4, 1932. 418,916.

NON-KNOCKING BENZINES, production.—I. G. Farbenindustrie. July 26, 1932. 418,926.

ASSISTING AGENTS in the textile and leather industries, manufacture and application of useful products.—A. G. Bloxam (Soc. of Chemical Industry in Basle). April 27, 1933. 419,010.

VINYL ESTERS, processes of making.—Carbide and Carbon Chemicals Corporation. Jan. 25, 1933. 418,943.

SOLUBLE PHOSPHATE FERTILISER, process of producing.—Bayerische Stickstoff-werke A.-G. Jan. 11, 1933. 418,788.

PURE CHROMIUM COMPOUNDS, process for making.—Dr. W. Hene. Jan. 31, 1933. 418,714.

RECOVERY OF PURE METALLIC MAGNESIUM from crude magnesium or magnesiferous materials, method of and means for.—Oesterreichisch Amerikanische Magnesit A.-G. May 30, 1933. 418,789.

PRIMARY DITERPENE-ALCOHOLS, manufacture.—Soc. of Chemical Industry in Basle. March 3, 1933. 418,723.

DYEING ACETYL-CELLULOSE and mixed materials containing acetylcellulose.—J. R. Geigy A.-G. July 21, 1933. 419,048.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Jan. 25, 1933. 418,622.

HYDROCHLORIC ACID, method of continuously manufacturing.—American Cyanamid Co. June 8, 1933. 418,335.

POLYMERISING MONOMERIC ALDEHYDE SUGARS (aldoses), process. Holzhydrolyse A.-G. Feb. 16, 1933. 418,481.

FERRO-CHROMIUM free from carbon, production.—Norsk Hydro-Elektrisk Kvaelstofaktieselskab. April 26, 1933. 418,560.

PHOTOGRAPHIC SENSITISING DYES, manufacture.—I. G. Farbenindustrie. Jan. 19, 1932. 418,561.

SUBSTANTIVE AZO DYESTUFFS, manufacture.—Deutsche Hydrierwerke A.-G. Jan. 29, 1932. 418,360.

Applications for Patents

(November 1 to 7 inclusive).

MIXED ESTERS, production.—H. A. Auden and H. P. Staudinger. 32008.

SYNTHETIC RESINS.—Bakelite, Ltd. (United States, Nov. 7, '33.) 31546.

ANHYDRIDES OF FATTY ACIDS, manufacture.—C. F. Boehringer und Soehne Ges. (Germany, Nov. 16, '33.) 31891.

TITANIUM PIGMENTS, production.—British Titan Products Co., Ltd. (United States, Nov. 9, '33.) 32060.

DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie. 31523.

N-HYDROXYALKYLAMINONITRO-AND-AMINOBENZENES, manufacture. A. Carpmael (I. G. Farbenindustrie). 31524.

SUBSTANCES DISPLAYING HORMONE-LIKE ACTION, manufacture.—A. Carpmael (I. G. Farbenindustrie). 31795, 31796, 31797.

VITAMINE PREPARATION, manufacture.—A. Carpmael (I. G. Farbenindustrie). 31909.

ACETIC ANHYDRIDE, manufacture.—Consortium für Elektrochemische Industrie Ges. (Germany, Nov. 28, '33.) 31609.

METHYL METRACRYLATE, manufacture.—J. W. C. Crawford. 31570.

UNSATURATED ORGANIC COMPOUNDS, manufacture.—J. W. C. Crawford and Imperial Chemical Industries, Ltd. 32055.

CRYSTALLINE ANHYDROUS SODIUM METASILICATE, production.—J. Crosfield and Sons, Ltd. (United States, Nov. 25, '33.) 31780.

BENZENE HEXACHLORIDE, production.—A. L. Curtis. 32051.

FORMALDEHYDE CONCENTRATES, manufacture.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, Nov. 17, '33.) 31769.

AMINOTRIFLUORO-METHYL-ARYL-SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 31497.

AZO DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 31616.

2-AMINOANTHRAQUINONE-SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 31864.

2-AMINO-3-BROMO-ANTHRAQUINONE SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 31866.

AMINOALKYL SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 31867.

POLYNUCLEAR CYCLIC ALCOHOLS, manufacture.—W. W. Groves (Soc. of Chemical Industry in Basle). 31739.

ELECTRODEPOSITION OF METALS.—Harshaw Chemical Co. (United States, March 14.) 31654.

ELECTRODEPOSITION OF METALS.—Harshaw Chemical Co. (United States, May 4.) 31655.

POLYMERISING MONOMERIC ALDEHYDE SUGARS.—Holzhydrolyse A.-G. (Germany, Nov. 7, '33.) 32064.

TRISAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 3, '33.) 31632.

OXYNAPHTHOTRIAZOLES, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 3, '33.) 31736.

SYMMETRICAL DI-(ARYL-AMINO)-HYDROXYBENZENES, manufacture. I. G. Farbenindustrie. (Germany, Nov. 7, '33.) 32002.

METHYL METRACRYLATE, manufacture.—Imperial Chemical Industries, Ltd., D. E. Woods and G. E. Wainwright. 31570.

SOLIDS, ETC., FROM LIQUIDS, centrifugal separation.—Imperial Chemical Industries, Ltd. 31778.

ANTHRAQUINONE VAT DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., F. Irving and C. Shaw. 32057.

WASHING DISTILLATES.—R. G. Israel and H. P. Stephenson. 32046.

OLEFINE DI-CHLORIDES, production.—R. G. Israel and H. P. Stephenson. 32047.

CHLORHYDRINS, production.—R. G. Israel and H. P. Stephenson. 32048.

UNSATURATED GASEOUS PRODUCTS, production.—R. G. Israel and H. P. Stephenson. 32049.

GASES, etc., recovery.—R. G. Israel and H. P. Stephenson. 32050.

SEPARATION of mixture of cis and trans benzene hexachloride.—R. G. Israel and H. P. Stephenson. 32052.

BENZENE JELLY, making.—Kerasin, Ltd. (Germany, Nov. 2, '33.) 31573.

ELECTRIC ARC WELDING.—Murex Welding Processes, Ltd. 31777.

ORGANIC DEODORISED SOLVENTS, production.—F. N. Pickett. 31846, 31847.

POLYMERISATION PRODUCTS, manufacture.—H. Staudinger. (Germany, Nov. 1, '33.) 31392.

CRACKING HEAVY DISTILLATES.—H. P. Stephenson. 32045.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

Price Changes

General Chemicals.—FORMALDEHYDE (London), £25 10s. per ton; LEAD NITRATE, £27 10s.; LEAD, white, £36 10s. per ton.

Coal Tar Products.—CREOSOTE, B.S.I. specification, 4¼d. to 4½d. per gal.; PYRIDINE, 90/140, 6s. 6d. to 8s. 6d. per gal.

Pharmaceutical and Fine Chemicals.—MENTHOL, A.B.R. recryst. B.P., 12s. 1½d. per lb.; HELIOTROPINE, 7s. 9d.; LINALOL (ex Bois de Rose), 7s., ex Shui oil, 4s. 6d.; LINALYL ACETATE (ex Bois de Rose) 8s. 3d., ex Shui oil 5s. 3d.; MUSK, ambrette, 20s., ketone 18s., xylol 5s. 6d.

Essential Oils.—LAVENDER, Mont Blanc, 38/40%, 24s. per lb.; PALMA ROSA, 6s. 6d.; PEPPERMINT, Japanese, 5s. 3d.; PETIT GRAIN, 5s.; SANDALWOOD, Australian, B.P. and French codex, 92/95%, 15s. 3d.

All other prices remain unchanged.

THERE has been no change in the prices of rubber chemicals, wood distillation products, intermediates and dyes, and market conditions have remained steady on the whole. Unless otherwise stated, the general prices given below cover fair quantities net and naked at sellers' works.

LONDON.—The position of chemicals still remains very firm and the good general demand is maintained. There is little change to report in the market prices for coal tar products.

MANCHESTER.—Price movements on the chemical market here during the past week have been extremely limited and the few changes that have occurred have been confined to fractional movements in one direction or the other. The general undertone remains very steady and any important movement in favour of buyers is regarded as unlikely. Heavy chemicals are being taken up in fairly satisfactory quantities against commitments, and a moderate weight of business is going through on this market for early delivery, with a sprinkling of forward contracts reported this week. On the whole, the improvement in trade seems to have been consolidated although further progress is slow. In the by-products market locally conditions are not too satisfactory at the moment, and only in one or two sections is the demand reasonably active; in a number of instances the price tendency is easy, more especially in the light products.

SCOTLAND.—There has been a slight decrease in business in the Scottish heavy chemical market.

General Chemicals

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

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

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

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

ACID, CITRIC.—10½d. per lb. less 5%. MANCHESTER: 10¼d.

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

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

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

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

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £53 ex store.

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

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

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

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

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

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

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

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

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

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

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6¼d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

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

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

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

BARYTES.—£6 10s. to £8 per ton.

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

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

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

CADMIUM SULPHIDE.—2s. 5d. to 2s. 9d.

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

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

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON: 4½d. to 5d.

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

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

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

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

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

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD, NITRATE.—£27 10s. per ton.

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

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

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

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

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8¼d. to 8¾d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £37 10s.

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

POTASSIUM CHLORATE.—LONDON : £37 to £40 per ton. SCOTLAND : 99¾/100%, powder, £37. MANCHESTER : £37 10s.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.
POTASSIUM NIRATE.—SCOTLAND : Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON : 9¾d. per lb. SCOTLAND : B.P. crystals, 9d. MANCHESTER : B.P., 10d.
POTASSIUM PRUSSIATE.—LONDON : 8½d. to 8¾d. per lb. SCOTLAND : Yellow spot, 8½d. ex store. MANCHESTER : Yellow, 8½d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND : Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER : £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON : £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND : Refined recrystallised £10 15s. ex quay or station. MANCHESTER : £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON : 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND : 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND : £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND : Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER : Commercial, £10 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON . Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON : 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON : 5d. to 5½d. per lb. SCOTLAND : 5s. to 5¾d. ex store. MANCHESTER : 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND : £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND : £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND : English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND : Ground quality, £3 5s. per ton d/d. MANCHESTER . £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND : For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER : Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER : £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND · British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON : £12 per ton. SCOTLAND : £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8⅛d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER : Crystals, 7¼d. per lb.; crude, 1s. 11d. per gal. SCOTLAND : 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON : 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND : Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON : Motor, 1s. 6½d. SCOTLAND : Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 4d. to 4¼d. per gal. f.o.r. Home. 3¾d. d/d. LONDON : 3½d. f.o.r. North; 4d. London. MANCHESTER : 3¼d. to 4¼d. SCOTLAND : Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON : Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND : 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON : Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND : 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—LONDON : 50s. per ton f.o.b. East Coast port.
PYRIDINE.—90/140, 7s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Nov., £6 19s.; Dec., £7 0s. 6d.; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—Nov., £6 18s. 9d.; Dec., £7; Jan., 1935, £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton, for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station.

Latest Oil Prices

LONDON, Nov. 14.—LINSEED OIL was firm. Spot, £19 5s. (small quantities 30s. extra); Dec., £17 15s.; Jan.-April, £18; May-Aug., £18 7s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), Nov.-Dec. shipment, £14 per ton. RAPE OIL was dearer. Crude extracted, £27 10s.; technical refined, £29, naked, ex wharf. COTTON OIL was firmer. Egyptian crude, £16 10s.; refined common edible, £20; deodorised, £21 10s., naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 44s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £18 10s. per ton; Nov.-Dec., and Jan.-April, £18; May-Aug., £18 5s., naked. COTTON OIL, Egyptian, crude, spot, £17 10s.; edible, refined, spot, £19; technical, spot, £19; deodorised, £21, naked. PALM KERNEL OIL, crude, f.m.q., spot, £13 10s., naked. GROUNDNUT OIL, extracted, spot, £23; deodorised, £27. RAPE OIL, extracted, spot, £26 10s.; refined, £28. SOYA OIL, extracted, spot, £16; deodorised, £19 per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL, pharmaceutical, 36s. 6d.; first, 31s. 6d.; second, 28s. 6d. per cwt. TURPENTINE, American, spot, 46s. per cwt.

From Week to Week

A DEPOSIT OF DIATOMITE AT KENTMERE, in the Lake District, is likely to provide employment for a number of men.

TO INDICATE THE OCCASION OF HER MARRIAGE to the Duke of Kent, Princess Marina has agreed to sponsor a colour for the British Colour Council and has expressed a wish that it should be called "Marina Green." The colour is similar to a pale jade with a turquoise tone.

MR. CLEMENT FLETCHER has been elected president of the Lancashire and Cheshire Coal Association for the ensuing year. Mr. Fletcher is a director and a member of the board of management of Manchester Collieries, Ltd., and is mining agent for that company's Atherton group of collieries. He is a member of the Lancashire and Cheshire Safety in Mines Research Committee and of the Miners' Welfare Local Schemes Joint Committee.

DEVELOPMENTS WITH REGARD TO THE PRODUCTION OF PETROL from coal at the Billingham-on-Tees works of the Imperial Chemical Industries were disclosed at a meeting of the Tees Conservancy Commission, held in Middlesbrough on November 5. It was reported that a new jetty had been constructed for the direct loading of the petrol and service-pipes from the factory to the jetty were in the process of being fixed.

AT A MEETING of the board of the Institute of Physics, held on November 13, the following were elected to membership: Fellows: N. Ahmad, A. L. Green, H. H. Macey, A. V. R. Telang, and T. C. Williams: associates: H. Falkner, A. W. Foster, J. Iball, A. W. Ikin, L. H. McDermott, D. H. Smith and W. J. Sulston; students: A. C. Challands, T. F. Harle and H. J. A. Turner; ordinary member: K. A. Smith.

THE CONTROL AND LICENCE of every distributor or retailer of any manufactured commodity was urged by Mr. H. L. Kenward, sales director of the Dunlop Rubber Co., Ltd., in a paper on price regulation which he read to the Institute of the Motor Trade at the Holborn Restaurant, London, on Tuesday. In each major industry, he said, a register of licenced retailers or distributors was an essential to the protection of prices. Competition was good, or so we were told, but unrestricted retailing did not create demand, it merely diverted into muddy ruts the water which should run in clear streams. Organisations existed for the protection of retail prices, but all their activities could only be partially successful while the number of retailers was entirely unrelated to the public need. "While Government control of industry is generally an unpopular vision," said Mr. Kenward, "there can surely be no objection to permissive legislation which shall strengthen and recognise the authorised trade associations existing for protection of prices. During the war the discovered and more obvious profiteers were subject to heavy fines; during periods of recovery the price cutter should be liable to the penalties awarded his more romantic brother, the burglar. Were there a defined register of traders, prepared not by any Association but by a group of representative manufacturers, distributors and retailers, there would need to be only one punishment for price cutting, that of removal from the register and the withdrawal of the trading licence."

THE INSTITUTE OF LABOUR MANAGEMENT is celebrating its 21st birthday. It was started at York in 1913 under the chairmanship of Mr. B. Seebohm Rowntree. A birthday dinner was held at the Hyde Park Hotel, London, on November 16.

MR. T. C. GUTHRIE, chartered accountant, of Manchester, was appointed receiver of E. Brooksbank and Co., Ltd., on November 6, under powers contained in debenture dated November 28, 1923.

TO HELP MANUFACTURERS AND TRADERS to find suitable sites for their factories, and to advise on the removal of their undertakings into other areas, the railway companies have established industrial information bureaux in London at Paddington, Waterloo, Euston and King's Cross.

THE BOARD OF TRADE RETURNS for the month ended October 31 show that exports of chemicals, drugs, dyes and colours, were valued at £1,798,007, as compared with £1,661,670 for October, 1933, an increase of £136,337. Imports were valued at £1,056,309, as compared with £957,895; re-exports were £51,912.

TWO HUNDRED PAISLEY WORKERS are assured steady employment by the announcement that the Associated Fireclay Companies, Ltd., London, will take over the old-established fireclay company, Robert Brown and Son, Ltd., Ferguslie, Paisley, which was established in 1840.

MR. ERNEST HENRY SANITER, chief metallurgist of the United Steel Companies, has died at his home at Rotherham. He was a holder of the Bessemer medal in recognition of distinguished research and discovery in steel-making. He successfully introduced the basic open-hearth method of steel manufacture to the Cleveland district while with Dorman, Long and Co., using for the purpose the local ironstone and the Saniter process of desulphurisation. Mr. Saniter had been a member of the Iron and Steel Institute for over forty years and a member of the Council since 1921. He was born at Middlesbrough in 1863.

MR. L. URWICK, chairman of Urwick, Orr and Partners, Ltd., gave an address on "The Function of Administration, with special reference to the work of Henri Fayol" at a meeting of the Institute of Industrial Administration at Southern House, Cannon Street, on Tuesday. Mr. Urwick said that Fayol, who died in 1925 and who was himself managing director of a great and successful combine in the heavy industries for over thirty years, did more than any other man in this century to make clearer the principles on which business government should be based. Fayol pointed out that all business activities could be divided into six basic groups of operations—technical, commercial, financial, security, accounting and administrative. These operations must be distinguished from governing the business—the co-ordination of these six operations and the ultimate control of staff. Administration was divisible into forecasting, planning, organisation, co-ordination, command and control. The bigger the business or the higher the position in the business the greater the proportion of administrative capacity and the smaller the proportion of technical capacity required.

International Nickel Co. of Canada

Statement for Third Quarter, 1934

THE interim statement of the International Nickel Co. of Canada, Ltd., for the third quarter, 1934, shows earnings equivalent to 24 cents per share on the common stock after allowing for preferred dividends. This compares with a rate of 31 cents per share in the previous quarter, and of 22½ cents. per share in the third quarter of 1933. Earnings for the first three quarters of 1934 total 86 cents per share, as against a total of 28½ cents per share for the same period a year ago.

In an accompanying letter to stockholders, Mr. Robert C. Stanley, president of the company, points out that the ores which the company mines and treats are of the copper-nickel type. "In extracting nickel and making it an important servant of industry," he writes, "approximately two pounds of copper are recovered for every pound of nickel. This means that copper is now being mined at the rate of more than 200,000,000 pounds per year as the direct result of providing the nickel now required in diversified industrial markets throughout the world. To refine its copper to the high degree of purity demanded by modern industry your company participated in the organisation of the Ontario Refining Company, Ltd., for the construction, as a custom refinery, of a modern electrolytic plant at Copper Cliff, Ontario. The International Nickel Co. of Canada now owns 90 per cent. of the capital stock of the Ontario Refining Co., and that refinery is now engaged exclusively in the production of "Orc" brand electrolytic copper from International Nickel Co.'s blister copper."

Motor Fuel Proprietary, Ltd.

New Process an Established Success

PRESIDING at the meeting of Motor Fuel Proprietary, Ltd., held in London on Wednesday, Mr. F. C. Marten, the chairman, said that they were meeting under conditions that not only placed the company in a position to erect a commercial plant, but also fully justified looking forward to great prosperity. The plant had been completed early this summer. Many tons of coal had been treated with results far exceeding expectations, and the board had felt justified in approaching a financial group with a view to raising the capital to commercialise the process. That group requested the board to obtain an independent report, and without elaborating very much on it, he could say he believed the yield of 27.3 gallons of light oils, as given, to be far greater than that of any of the known processes, while the chemicals produced had very great potentialities.

The directors, in estimating the profits to be derived from a plant treating 500 tons of coal per day to be over £250,000 per annum, felt they might have erred on the side of under-valuation. The future was more encouraging than at any previous time and could be faced with full confidence. The capital was to be increased to £300,000 by the creation of 800,000 new 5s. shares, of which 300,000 were to be offered to the shareholders at 15s.

Mr. H. P. Stephenson said the company had a proved process, which should produce substantial profits on the basis of semi-coke and petrol alone, with, in addition, very vast potential possibilities in valuable chemical products. The process was unique in that no mechanical difficulties were encountered in its operation, and the plant should have a normal commercial life definitely not under ten years before renewals were necessary. The semi-coke produced was without equal, and the motor spirit was equal to that at present offered to the public, giving, in common with all coal-produced spirit, a greater mileage per gallon. With a perfect semi-coke and a minimum yield of 27 gallons of light oil per ton of coal, the commercial future of the company was assured on that basis alone, while the chemical products were being increasingly used in the artificial silk, rubber, paint and varnish, lacquer and fat and oil industries. Their company had been the first to realise the enormous possibilities of the production of fine chemicals from coal, and patents were being taken out in every country in the world.

The report and accounts were unanimously adopted, and the proposed increase of capital was approved.

Forthcoming Events

LONDON.

Nov. 19, 26 and **Dec. 3.**—Royal Society of Arts. "Modern Spectroscopy." Herbert Dingle. 8 p.m. John Street, Adelphi, London.

Nov. 20.—Royal Institution. "The Solid State." Sir William Bragg. 5.15 p.m. 21 Albemarle Street, London.

Nov. 21.—Society of Chemical Industry (Plastics Group). Joint meeting with the Institute of the Plastics Industry. "Urea-Plastics." K. M. Chance. 7.30 p.m. 21 Tothill Street, London.

Nov. 22.—Institute of Fuel. Discussion on "The Training of Boiler House Employees," opened by John Bruce. 6.30 p.m. Bush House, Aldwych, London.

Nov. 23.—Chemical Engineering Group. "The Chemical Engineering Aspect of Low Temperature Carbonisation." Colonel W. A. Bristow. 8 p.m. Burlington House, Piccadilly, London.

Nov. 23.—Royal Institution. "Heavy Water in Chemistry." Professor M. Polanyi. 9 p.m. 21 Albemarle Street, London.

Nov. 24.—British Association of Chemists. Annual general meeting and dinner. Waldorf Hotel, Aldwych, London.

BIRMINGHAM.

Nov. 19.—University of Birmingham Chemical Society. "Organic Compounds of Thallium." R. C. Menzies. 5 p.m. Chemical Lecture Theatre, Edgbaston, Birmingham.

Nov. 20.—Midland Metallurgical Societies. "Fatigue in Metals." H. J. Gough. 7 p.m. James Watt Memorial Institute, Birmingham.

Nov. 22.—Institute of Brewing (Midland Counties Section). "The Biochemist in the Cider Factory." Vernon L. S. Charley. White Horse Hotel, Birmingham.

DERBY.

Nov. 22.—Society of Chemical Industry (Nottingham Section). "Developments in Oxide Catalysis." Dr. E. B. Maxted. 7.30 p.m. Derby.

EDINBURGH.

Nov. 30.—Society of Chemical Industry, Institute of Chemistry, and Chemical Society (Edinburgh). "Some Notes on Poisons." H. H. Campbell. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

GLASGOW.

Nov. 23.—Institute of Chemistry and Society of Chemical Industry (Glasgow Sections). Symposium on Micro-chemistry with demonstration, by Dr. D. T. Gibson and Dr. R. Roger. 7.30 p.m. University, Glasgow.

LEEDS.

Nov. 21.—Society of Glass Technology. 2 p.m. University, Leeds.

LIVERPOOL.

Nov. 23.—Institute of Chemistry and Society of Chemical Industry (Liverpool Sections). "Photo-electricity and the Chemical Industry." J. A. Walters. 6 p.m. University, Liverpool.

MANCHESTER.

Nov. 21.—Institute of Fuel (N. Western Section). Joint meeting with the Manchester District Association of Gas Engineers. 7 p.m. Engineers Club, Albert Square, Manchester.

Nov. 21.—Institute of Vitreous Enamellers (Northern Section). "Costing for Vitreous Enamelling." W. H. Whittle. 7.30 p.m. Queen's Hotel, Piccadilly, Manchester.

NOTTINGHAM.

Nov. 23.—Society of Dyers and Colourists (Midlands Section). Joint meeting with the Foremen Dyers' Guild. "The Dyeing of Viscose Rayon." J. M. Preston. Nottingham.

SWANSEA.

Nov. 23.—Institute of Chemistry (Swansea Section). Annual meeting. 7 p.m. Thomas' Cafe, High Street, Swansea.

Company News

W. and H. M. Goulding.—Payment of 3 per cent., less tax, is announced on the ordinary shares, payable January 1.

Fullers' Earth Union.—The payment of 2 per cent., less tax, is announced on the ordinary shares payable on November 19.

Monsanto Chemical (U.S.A.).—The net profit for the September quarter amounted to $566,195, against $704,918 in preceding period and $680,757 in 1933 quarter.

Alpha Cement, Ltd.—At an extraordinary general meeting held on November 10, resolutions were passed increasing the capital of the company to £900,000 by the creation of 200,000 5½ per cent. cumulative preference shares of £1 each.

Lewis Berger and Sons, Ltd.—The directors announce a final ordinary dividend of 6 per cent., less tax, making 10 per cent. for the year to July 31 last. This compares with 7½ per cent. for 1932-1933, and is the highest distribution since 1930.

British Feeding-Meals and Milk Products.—An extraordinary meeting of shareholders is to be held on November 30 to consider a resolution to reduce the capital of the company from £307,362 10s. to £276,524 18s. The reduction is to be effected by cancelling paid-up capital to the extent of 6s. per share on each of the 102,792 issued ordinary and by reducing the nominal amount of each issued ordinary from 10s. to 4s.

United Drug, Inc.—The report for the quarter to September 30 shows a loss of $46,875 after depreciation, interest and taxes, but before profit from sale of securities, including $538,912 profit from sale of securities, the net profit was $492,037, equivalent to 35 cents a share (par $5) on 1,400,560 shares of capital stock. For the nine months to September 30, the net profit was $1,094,001, including profit from sale of securities and after charges and taxes, equal to 78 cents a share.

Tate and Lyle.—A final dividend of 16½ per cent., less tax, is announced for the year to September 30, 1934, making a total of 22½ per cent. for the year, against 17 per cent. for last year. General reserve receives £150,000, against £50,000, and taxation equalisation reserve receives £150,000, and £50,000 is written off plant and machinery, in comparison with £250,000 written off a year ago under the scheme of reconstruction of refineries. In addition, £4,000 is written off leasehold property account and £21,000 off cottage property account. The carry-forward is slightly lower at £43,341, against £48,973. The preliminary statements indicate an increase in total profits of approximately £270,000 over last year's figure of £1,032,334.

New Companies Registered

Astra Metals and Residues, Ltd., Sentinel House, Southampton Row, London, W.C.1.—Registered November 10. Nominal capital £2,000. Merchants and dealers in and brokers of copper, tin, zinc, lead, nickel, aluminium, antimony and other metallurgical and chemical products and merchants and brokers on the London Metal Exchanges and elsewhere.

Charles Tennant and Co. (I.F.S.), Ltd.—Registered in Dublin on November 9. Nominal capital £50,000. Chemists, druggists, drysalters, producers, manufacturers, warehousemen, exporters, importers, dealers in pharmaceutical, medicinal, industrial and other chemical preparations, etc. Directors: Joseph V. Russell, 58 Dalziel Drive, Pollokshields, Glasgow, Moore F. Parkhill, Francis J. Tennant.

Extruded Plastics, Ltd., Abbey House, Baker Street, London, N.W.1.—Registered as a "private" company on November 9. Nominal capital £5,000. Manufacturers of and dealers in mouldings or moulded articles produced partly or wholly from any kind of synthetic resin, manufacturers of and/or dealers in organic and/or inorganic chemical substances and products, etc. A subscriber: Norman H. Buckley, Ideal House, 1 Argyle Street, W.1.

Vaughan Mason and Co., Ltd.—Registered November 10. Nominal capital £5,000. Shipping, pharmaceutical, analytical, manufacturing and consulting chemists, chemists' and druggists' sundriesmen, etc. Directors: Fredk. W. Vaughan (chairman), South Dene House, Low Fell, Co., Durham; Robert Mason.

Chemical Trade Inquiries

Glasgow Corporation Gas (Chemical Works) Department is inviting tenders for the supply and delivery of best quality hand-picked causticising lime at the Provan Chemical Works, Glasgow, the total estimated quantity required being about 1,000 tons. Terms must include carriage to the siding at the works. Delivery will be required in approximate equal monthly quantities during the period January 1 to December 31, 1935. Tenders are to be lodged with the Town Clerk by November 22.

FOR SALE

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

WANTED

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

PATENTS & TRADE MARKS

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

WORKING NOTICES

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

THE Proprietor of British Patent No. 194,454, dated January 6, 1922, relating to "Improvements in Materials for Polishing and Cleansing," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain. Inquiries to B. Singer, Steger Building, Chicago, Illinois.